

**THE ECONOMIC CONDITION OF THE MAIN CYRENAICAN
CITIES (NORTH-EASTERN LIBYA) FROM THE HELLENISTIC
TO THE MID-ROMAN PERIOD: TEXTUAL ANALYSIS**

**Thesis submitted for the degree of
Doctor of Philosophy
at the University of Leicester**

by

**Muna H. Haroun Abdelhamed
School of Archaeology & Ancient History
University of Leicester**

2018

Abstract

Muna Abdelhamed, *The Economic Condition of the Main Cyrenaican Cities (North-Eastern Libya) from the Hellenistic to the mid-Roman period: textual analysis*

This thesis investigates cereals, grapes and horses as key examples of Cyrenaica's agro-pastoral economic resources in the Hellenistic and early-mid Roman periods. These have been examined in three case studies to indicate the region's potential for producing annual crops, fruiting plants and animal products. Since cereals and horses are difficult to trace archaeologically and the archaeological data associated with grape cultivation and wine production is quite modest, the main database used in this thesis relates to textual evidence. This includes the literary documents of the Greeks, Romans, Arabs, Ottomans, and the first European travellers. The epigraphy and a papyrus relating to the period of study are also significant data used in this project. The epigraphic data collected from the *Inscriptions of Greek Cyrenaica (IGCyr)*, *Greek Verse Inscriptions of Cyrenaica (GVCyr)* and *Inscriptions of Roman Cyrenaica (IRCyr)* projects are the principal sources of information. Using textual data required me to implement new approaches to test the region's agro-pastoral capacity.

In order to demonstrate the region's connectivity, the thesis investigates some of the imported commodities and highlights things that were perhaps exported in return. It also discusses the reasons why Cyrenaican citizens received honours attested in external and local epigraphic evidence. The research suggests that these people were Cyrenaican cereal traders involved in Mediterranean commercial activities. Additionally, ancient geographical references to Cyrenaican coastal sites including harbours and anchorages receive close attention in this thesis. The 16 maritime points (9 are ports and anchorages) between *Cherronesos* (Χερρόνησος) and *Catabathmus* (Κατάβαθμος) mentioned in *Stadiasmus*, raises a question about the maritime connectivity between Cyrenaica and Egypt in the second century AD.

Finally, the results also allow me to draw a clear picture of the economic contribution of Libyan groups to Cyrenaica's prosperity. This includes harvesting silphium, breeding animal and connecting Cyrenaica with the African Sahara.

Acknowledgments

First of all, my thanks must go to Allah for keeping my life and health and inspiring me to finish this task. I would then like to express my deepest gratitude to my country of Libya for the generous financial support which has enabled me to complete this thesis. A sincere acknowledgment must also go to the School of Archaeology and Ancient History at the University of Leicester which has given me the opportunity to accomplish this research. In particular, I am most grateful to my supervisors, Professors David Mattingly and Graham Shipley, for their academic support and their patience. They have explained and clarified as much as they can in their feedback during our discussions in their offices, or via our emails. This has enabled me to understand any ambiguous matter, and to improve my English and ancient Greek languages which have been among the main skills I have needed to complete this research. Thanks also to Professors Charlotte Roueché and Dr Naoíse Mac Sweeney who both kindly accepted to examine and review my work.

I would also like to extend my thanks to some people from this School who have provided me different kinds of support which positively affected my academic journey. Professor Simon James was the first member I met from the department after my supervisors. He encouraged me during the time when I thought that obtaining a PhD would be beyond my capabilities. Also, Professor Neil Christie who never hesitated to help, encourage and advise me. Rachel Godfrey and Adam Thuraisingam from the School's Professional Services Staff displayed their support and patience when carefully listening to me or reading my emails, and then took quick action to solve my problems. Furthermore, I would like to thank my colleagues for their academic, technical and other kinds of support, especially Dr Ahmad Emrage, Dr Botan Maghdid, Dr Eleonora Zampieri, Dr Jane Ainsworth, Dr Manolis Pagkalos and Dr Mohamed Abdrabba.

I warmly thank the teams of *IGCyr*, *GVCyr* and *IRCyr* projects, especially Professors Charlotte Roueché and Catherine Dobias-Lalou and Doctor Hafed Walda who have enabled me to access the epigraphic data of these projects ahead of their final publication. I cannot stress enough how appreciative I am of the time that Professor Catherine Dobias-Lalou has spent to answer my questions and patiently discuss with me some matters relevant to the Greek inscriptions of Cyrenaica.

I would like to express also my deepest appreciation to Paul Bennett and his wife Becky from Canterbury for their warmth, hospitality and immeasurable help in making me feel settled when starting my first English language course. I would like also to take this opportunity to give grateful thanks to my friends Dr Ahmad Emrage and his wife Alya who allowed me to share their accommodation for a month and then helped me to rent a flat and prepare it for my family who were to come later. Furthermore, a special thank you must go to my friend, neighbour and landlord, Nicholas Brown, for his support in so many different ways and especially for his proof-reading in some difficult areas of my writings.

I would like also to give deep recognition to all of the academic staff members of the archaeology department of the University of Benghazi in Libya, particularly those who have taught me the principal keys to Archaeology and classical languages. I owe a particular debt of acknowledgments also to Professor Mohamed Edweb who has taught me the ancient Greek and Latin grammars and has kept encouraging me to improve my skills in this field.

Last but certainly not least, I would like to express deep thanks to my family especially my father, sisters, brothers, and sisters and brothers in law, for their support too. I am also deeply indebted to my husband, Ahmad Buzaian, who has been so constantly and quietly supportive throughout this immense challenge and whom I can never thank enough. Thanks also for my sons, Mustafa, Kamal and Zakaria for their continued understanding and support. My deepest thanks, however, must go to my mother who would have been so proud of me. Unfortunately, due to her having cancer, we have been prevented from living and sharing together this most important moment in time. Therefore, I dedicate my thesis to her, together with a prayer to Allah asking him to bless her.

Muna Abdelhamed

Table of Contents

Abstract	i
Acknowledgments	ii
Table of Contents	iv
List of Tables	ix
List of Figures	xii
List of Abbreviations	xviii
Part I	
Chapter I : Introduction to the Research	1
I.1: Introductory	1
I.1.1 General Introduction	1
I.1.2 The research context	1
I.1.3 The project objectives and questions	4
I.1.4 Organisation of the study	5
I.1.5 Geographical outline	6
I.1.6 Historical background	9
I.2: The literature Review	11
I.2.1 Debate on the ancient economy and ideal types of city	11
I.2.2 General studies on the Cyrenaican economy	15
Chapter II : Sources and Agricultural Background	20
II.1 The Project Sources.....	20
II.1.1 Literary:	20
II.1.2 Epigraphic evidence.....	22
II.1.3 Papyri	25
II.1.4 Medieval Arabas and early/modern European travellers.....	26
II.1.5 Agricultural surveys.....	27
II.1.6 Visual art.....	27
II.1.7 Numismatics	28
II.1.8 Bio-archaeological and archaeobotanical studies	28

II.1.9 Amphorae production and trade at ports.....	29
II.1.10 Kilns as evidence of local manufacturing of amphorae.....	30
II.1.11 Industrial installations.....	31
II.2 Agricultural Background.....	34
II.2.1 The general annual crops of Cyrenaica.....	34
II.2.2 Figs, almonds and olives and olive oil as examples of Cyrenaica’s cultivated fruit	46
II.2.3 Animal husbandry in Cyrenaica	57
II.2.4 An estimation of Roman Cyrenaica’s population.....	71
II.3 Conclusion.....	73
Chapter III : Wheat and Barley: Case Study of Cyrenaica’s Annual Crops.....	74
III.1 General Introduction	74
III.2 Methodology of Assessing Cyrenaica’s Agricultural Potential Regarding Cereals	74
III.3 Wheat and Barley a Case Study of The Annual Crops.....	75
III.3.1 Environmental circumstances of growing wheat and barley in Cyrenaica ..	75
III.3.2 The Cyrenaican cereal seeds	78
III.3.3 Patterns of growing and manuring cereal in Cyrenaica.....	79
III.3.4 Estimating Cyrenaican cereal production in the Hellenistic period using epigraphic evidence, modern statistics and the approximated arable lands	87
III.3.5 The Hellenistic consignment: Wheat or Barley.....	100
III.3.6 Export of cereals (Wheat and barley) as an indication of the region’s commercial connectivity in the Hellenistic period.....	108
III.3.7 Cyrenaican cereal during the Roman period	111
III.4 Conclusion	115
Chapter IV : Grapes Cultivation and Wine Production: Case Study	117
IV.1 General Introduction.....	117
IV.2 Methodology.....	117
IV.3 Grapes (σταφυλαί): The Cultivated Fruit and its Products, Raisins and Wine (A Case Study).....	119

IV.3.1 General introduction.....	119
IV.3.2 The environmental requirements for growing grapes	119
IV.3.3 Patterns of grape cultivation.....	122
IV.3.4 Epigraphic evidence of grape cultivation and raisin production at Cyrenaica in the fourth century BC	123
IV.3.5 Epigraphic evidence of grapes cultivation, raisins, and wine production at Cyrenaica in the Hellenistic period	126
IV.3.6 Documentary evidence of grape cultivation and wine production at Cherronesos (Ras et-Tin) (east of Darna) in the second century AD.....	132
IV.3.7 Assessing wine production capacity of Cherronesos (Ras et-Tin) based on the second century AD papyrus.....	134
IV.3.8 A quantitative assessment of wine production capacity per hectare of a selected area based on the modern pattern of grape cultivation.....	137
IV.3.9 Selected archaeological and industrial evidence of wine production from Cyrenaica in the Hellenistic and early/mid-Roman epochs	146
IV.4 Conclusion	150
Chapter V Horses: Case Study of Cyrenaica’s Animal husbandry	152
V.1 General Introduction	152
V.2 Methodology	152
V.3 Horse Breeding: A Case Study	153
V.3.1 Cyrene famous in literature as a place for horses, especially those used in contests	153
V.3.2 Cyrenaican cavalry	160
V.3.3 Equestrianism in the ephebate	166
V.3.4 Metrical indications of horsemanship on ephebic inscriptions from Cyrene:	174
V.3.5 Epigraphic evidence of the use of the word ‘horse’ in the structure of personal names.....	176
V.3.6 Cyrenaican horses in different cultural materials	183
V.4 Conclusion	186
Chapter VI : Cyrenaica’s Commercial Interactions During the Hellenistic and Early/Mid-Roman Periods.....	188

VI.1 General Introduction.....	188
VI.2.1 Harbours as Evidence of Inter-regional and Intra-Regional Trade:	189
VI.2.1.1 Cyrenaican harbours dated to the fifth century BC.....	189
VI.2.1.2 Cyrenaican harbours dated to the fourth century BC.....	191
VI.2.1.3 Cyrenaican ports during the Hellenistic period and after.....	193
VI.2.1.4 Harbour commercial functions.....	198
VI.2.2 Indirect Epigraphic Evidence of Cyrenaican Merchants:	199
VI.2.2.1 Epigraphic evidence of non-local honours for Cyrenaican citizens:.....	200
VI.2.2.2 Epigraphic evidence of locally honoured Cyrenaican philanthropists:...	203
VI.3 Imported Pottery as Evidence of Cyrenaica’s Trade Orientations	206
VI.3.1 Commercial connections in the Archaic and Classical periods (the fine pottery of Cyrene and Teucheira)	207
VI.3.2 Commercial connectivity in the Hellenistic period up to 250 BC (Local and imported amphora of Euesperides).....	208
VI.3.3 Hellenistic period from 250 BC and early/mid-Roman connectivity	212
VI.4 Imported Fine Wares into Ptolemais from the late Hellenistic to late Roman periods	221
VI.4 Marble Imported to Cyrenaica.....	225
VI.4.1 Marble used in sculpture	226
VI.4.2 Marble used in epigraphy	227
VI.5 Products Likely Exported from Cyrenaica	232
VI.5.1 General Introduction	232
VI.5.2 Sahara products	232
VI.5.3 Animals, animal by-products and manufactured items	234
VI.5.4 Fish industry	235
VI.5.5 Wild and Cultivated products.....	236
VI.6 Cyrenaica’s Distinctive Location and the Profits of Exporting Diverse Products	237
VI.7 General Conclusion	238
Chapter VII : Conclusion.....	239

VII.1 General Review	239
VII.1.1 Cereals.....	241
VII.1.2 Olive oil, wine and other agricultural products	243
VII.1.3 Animal and animal by-products.....	245
VII.2 Trade.....	247
VII.3 Were Libya and Cyrenaica the Same Place in the Ancient Literary Sources.	250
VII.4 Final conclusions: the nature of Cyrenaican economy in the Hellenistic and early/mid-Roman	251
VII.5 Recommendation for further work:.....	254
Part II: Appendices.....	258
Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals.....	258
Appendix II: Tables of the recorded products in the <i>demiourgoi</i> inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions.....	277
Appendix III: Published and New industrial features connected to wine production in Cyrenaica.....	301
Appendix IV: Measurements, Currency and Numbers used in the research	304
Bibliography	307

List of Tables

Table II.1: The numbers of the <i>demiourgoi</i> inscriptions (DMI) used in this thesis and their corresponding numbers in the <i>IGCyr</i> project	24
Table II.2: Various types of data representing different items in different periods (L= Literary; E= Epigraphy; A= Archaeology evidence including Archaeobotanical and bioarchaeological data)	33
Table II.3: Prices of olives and olive oil in the fourth century BC and the third/second centuries BC.....	55
Table II.4: Bone number of the main consumed stocks and their percentages which found in Berenice and dated to the period between the second century BC and the mid-third century AD.....	62
Table II.5: Population number of some Cyrenaican citeis during the Roman period according to Wilson (2011: 184, 185 and with assuming the population number of some other cities).	72
Table II.6: Wadi Faynan's (Jordan) population density per towns, villages, hamlets and minor sites estimated by Mattingly (2011); Similar sites in Cyrenaica estimated by Abdelhamed (2018); Number of sites in Cyrenaica per 100 km ² estimated based on Abdussaid's project (1984).....	72
Table III.1 An estimation of wheat production in an area that was planted with 42,000 <i>medimnoi</i> of beans in the Hellenistic period, and with consideration to the different volumes of each crop could be produced per hectare.	97
Table III.2: Approaches to estimating the percentage of cultivated land in hectares in Cyrene.....	99
Table III.3: The highest price of wheat and barley in drachmas and obols per medimnos recorded in Cyrenaica and the Greek motherland in the 4th century BC.	102
Table III.4: The highest prices of wheat and barley in drachmas and obols per medimnos recorded in the Greek motherland in the fourth century BC.	102
Table III.5: The average increases in barley and wheat prices in the fourth BC and the third/second centuries BC at Cyrene.	103
Table III.6: The relationship between the cost in drachma of wheat per medimnos and straw per net and the cultivated hay per carload (red arrows represent decline and green arrows represent growth).	104
Table III.7: The relationship between the cost in drachma of wheat per medimnos and cultivated hay per carload (red arrows represent decline and green arrows represent growth).....	104
Table III.8: Quantities of wheat and barley production and percentages (App. II. C. 2).	105
Table III.9: Cyrene's cereal recipients, quantities, percentages, and the number of cities which received grain twice in each region (<i>IGCyr010900</i>).....	110
Table IV.1: The profits percentage of different practised activity in a farm at Cyrenaica in 1966 from total income of £1291.	121
Table IV.2: Prices of grapes types based on data collected from <i>demiourgoi</i> lists of the	

fourth century BC.	124
Table IV.3: Prices in drachma for various products in three <i>demiourgoi</i> inscriptions (App. II. D.7).....	128
Table IV.4: Samples of the data provided in the papyrus Vaticanus Graecus II (Catani 1985:153).....	134
Table IV.5: Estimating wine production per hectare based on determined three different quantities per hectare.	135
Table IV.6: Levels of grapes and wine production of different types of land estimated based on data indicated by the papyrus of Cherronesos.	137
Table IV.7: Estimating Cherronesos' grape production per hectare based on wine quantity per aroura provided by the papyrus and estimating wine production of the selected area based on grape production per hectare.	141
Table IV.8: Land classes per hectares and their percentages at Al Hania and Al Useta (Based on data provided by FAO 1969: 70, 83). (nos. corresponding to the data shown in figure IV.18).	142
Table IV.9: An estimation of grape production in kg and wine in litres within the case study area (considering 35% of the investigated area represents class I and II land)...	143
Table V.1: Place, number and percentage of cavalry participated in the army of Ptolemy IV in 217 BC (after Polybius).....	162
Table V.2: The percentages of the infantry and cavalry of Cyrenaica in the Battle of Rhabhia in 217 BC.....	164
Table V.3: Cyrenaican charioteer winners, historical dates and the names of the festivals or their locations (For the literary sources accounts see App. I. D. 3).	176
Table V.4: A comparison of Greek personal names formed from two words (one of which is the word horse) in Crete, Cyprus and Cyrenaica from the fifth century BC to the first century AD (based on data collected from Fraser and Matthews 1987).	178
Table V.5 A comparison of Greek personal names formed from two words (one of which is the word horse) in the Peloponnese and Cyrenaica from the fifth century BC to the first century AD (based on data collected from Fraser and Matthews 1987 and 1997).....	180
Table V.6: The total number of three personal names Ἀρίστιππος (Best-horse), Κάλλιππος (Beautiful-horse) and (Μελάνιππος) and the total number of ephebes' instructors in each century from the 4th century BC to the 3rd century AD.	182
Table VI.1: Harbours and anchorages identified by Pseudo-Skylax (108); See translation of Shipley 2011: 47, 48, 80, 81).	192
Table VI.2: Number of large ports, anchorages, and unidentified types of ports according to Strabo in the first time.	194
Table VI.3: Ports and anchorages mentioned by the Stadiasmus and located on the coast between Catabathmos and Cherronesos (some of them indicated before by other writers).	197
Table VI.4: Types and numbers of Cyrenaican harbours in Greek and Roman periods (Author's table data from Hesein 2014: 225)	198
Table VI.5: Probable or possible content, source and percentages of amphorae (RBH)	

found at Euesperides dated to the Hellenistic period (nos. correspond to those types shown in Figure VI.3).	210
Table VI.6: Number and percentage local amphora sherds (BRH) collected from each period at Berenice (Table data gained from Hesein 2014: 515 based on data from Riley 1979).	213
Table VI.7: The number, and location of MRA1 and MRA8 kilns at Cyrenaica in the Mid-Roman period (some produced both types of amphora).	215
Table VI.8: Hellenistic imported and local fine wares found at Berenice (nos. correspond to the ware types shown in Figures VI.8 and 9) (Kenrick 1985b: 252).	218
Table VI.9: Number and percentage of early Roman Fine Wares found at Berenice (nos. corresponding to the ware types shown in figs. VI. 10, 11), (Kenrick 1985a: 514; Kenrick 1985b: 254; Soricelli 1987: 73).	220
Table VI.10: Total sherds of local and imported fine wares at Berenice representing each period (nos. corresponding to the data shown in Figure VI. 12) (data from Hesein 2014: 522).	221
Table VI.11: The different early Eastern Roman Red Slip Wares in Ptolemais (Table's data from Domžalski 2012: 321-22 cf. figs. VI. 13, 14).	224
Table VI.12: The number, percentage of sculptures made from marble imported from different places to Cyrene by city and terrain in the period between the 6th BC to AD 3rd. (Author's data is from Kane 1985: 238)	226
Table VI.13: The numbers and percentages of the funeral inscriptions inscribed on marble dated to the Hellenistic and early/mid-Roman period found at Cyrene (Author's table data based on a collection from <i>IGCyr.</i> and <i>IRCyr.</i> projects).	228
Table VI.14: Total funerary inscriptions and the number and percentages of those inscribed on marble and on other materials during the early/mid-Roman period in different Cyrenaican cities (Author's table data is based on calculating the inscriptions from <i>IRCyr</i> project).	229

List of Figures

Figure I.1: Location map of Cyrenaica and its main cities. Source: Base map provided by 2012 Ancient World Mapping Center and updated by the researcher.....	7
Figure I.2: The average annual rainfall in Cyrenaica and Tripolitania (Adapted from a map in <i>The Middle East: A Geographical Study</i> , by O. Beaumont, G. Black and J. M. Wagstaff 1976, John Wiley and Sons).....	9
Figure II.1: The percentage of <i>demiourgoi</i> inscriptions' which mention cumin, garlic and onion in the second/third centuries BC.....	36
Figure II.2: The number of the <i>demiourgoi</i> inscriptions which indicate different types of pulse in the second/third centuries BC.	38
Figure II.3: Map of area where silphium grown (Catani 1985: 155 Fig. 12.3)	40
Figure II.4: The number of the references to silphium in the literary from the fifth century BC to the fourth century AD.....	41
Figure II.5: Obv. Two fruits of silphium. Re. One fruit of silphium. Attic drachma 570-480 BC (Robinson 1927: Pl. V. 3).....	42
Figure II.6: Obv. full representation of Silphium. Rev. Head of Zeus Ammon. Tetradrachm. 435-308 BC. (Robinson 1927: Pl. X. 6).....	43
Figure II.7: The cup of Arcesilaos II dated to the sixth century BC. Source: Images for silphium of Cyrene.....	44
Figure II.8: Obv. Head of Zeus-Ammon. Rev. Date palm, small silphium plant left, crab right. c.308-277 BC (Robinson 1927: Pl. XXVI. 2).....	45
Figure II.9: Obv. Gazelle in field with jerboa and bunch of grapes. Rev. Silphium dated to 300 BC (Robinson 1927: Pl. XXV. 18).....	46
Figure II.10: The number of 3rd and 2nd BC <i>demiourgoi</i> inscriptions mentioning each product, arranged according to the general order of citation of the crops in these inscriptions.....	51
Figure II.11: The number of the olives and almonds trees cultivated in Cyrenaica in 1937 by the Italian farmers.	52
Figure II.12: The number of the fourth century BC <i>demiourgoi</i> inscriptions mentioning each product, arranged according the general order of citation of the crops in these inscriptions.....	54
Figure II.13: Relief sculpture of cows, donkeys and rams on 'Teheno's board' dated to the fourth millennium BC (Gardiner 1961: 394).....	61
Figure II.14: Numbers of animal bones at Berenice in the period from the 2 nd century BC to the middle of the 3 rd century AD. Based on data represented by Barker (1979: 12)..	62
Figure II.15: The percentages of animals' bones found in the period between the second century BC and the mid-third century AD at Berenice.	63
Figure II.16: Sheep numbers at Tripolitania and Cyrenaica in different years (based on data resented in Allan et al. 1973:62).	65
Figure II.17: The total number of sheep and their percentages at Tripolitania and Cyrenaica according to the records of years 1945, 1955, 1960 and 1965 (based on data	

represented in Allan et al. 1973:62).....	66
Figure III.1: The average annual rainfall in Cyrenaica (based on Doyel and Maguire 1964).	76
Figure III.2: Annual rainfall and amount of wheat production by kg per hectare from 1958-1963 (an area around Barce) (based on data collected from FAO 1969:12).	77
Figure III.3: Volume of cereals and legumes in medimnos in one semester (6 months) based on a <i>demiourgoi</i> inscription dated to the second century BC.	85
Figure III.4: Cereal and legume production in one semester (6 months) based on an inscription from the second century BC.	85
Figure III.5: The cereal quantities per <i>medimnoi</i> of Attica, the dependent cities in 329/8 BC and Cyrenaica in 331-326 BC.	90
Figure III.6: The quantities of cereal in tonnes of the ancient decree of Cyrene, and another two modern statistics.	91
Figure III.7: The percentage of the cereal quantities exported from Cyrenaica in the Hellenistic period and in 1850 AD.	92
Figure III.8: Cyrenaican cereal production in tonnes of the Hellenistic period and before/after the Italian reclamations of the agricultural land in 1932.....	93
Figure III.9: Quantities of various products based on a <i>demiourgoi</i> inscription dated to the second century BC.	95
Figure III.10: The wheat yield in <i>medimnoi</i> of Cyrene in the second century BC and Lemnos, Skyros and Imbros in 329/8 BC based on epigraphic evidence.....	96
Figure III.11: Volumes of wheat and barley per medimnos donated to the Sicilian city, Entella in the middle of the third century BC.	101
Figure III.12: A comparison of the highest prices of wheat and barley per medimnos in Cyrenaica and the Greek motherland in the 4th century BC. 1 drachma = 6 obols.	102
Figure III.13: Comparing the highest prices per drachma and obol of barley and wheat in the fourth BC and the third/second centuries BC.	103
Figure III.14: Percentage of uses of the words ‘cereal’, ‘wheat’ and ‘barley’ in Greek and Roman literary documents (Based on the author literary collected data in App. I. A. 1)	108
Figure III.15: The recipients of Cyrene’s cereal consignment of 330-326 BC. Quantity in medimnos received by each region (Bresson 2011: 76. Fig. 4. 3; <i>IGCyr010900</i>).	109
Figure III.16: Percentages of Cyrene’s cereal received by each region (Author’s data based on Bresson 2011: 76. figs. 4. 3).	110
Figure IV.1: The area devoted to each enterprise in a Cyrenaican farm in 1966, and the income from each.....	121
Figure IV.2: Land proportion devoted to cultivation of three kinds of fruits in a Cyrenaican farm of 2 hectares in 1966.	121
Figure IV.3: The number of the <i>demiourgoi</i> inscriptions which indicate different types of grape and raisins in the fourth century BC	124
Figure IV.4: The highest prices per obols of the under-guarantee and without guarantee	

of both early (white) and black grapes.....	125
Figure IV.5: The number of the 3 rd /2 nd centuries BC <i>demiourgoi</i> inscriptions mentioning different types of grapes, wine and raisins, arranged according to the general order of citation the crops in these inscriptions.....	127
Figure IV.6: The percentages of wine, raisins and the other types of grapes present in nine <i>demiourgoi</i> inscriptions of the third/second centuries BC (excluding the unidentified types of grapes).....	127
Figure IV.7: The percentage of the recorded grape types with raisins and the percentage of other named products in the fourth century BC (Based on the account of the <i>demiourgoi</i>).....	129
Figure IV.8: The percentage of the recorded types of grape, their products (wine and raisins) and the percentage of other named products in the third/second centuries BC (Based on the account of the <i>demiourgoi</i>).....	130
Figure IV.9: The number of references to Cyrenaican grapes and olives in the literary sources in the period between the mid-fourth and the first centuries BC.....	131
Figure IV.10: A relief representing Libya crowning the nymph Cyrene. Source: British Museum. no.1861, 1127. 30; for the inscribed text see <i>GVCyr029</i>	132
Figure IV.11: The percentage of the cadastral records that indicated grapes among the total records of the papyrus Vaticanus Graecus II.	133
Figure IV.12: Three levels of estimated wine production in litre per hectare.	136
Figure IV.13: Distribution map of wine making sites in the selected case study area. Yellow: previously investigated. Red: newly discovered and not published	138
Figure IV.14: Distribution map of wine making sites in Cyrenaica. Yellow: previously investigated. Red: newly discovered and not published.	138
Figure IV.15: Number of each archaeological recorded element representing features of wine production at sites in the case study area and other parts of Cyrenaica (Amphora 1 including Hellenistic and Mid-Roman)	139
Figure IV.16: The percentages of recorded archaeological elements representing features of wine production in the selected area and the other parts of Cyrenaica.	139
Figure IV.17: The estimated wine production (in litre) per hectare of Cherronesos and the case study area.	141
Figure IV.18: Percentages of land classes per hectares at Al Hania and Al Useta (Based on data provided by FAO 1969: 70, 83). (nos. corresponding to the data shown in table III. 9).	142
Figure IV.19: The maximum, average and minimum estimated wine production per tonnes of the case study area.....	143
Figure IV.20: The maximum, average and minimum estimated wine production per tonnes of the case study area in case only half of its grapes production used for wine making.	144
Figure IV.21: Numbers of Hellenistic and Roman kilns found in Cyrenaica and other regions (Hesein 2014: 191-3)	147
Figure IV.22: Percentage of the amphora kilns and others in Cyrenaica	148

Figure IV.23: Mid-Roman Amphora 1. Benghazi University, excavations at Teucheira (Photo by Muna, season 1994).	149
Figure V.1: Different references to Cyrenaican horses and chariots as represented in ancient Greek and Roman sources (based on the collected data in App. I. D. 3).....	154
Figure V.2: The numbers and percentages of the Cyrenaican and other cavalries in the army of Ptolemy IV in 217 BC (see also Table IV. 2).	163
Figure V.3: The probable band numbers which represent the use of horses. Based on data from the inscription <i>IGCyr084000</i>	165
Figure V.4: A Panathenaic amphora from Alslaiia near Barce (El-Marj) dated to 510-470 BC (Laronde 1987:143. Fig. 38).....	168
Figure V.5: View of a four-horse chariot race represented on a Panathenaic prize amphora found in Tocra and dated to 410-400 BC. Source: The British Museum. N. 1866,0415.249.	168
Figure V.6: The percentages of Cyrene's ephobic inscriptions containing direct or indirect clues related to horse-riding.....	172
Figure V.7: A relief of a four-horse chariot with a driver depicted on a face of an ephobic inscriptions. Sources: <i>IRCyr.C.698, 699,700-705</i>	173
Figure V.8: The percentages of ephobic inscriptions associated with figures of quadriga and horseback riding. Based on data collected from <i>IRCyr</i>	174
Figure V.9: Cyrenaican personal names consisting of horse compound names and adjectives in use from the fifth century to the second century AD. Ἀρίστιππος (Best-horse) Κάλλιππος (Beautiful-horse) and Μελάνιππος (Black-horse) (based on data collected from Fraser and Matthews 1987).	177
Figure V.10: A comparison of the occurrences of horse-related Greek personal names in Crete, Cyprus and Cyrenaica from the fifth century BC to the first century AD (nos. correspond to the names shown in Table V. 4). (Based on data collected from Fraser and Matthews 1987).	178
Figure V.11: A comparison of the occurrences of horse-related Greek personal names in Peloponnese and Cyrenaica from the fifth century BC to the first century AD (nos. correspond to the names shown in Table V. 5). (Based on data collected from Fraser and Matthews 1987 and 1997).....	180
Figure V.12: The total number of three personal names Ἀρίστιππος (Best-horse), Κάλλιππος (Beautiful-horse) and (Μελάνιππος) and the total number of ephobes' instructors in each century from the 4th century BC to the 3rd century AD.....	182
Figure V.13: Number of the ephobic inscriptions dated to the period from fourth to second centuries BC and that dated to the period from 1 BC to the third century AD and the number of ephobes' instructors gained from each group (based on data from <i>IGCyr, GVCyr</i> and <i>IRCyr</i> projects).....	182
Figure V.14: An illustration of the percentages which represented heroes and horses on Attic black figure vases collected from Athens, Samos and Cyrene.	183
Figure V.15: Relief sculpture from Ptolemais showing a Hero equitans type (Muszyńska 2012: 294, fig. 2).....	184
Figure V.16: Golden Starer. Obv. Quadriga driven by Nike. Rev. Ammon. Late 4th	

century BC Source: Cyrenaica - Coin Archives; see also Robenson Pl.XIV. 1-10.....	184
Figure V.17: Plan of hippodrome at Cyrene (Humphrey 1986: fig. 256).	185
Figure VI.1: Number of large ports and anchorages according to Herodotus and Pseudo-Skylax in the fifth and fourth centuries BC.	193
Figure VI.2: Map of ports and anchorages mentioned by the Stadiasmus and located on the coast between Catabathmos and Cherronesos (some of them indicated before by other writers).	196
Figure VI.3: Relative proportions of all quantified amphorae (RBH) at Euesperides dated to the Hellenistic period (Göransson, 2007: 191. Fig.41. nos. correspond to data in table VI.5).	209
Figure VI.4: Suggested routes for the common amphorae types found at Euesperides (after Göranson, 2007: 225, 227, 229).	211
Figure VI.5: Number and percentages of imported amphora sherds (BRH) representing the period from the Hellenistic to the third century AD at Berenice (The graph is based on a quantitative study conducted by Hesein 2014: 286-289 based on data from Riley 1979).	212
Figure VI.6: Quantities of local amphora sherds (BRH) collected from each period at Berenice (The graph is depending on quantification conducted by Hesein 2014: 515 based on data from Riley 1979)	214
Figure VI.7: Trends of imported and local amphora at Berenice based on sherds (BRH) collected from each period (Chart data is from quantification conducted by Hesein 2014: 515 based on data from Riley 1979).	214
Figure VI.8: Hellenistic imported and local fine wares found at Berenice (nos. correspond to the ware types shown in Figure VI. 9 and Table VI. 8), (Kenrick 1985a: 514; Kenrick 1985b: 252).	217
Figure VI.9: Sources of imported Hellenistic fine wares at Berenice. Numbers correspond with those shown in Figure VI.8 and Table VI.8) (Kenrick, 1985b: 252).	218
Figure VI.10: Early Roman fine wares found at Berenice (nos. correspond to the ware types shown in Figure VI. 11 and Table VI. 9) (Kenrick 1985a: 514; Kenrick 1985b: 254; Soricelli 1987: 73).	219
Figure VI.11: Main sources of Early Roman fine wares at Berenice (nos. correspond to the ware types shown in Figure VI.10 and Table VI.9) (Kenrick 1985b: 254; Soricelli 1987: 73).	219
Figure VI.12: Change in trade size based on the imported fine wares to Berenice in different eras. (nos. corresponding to the data types shown in table VI.10).	221
Figure VI.13: Ptolemais. Identified sources of terra Sigillata and late Roman Red Slip wares respectively, from c.100 BC - AD 300 (A) and c. AD 300-650 (B) (nos. corresponding to the Eastern Roman Red Slip Wares in Ptolemais shown in figure VI.14 and table VI. 11) (Domžalski 2012: 324-33).	222
Figure VI.14: Percentage of early Roman Red Slip wares found in the Polish excavations at Ptolemais (c. 100 BC- AD 300) (nos. corresponding to the Eastern Roman Red Slip Wares in Ptolemais shown in figure VI.13, table VI.11) (Domžalski 2012: 322).	223
Figure VI.15: The sources of marble imported to Cyrene by terrain in the period between	

6th BC to AD 3rd (Author's data is from Kane 1985: 238).	227
Figure VI.16: The number of Hellenistic marble funerary inscriptions from Cyrene in each century and those whose date is uncertain. These probably represent the end of one century and the beginning of another, e.g. 4/3 BC. (Author's graph data based on inscriptions gathered from <i>IRCyr.</i> project).	228
Figure VI.17: Number of funerary inscriptions carved on marble in early/mid-Roman period Cyrene (Author's graph data based on inscriptions gleaned from <i>IRCyr</i> project).	229
Figure VI.18: The number of marble panels used for engraving the funeral and ephebic inscriptions during the early/mid-Roman period in Cyrene (Author's graph data is based on epigraphy from <i>IRCyr</i> project).	230
Figure VI.19: Coins from Cyrene dated to the third century BC. Ob. Head of Zeus-Ammon. Re. Palm tree with fruit, silphium and crab (Robinson 1927: 61-63, Pl. XXVI. 2. See also, 1, 3- 14).	233
Figure VI.20: Trade routes of Cyrenaica, internal Libya and deep Africa as suggested by Laronde (1987: 212).	234
Figure VI.21: Archeological sites represented instalisions related to fish processing (Hesein 2014: 197).	236

List of Abbreviations

Abbreviations of Ancient Literary Sources

- Ap* = *Against Apion* (work of Flavius Josephus)
- Anab.* = *Anabasis of Alexander* (work of Arrian)
- Anth. Gr.* = *Anthologia Graeca* (collection of poems)
- Ath. Pol.* = *Athenian Constitution or Athenaion Politeia* (work of Aristotle)
- Comic. Test. Frag.* = *Comic Testimonia and Fragments* (work of Hermippus)
- Charact.* = *Characteristics of Animals* (work of Aelian)
- Cyng.* = *Cyngteica or the Chase* (work of Oppian)
- Cyr.* = *Cyropaed* (work of Xenophon)
- Dig.* = *Digest* (Roman law)
- Hist. Pl.* = *Enquiry into Plants or Historia Plantarum* (work of Theophrastus)
- Isthm* = *Isthmian* (work of Pindar)
- NH* = *Natural History* (work of Pliny)
- Od.* = *Odessa* (work of Homer)
- P. D. L. T.* = *Perseus Digital Library of Tufts* (online)
- Pelop.* = *The Peloponnesian War* (work of Thuc.)
- Pyth.* = *Pythian* (work of Pindar)
- Supp.* = *Suppliant Women* (work of Aeschylus)
- T. A. D.* = *Treatment of Acute Diseases* (work of Aretaeus)

Abbreviations of Ancient Authors' Names

- Callim. = Callimachus
- Hdt. = Herodotus
- Sky. = Skylax
- Sta. = Stadiasmus
- Steph. Byz. = Stephanus Byzantinus

Stra.= Strabo

Abbreviations of Epigraphic and Papyrologic Sources

APIS = Advanced Papyrological Information System

IC=Inscriptiones Cetircae

IG = Inscriptiones Graecae

SEG = Supplementum Epigraphicum Graecum (1923-)

IGCyr = The Inscriptions of Greek Cyrenaica

GVCyr = The Greek Verse Inscriptions of Cyrenaica

IRCyr = The Inscriptions of Roman Cyrenaica

IRCyr.B = The Inscriptions of Roman Cyrenaica. Berenice

IRCyr.C = The Inscriptions of Roman Cyrenaica. Cyrene

IRCyr.P = The Inscriptions of Roman Cyrenaica. Ptolemais

IRCyr.T = The Inscriptions of Roman Cyrenaica. Tocra

Other Abbreviations

Amph.= Amphora

App. = Appendix.

C. = century (used in the charts)

Cen. = century (used in the appendices).

C. Hay = Cultivated hay.

Collec. = Collecting vat.

DMI = *damiergoi* (*demiourgoi*) Inscription

FAO = Food and Agriculture Organisation of the United Nations

G = Greek

Ha = Hectare

Ident. = Identified

Inc. = Income

Insc.= Inscription

L = Latin

MRA 1 = Mid Roman Amphora 1

MRA 8 = Mid Roman Amphora 8

N. = Number

Obv. = Obverse

Oliv. = Olives.

Pers. Comm. = Personal Communication

Pop. = Population

Prod. = Production

Rev. = Reverse

Qua. = Quantity

RBH = Rim, Base and Handle

Tread. Fl. = Treading floor

Unident = Unidentified

W. Hay = Wild hay

Part I

Chapter I : Introduction to the Research

I.1: Introductory

I.1.1 General Introduction

This dissertation sets out the test the assumption, often found in ancient literary texts, that Cyrenaica was an especially fertile and rich region. This project uses ancient sources, epigraphy and other cultural materials in order to examine cereals, grapes and horses as key case studies of the economic potential of Cyrenaica in the Hellenistic and early/mid-Roman periods. The study will investigate the ancient literary accounts relating to the economy of Cyrenaica and it will deal carefully with information related to ‘Libya’ which was sometimes used as an alternative to ‘Cyrenaica’. It will also consider previous economic debate on the nature of the ancient economy. This includes theories, in particular, those relating to models of ancient cities and economic growth to provide an interpretive framework for the Cyrenaican cities in the proposed period. The research also aspires to discuss the probable exchanged commodities in antiquity era in order to highlight the position of Cyrenaica in its pan-Mediterranean context.

I.1.2 The research context

Λιβύη...καρπουμένη ‘producer of crops’ (Aeschylus, *Supp*, 315);
...καρποφόρος ‘fruit bearing’ Λιβύας (Pindar, *Pyth*, IV; 6);
...πολυκαρποτάτας ‘the most productive of varied crops’ (Pindar, *Pyth*, IX; 7); ...Λιβύην μηλοτρόφον ‘sheep feeder’ (Herodotus IV. 155, 157);
Κυρήνη...καλλίκαρπος ‘rich in fruit’ and ἵπποτρόφος ‘horse-feeding’ (Strabo XVII. 21).

Cyrenaica/Libya were both described by the literary sources as productive areas in crops and animals. Different nouns and adjectives, including a superlative form, were used by the Greek and Roman writers in different contexts to highlight this characteristic. Homer (*Od*, IV. 84-89), for example, appreciates Libya’s abundance in animal by-products. Pindar (*Pyth*, IX. 60), also talks about the Queen of Libya’s property and possessions which included wide areas of productive land. This land produced a considerable volume of fruit, and it was also known for its wild animals. Examining this representation is one of the most important aspects of this thesis. In order to examine the

reality of the story that has been told about the great economic capability of Cyrenaica/Libya, it is important to deal carefully with the references which used the word 'Libya' rather than Cyrenaica. This is necessary to clarify whether Libya, as mentioned by some of the ancient writers, means Cyrenaica or whether it refers to another place in Africa. By examining references that mention Cyrenaica or Libya, it has been possible to trace whether other literary references that come from later periods, such as the medieval era and beyond, reported Cyrenaica as a place with noticeable economic resources. Even though these indications are from a later period, they reveal that the economic resources of a place, its climate and its agricultural potential, did not change over time. Al-Aiashe (العياشي) (1661-63: 201), as an illustration, reports the export of great quantities of animal by-products from the region, and stresses their cheap prices in contrast to the other places that he had visited (see App. I. C.1.9). Furthermore, the related accounts of the epigraphy and the available archaeological evidence are both sources of significant data that could help us to assess the actuality of Cyrenaica's situation, a picture that is represented by the literary sources. The Grain decree of Cyrene is a good example of this epigraphic evidence (see chapter II).

If ancient Cyrenaica had a substantial economic capability, as the literary sources indicated, its economy should be assessed within the on-going wider debate on the nature of the Mediterranean's ancient economy, taking account of the latest scholarly debate.

Over the last 50 years, the ancient Mediterranean economy has been paid much attention by, and has become a controversial subject for scholars in the fields of ancient history and archaeology. As a result, different theories have emerged from this wide debate that can be considered the starting point of any new contribution to discussion of ancient economy. The work of Weber (1909; 1978; 1979); Rostovtzeff (1941), Scheidel (2002), Hopkins (1983), Finley (1985; 1999), Engels (1990), Bresson 2016 and others involve us in an impressive discussion about the varied features or nature of the Greek and Roman economy. For many years the outstanding theories concerned the so-called 'Primitivism and modernism' debate. The former was advocated, among others, by Weber (1909; 1978; 1979). He represents the ancient city as a 'consumer city' in which residents survive completely on agriculture productions. In other words, the elite were drowning in their wealth from renting their lands in the city's hinterland and collecting tax from farmers. Also the inter-regional trade and manufacture are not important in this

type of city. This approach was supported by Jones (1937) and Finley (1985; 1999). However, the latter has modified the theory to be more influential. In contrast, Rostovtzeff (1941) advocated the 'Modernist' theory. His main argument concerned an ancient capacity for economic growth and long-distance trade with reasonable profits. These distinctive approaches will be discussed in detail in the literature review.

It is worth mentioning that in the last three decades, scholars in the ancient economy have adopted a new approach, where they confronted the debate on "primitivism" with archaeological evidence (Greene 1986; Mattingly and Salmon 2001). To test whether the Weberian 'consumer city' fits well with the city of Leptiminus in Tunisia, Mattingly built a persuasive argument on the analysis of the artefacts that revealed from survey and excavations, in particular, those which were relevant to olive oil production and he proved that the city was both a producer and a commercial. This approach has been successfully adopted by scholars for testing some ancient cities. In addition, Hopkins (1978), in his advanced discussion about the ancient economy, addressed this important question 'whether there was economic growth in classical antiquity?' He stressed seven points and considered them the outstanding features that may be associated with economic growth (1980, 1983: xv-xxi, 2002: 190 - 230). These aspects will be listed in the literature review. I shall attempt to test some of them, in view of the available textual and archaeological evidence, as a key of economic growth in the proposed era. Increasing demand is a case in point.

In short, because our information is pretty limited about the economic mainstays of Cyrenaica, I combine and analyse the available archaeological and textual data relating to cereals, grapes and horses, in order to identify whether they contributed to the region's essential economic resources during the Hellenistic and early/mid-Roman periods. I also examine whether Libya, used in the literary sources, refers to Cyrenaica. In addition, I assess whether the main cities of Cyrenaica resemble the features of the consumer city, the producer city, or other models and whether these cities occupied a position in the pan-Mediterranean economy during both the Hellenistic and early/mid-Roman epochs. This will certainly consider previous contradictory arguments about whether Cyrenaica was a consumer or producer region (Coster 1968:104-44; Burn 1994; Harrison 1985a; Wilson 2001, 2004).

Furthermore, I shall give Hopkins' proposed facets of economic growth careful consideration. It is to be hoped that after an intensive investigation, I shall be able to present an overview of Cyrenaican trade patterns during this extended period, through testing the written sources and archaeological evidence for the three main examined elements and others in the main cities of Cyrenaica.

It is important to mention that different approaches have also been used in this research including analysis of the ancient textual data (literary and epigraphy) related to Cyrenaica's economy during the Hellenistic and early/mid-Roman periods, with the archaeological evidence is considered in some cases to support the arguments that emerging from textual examination.

I.1.3 The project objectives and questions

In view of the limited studies on the economy of Cyrenaica during the Hellenistic and early/mid-Roman epochs, the main goal of this project is to increase our understanding of the economic resources of the Cyrenaican cities.

The research aims to explore the evidence of cereals, grapes and horses' production. It also intends to investigate the region's interaction and probable contribution to the Mediterranean economy in both proposed periods.

Therefore, based on examining some economic mainstays of the region, the project addresses the following subsidiary questions:

- Cyrenaica/Libya is viewed as very fertile by the literary sources. What does Libya usually refer to? How can we examine these general assertions? Are they simply a convention, or do they represent a reality?

- To what extent was the region reliant on any one product during the Hellenistic period as a main economic resource? To what extent was it a diversified economy?

- Was the economic orientation of the region the same in both the Hellenistic and early/mid-Roman Periods? To what extent did the economic trajectory and trade patterns change in Hellenistic and Roman times?

- To what extent did Cyrenaican cities occupy an important position in the pan-Mediterranean economy during this extended period? Do the available data from ancient literary sources and epigraphy allow us a better understanding of the features of the ancient economy of the Cyrenaican cities during the Greek and Roman periods?

I.1.4 Organisation of the study

The body of this thesis comprises seven chapters, supplemented by a series of data appendices. The first chapter is an introduction to the thesis, the second chapter addresses the thesis resources and general agricultural background, whilst the third, fourth and fifth chapters are devoted to an investigation of the proposed three case studies, specifically cereals, grapes, and horses. The sixth chapter investigates the region's commercial relationships and the final chapter concludes the thesis. The contents of each chapter can be summarised as follow:

Chapter I began with a general introduction followed by the research context, the project objectives and my research questions, in addition to a geographical outline and historical background of Cyrenaica during the Greek and Roman periods. This chapter will go on to provide a background to the relevant previous studies in section I.2. Chapter II examines the main sources of the project's information and their significance for each period. It also provides a general agro-pastoral background about Cyrenaica. This includes investigations of the region's annual crops such as silphium, cumin and legumes, fruits cultivated, with a focus on olives and olive oil production in addition to the most commonly bred animals such as sheep and goats, cattle, donkeys and camels with an introduction to the region's potential of pastoral production and an estimate of fodder capacity. An approximation of the probable population density of the region during the early/mid-Roman periods has been included in this chapter.

Chapter III examines cereals (wheat and barley) as a case study to assess the region's productive capacity of annual crops. It devotes a particular section to clarify my approaches for assessing cereal production of Cyrenaica in the proposed period. Fruiting plants, with wine production as a case study are discussed in chapter IV. It addresses also the methodology used in this thesis to examine Cyrenaica's potential for growing grapes and producing wine and raisins. The probable wine production and consumption of a selected area of Cyrenaica has been estimated in this chapter. The third case study of

horse rearing in Cyrenaica is explored in chapter V. The husbandry of horses in the region is investigated in depth in this chapter as a key of the region's pastoral potential and its probable contribution to regional and inter-regional economy. This chapter also outlines the approaches implemented in this chapter

Chapter VI is devoted to an examination of the region's commercial interaction during the Hellenistic and early/mid-Roman period. The harbours reported by the ancient Greek and Roman writers are considered, along with evidence of Cyrenaican merchants, to shed light on the region's involvement in Mediterranean maritime trade. It also investigates pottery and marble as examples of imported commodities and identifies some products that were probably exported in exchange. Chapter VII presents the most significant results drawn from the project. It also recommends further needed work in some areas that may perhaps shed more light on the economy of Cyrenaica and its connectivity.

The final element of this project presents the database of the research in the form of four appendices. Appendix I is devoted to the direct and indirect references to cultivated and wild products and animals of Cyrenaica. These include Greek, Roman, Arab writers, as well as references from the last two centuries. Appendix II contains tables of the recorded products in the *demiourgoi* inscriptions of Cyrene in the fourth, third and second centuries BC. It also reports epigraphic evidence of the ephebate at Cyrenaica. The epigraphic data collection has been facilitated by the *IGCyr* and *IRCyr* projects. Appendix III includes published and [unpublished] industrial features connected to wine production in Cyrenaica. Appendix IV clarifies the conversion measures of measurements, currency and numbers used in the research.

I.1.5 Geographical outline

Cyrenaica (Κυρηναϊκή) is located in north-east Libya. The region may be generally described as an outpost projecting northwards into the Mediterranean just 300 km south of Crete and in many respects Cyrenaica resembles an island surrounded by the sea on three sides and by the great desert on the south (Figure I.1).

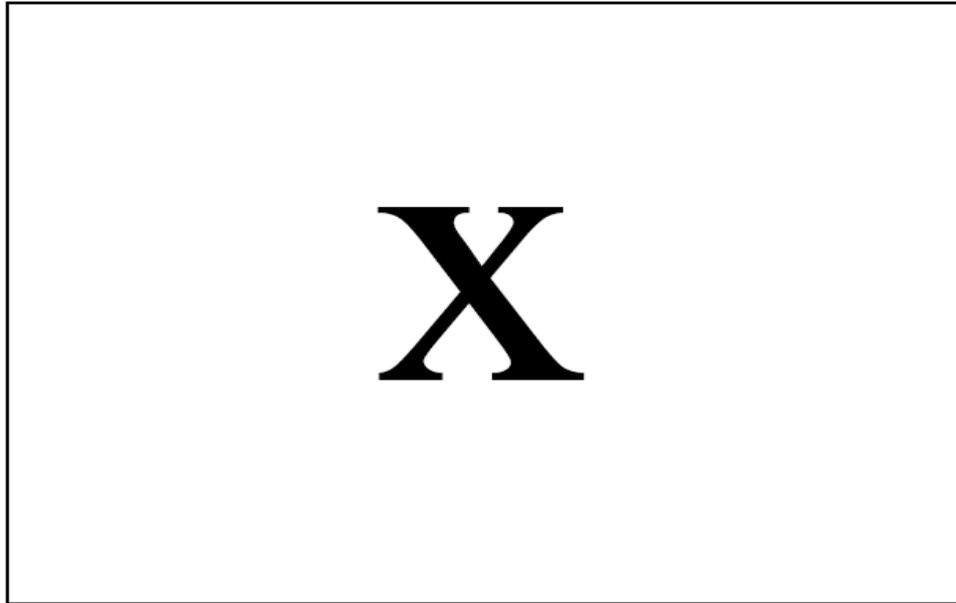


Figure I.1: Location map of Cyrenaica and its main cities. Source: Base map provided by 2012 Ancient World Mapping Center and updated by the researcher.

At the time of Herodotus there was no clear border separating Cyrenaica from Egypt. He mentioned that the people of the cities of *Marea* (Μαρέη) and *Apis* (Ἄπις), some 25 km west of Marsa Matruh, inhabited parts of Egypt that bordered on Libya (II, 18). Scylax (108.1) gave a clear indication that Cherronesos or *Cherronesus* (Χερρόνησος), 47 km east of Derna, was within the eastern Cyrenaican territory, while he stated in a different paragraph (107.3) that Egyptian sovereignty extended to *Apis*. According to the famous *Diagramma* of Ptolemy I (*SEG* 9. 1; *SEG* 18. 726), it was *Catabathmus* (Κατάβαθμος), modern Sallum, that marked the border with Egypt in the east and *Automalax* (Αὐτόμαλαξ), modern Bu Sceifa, that lay at the western limit, situated at the very foot of the Syrtic Gulf. The same eastern border was noted during the early Roman period by Sallust (*Bellum Iugurthinum*, XIX. 3), Strabo (XVII. I. 3, 13, 22) and Pliny (*NH*, V. v. 38). However, Sallust considered *Arae Philaenorum* as marking the western border between Cyreneans and Carthaginians.

As a result of the Jewish revolt in AD 115-117, the eastern administrative boundaries of the region were temporarily shrunk to reach the southern limits of the city of Darnis. South and east of this point, Marmarica was subsequently subject to Egypt and divided into two regions (Ptolemy IV. 4-1, 4; IV. 5, 1) *Marmaricus Nomos* which extended from the town of Darnis southward to *Petras Minor* and the second *Libycus Nomos* which stretched from *Petras Major* to the Nile Delta.

A key feature of Cyrenaica is the Green Mountain, al-Jabal al-Akhdar, located between latitudes 32°- 33° N and longitudes 20° - 23° E. It comprises a plateau not higher than 880 m, fronted by two escarpments that run in line and parallel with the coast from the south-west to the north-east, and it is characterised by high rates of rainfall, in addition to the availability of fertile land suitable for agriculture. Generally, the Mountain can also be divided into three climatic zones: a wet region, a semi-arid region and an arid region.

At Benghazi, the coastal strip swings away to the south between the Gebel and the sea, with its character becoming more arid till it merges with the desert of Syrtica, while to the north it gradually narrows and bends to be blocked abruptly by the Gebel at the sea to the east of Ptolemais. Altitude is accepted to be a vital factor in vegetation distribution. However, no distinctive plant diversity was noticed across the Gebel and this perhaps is due to the fact that the plateau is mostly flat, gently rolling terrain sometimes cut by valleys. It does not take the form of a conical mountain (Hegazy et al. 2011: 1885-1898).

South of the plateau there is a shallow hyper-arid depression starting from the Gulf of Syrte and extending to the east beyond the Egyptian border. This area includes a small number of verdant oases, such as Gaghbub and Aujila.

Climate

Climate and vegetation are predominantly Mediterranean in character. The prevailing winds blow from the north and north-west to north. Rainfall is seasonal and is mostly confined to the period October – April (Figure I.2). Temperatures vary by virtue of proximity to the sea and with altitude. It reaches its maximum in July and August with a mean of about 23.8-25.8°C (Buru 1965: 78-84). In short, the weather is cooler in the highlands, and frosts occur at maximum elevations. In the desert interior the climate has very hot summers and extreme daily temperature ranges.

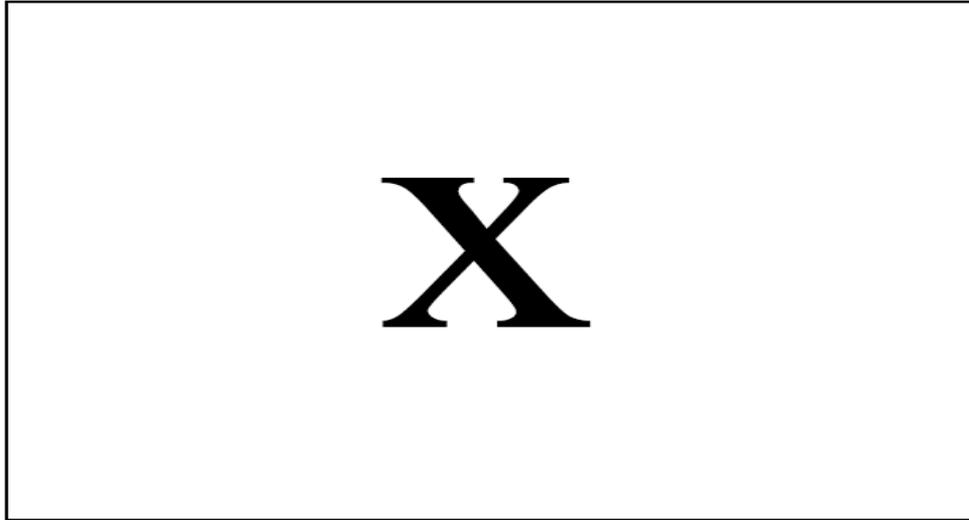


Figure I.2: The average annual rainfall in Cyrenaica and Tripolitania (Adapted from a map in *The Middle East: A Geographical Study*, by O. Beaumont, G. Black and J. M. Wagstaff 1976, John Wiley and Sons).

I.1.6 Historical background

Greek colonisation of Cyrenaica began in the second half of the seventh century BC when settlers from Thera, in the southern Aegean Sea (modern island of Santorini), founded the city of Cyrene (modern Shahat) in 631 BC. Battus was the first king of this mother Greek city, and we are told that his family inherited power in eight successive generations for a period of two centuries (Herodotus IV, 150-151, 153, 156-159). The number of the early immigrants was estimated at about two hundred men (this calculation is based on the two fifty-oared ships '*penteconter*' which were used to transport the first adventurers (Herodotus IV. 156). In the reign of the third king of Cyrene, Battus II, a large number of new immigrants arrived into the region making the Libyans enter into the war with the Greeks in order to defend their existence and their land (Applebaum 1979: 18, 86-88, 127; Herodotus IV. 159). After nearly a decade the Greeks advanced to the west of the region and established Teucheira (modern Tocra) (Boardman 1966: 13) and Euesperides (modern Benghazi) as the most western Greek city in Cyrenaica (Jones 1985). Towards the end of the sixth century BC, a conflict between the royal families led a dissident group, supported by Libyan tribal allies, to found a rival city to Cyrene, Barce (modern al-Merj). It was essential for the Greeks to have port facilities in order to ensure easy contact with the motherland. The foundation of both Cyrene and Barce were accompanied by the establishment of ports on the coast. In due course of time the port of Cyrene became an independent city named Apollonia (Pedley 1979: 11-28). Barce's port,

Ptolemais also became another important town, eventually replacing Barce which was devastated by the Persians by the end of the sixth century BC (Kraeling 1960: 3, 4).

In 440 BC, Arcesilaus IV, the last king of the Battades, was murdered in Euesperides (Mitchell 1966: 99-113). Consequently, the region became rather vulnerable and bisected by internal frictions, political turmoil and the increased risk of attacks by Libyan tribes. By 332 BC the region had willingly offered loyalty and obedience to Alexander the Great and Cyrenaica peacefully passed to the Ptolemies of Egypt. Cyrenaica seems to have enjoyed a relative period of peace and prosperity and the region became known as the Pentapolis. For a period in the third century the region of the five cities acted independently from the Ptolemaic sphere under King Magas (c.276-250), who renounced his allegiance to the Ptolemies. However, soon after his death the region returned to Ptolemaic rule until it passed to the Romans as a consequence of Apion's will in 96 BC.

At the beginning of the Roman rule the region suffered from chaos because it was under local autonomy instead of direct control by the Roman Senate itself. However, with the regime of Augustus in 31 BC and after, Cyrenaica generally received some attention by its rulers and enjoyed prosperity. Nevertheless, in AD 115-117 the region witnessed the Jewish revolt. This revolution has been variably interpreted. Some believe it was politically motivated (Reynolds 1959), while others (Applebaum 1979: 201-40) argue that economic and religious factors were the actual reasons behind the turbulence. The revolt devastated Cyrene as well as other Cyrenaican urban centres and rural settlements (Applebaum 1951; 1979: 201-94; Smallwood, 1976: 15), and its impact on the subsequent history of Cyrenaica led in the short term at least, to its decline and economic contraction. In terms of the previous suggestion of Reynolds and Applebaum, it can be reasonable to expect that the land was one of the key factors of the Jewish revolt because it was the main economic resource for both Greek and Jewish settlers in the region.

In general, under Roman sovereignty, Cyrenaica was for a long period joined with Crete as one province until separated by Emperor Diocletian at the end of the third century AD (Rowe 1956: 3). When the Emperor Constantine I recognised Christianity in the first half of the fourth century AD, the new faith spread in the region, but did not eliminate paganism. The most remarkable figure in the Christian period of Cyrenaica was the Metropolitan Bishop, Synesius (AD 370-417). He is best known for his correspondence

which reflected the situation in the region between the end of the fourth and the beginning of the fifth centuries (Fitzgerald 1926; Pando 1940). The grim picture given by this Bishop about the situation in the region has led many scholars to argue that city life in the Cyrenaica finally faded in the fifth century AD (Alston 2004; Jones 1971: 361; Ward-Perkins 2001; Wilson 2001; 2004).

I.2: The literature Review

The literature review is organised in two sections. The first one aims to identify the on-going debate and the different approaches on the ancient economy to explore the relevant area of discussion that can be associated with the economy of Cyrenaica. The second part proposes to highlight the main previous studies on the Cyrenaican economy.

I.2.1 Debate on the ancient economy and ideal types of city

I.2.1.1 Primitivism and modernism theories of urban city

Debate on the ancient economy during the twentieth century was dominated by the theoretical ideas of Max Weber and Moses Finley. Weber's works on the ancient economy include: *The Agrarian Sociology of Ancient Civilizations* (1976) and *Economy and Society* (1922 in Germany and translated to English in 1968). Weber (1968: 1212-15) addressed the economic conception of the city and classified its types to three models: The 'consumer city', the 'producer city' and the 'Merchant city'. The work also discussed the city's relation to agriculture. Weber argued that the economic characteristics of ancient cities were completely different to the medieval and modern ones. He described the ancient city as a typical example of the 'consumer city'. This city was the centre of political life and it relied economically on two sources; its hinterland production especially from the elite estates and the collecting of rents and taxes. The elites, in this model, resided in the city and played an important political role. However, trade and manufacturing were generally unimportant sectors in ancient cities.

These models of cities, in particular the 'consumer city', have attracted much approving attention of many scholars for about a century (Hopkins 1978; Whittaker 1990 and 1995; Finley 1985 and 1999: 123-49), though some others have disputed them intensively (Greene 2000; Hopkins 1978; 1983; Parkins 1997; Mattingly 1997). David Mattingly has questioned whether the entirety of ancient cities fit the consumer model of

Weber (Mattingly and Salmon 2001: 66-89). He examined archaeological data relating to olive oil production and to the Roman port city of Leptiminus in Tunisia. The value of this work is that Mattingly has been able to break the conventional assumption of the consumer city and produce a new vision, arguing, for example, that the ancient city of Leptiminus exhibits many features of a producer city with commercial links rather than consumer city. Moreover, Mattingly has pointed out important markers of the economic performance of Leptiminus in the field of trade through its clear large-scale of production and long-distance commerce (Mattingly 1992; 1995; Mattingly and Salmon 2001: 66-89). This work was achieved by a comprehensive survey and extensive project conducted at Leptiminus, published in three volumes (Ben Lazreg and Mattingly 1992; Stirling et al. 2001; Stone et al. 2011). The results of this project have opened a new angle of approach to the on-going economic debate. Despite the fact that some would argue that Weber's theories are out of date, they continue to influence many researchers who find these models are still useful (Morris 2004: 88 is a case in point).

Other scholars have advanced different arguments about the nature of the ancient economy and established a divergent interpretation of ancient towns. Mikhail Rostovtzeff (1941; 1957) saw the ancient economy as modernist in behaviour, including capital growth, animated markets, long-distance trade and a considerable volume of profits. Many people now reject Rostovtzeff's views about the modernist nature of the ancient economy and instead argue that consumption was a motivation of exchanging and trading goods in antiquity (Morley 2007: 92). However, Meikle (1995; 2002: 233) made a distinctive approach when he argued that 'use value', which means resale goods, was an important factor of the ancient economy's development. The controversy on primitive and moderne characteristics of the ancient city has continued for decades, with the different models clearly tested against evidence from many cities from the manifold provinces. Nevertheless, the Cyrenaican cities in the Hellenistic and early/mid-Roman eras have been hitherto neglected, because of the general lack of historical and archaeological studies in the region.

The models of Weber, Finley and Rostovtzeff have continued to draw scholarly attention. A group of scholars in the collection, *Making, Moving and Managing: the New World of Ancient Economies, 323-31BC* (Archibald, Davies and Gabrielsen 2005), disputed different features of the ancient economy in antiquity, in particular the

Hellenistic periods, through analysing varied archaeological data. A general middle position seems to be more favoured among historians, between the extreme primitive and modernist characterisation of the ancient economy. Davies (1998: 255-57; 2005:127-56) criticised the typical proposed figures of ancient economic models. In his view, there were varied integrated factors which may have shaped or represented the exact model of the ancient economy. These aspects might indicate the diversity of the ancient economy. The economy of the Cyrenaican cities during the Greek and Roman periods may have been also formed by a combination of various factors. These will be assessed in this thesis.

I.2.1.2 Economic growth

Tracing economic development or growth has emerged as an important issue arising from the intensive theoretical debate on primitivism and modernism of the ancient economy. Hopkins (1978), in his article *Taxes and Trade in the Roman Empire (200 BC.-A.D. 400)* asked, whether there was economic growth in classical antiquity? This question generated a new trend among the researchers on the ancient economy for estimating the scale of economic growth, in particular, in the trade sector. Hopkins (1980; 1983: xv-xxi, 2002: 190-230) stressed seven points and considered them the outstanding features that may be associated with the economic growth. These aspects can be listed as follows:

- Population growth.
- Increasing demand.
- Spread of craft production.
- The average per capita production.
- Inter-regional exchange growth.
- Improving the manner of labour work.
- Tax collection.

Hopkins focused on Roman growth in production and consumption, in terms of both per capita and aggregate growth. He also argued that the average rates of consumption during the Roman period were higher than previous times, especially in the western provinces. While Hopkins in general terms supported the ideal type of the consumer city, he extended critical thinking beyond the scope of the original model. This new 'Orthodoxy' described the ancient economy as a 'Cellular self-sufficiency', in which

the population of each unit or community, farm, town, province, relied on agricultural production to cover their needs (Hopkins 1983: xi). He argued that alongside agricultural production, there was only small-scale non-agricultural activity integrated into the local markets but that this too contributed to raising the standard of people lives (Hopkins 1983: xii). It is worth mentioning that Greene (1986: 14-15) embraced Hopkins' argument about Roman growth and indicated that the majority of Hopkins' proposed principles of economic development can be tested archaeologically (1980; 1983: xv-xxi; 2002: 190-230). Similarly, Saller (2002: 266) has proposed a middle level of growth in the Roman Empire somewhere in between primitive or modernist models as suggested by Finley and Rostovtzeff. Broadly speaking, based on the available archaeological and textual data from Cyrenaica it is possible to trace some of Hopkins' principles, such as population growth, increasing demand, inter-regional exchange growth and tax collecting, in relation to the region economy. It is also possible to assess whether there are other features that may reflect the economic growth in Cyrenaica.

I.2.1.3 New approaches to measuring ancient economic performance

In the last 20 years, a new theme has emerged among archaeologists and historians. This approach has improved innovative tools of quantified analysis for determining ancient economic performance. An important example of this type of studies is *The Cambridge Economic History of the Greco-Roman World* (Scheidel, Morris and Saller 2007). In this work, scholars have developed a new approach through studying a particular point such as demography, ecology, law, economic institution or production capacity as methods of measuring the ancient economy. New Institutional Economics (NIE) is one of the most important approaches advocated in this book. The 'Economic institutions' at issue here were defined by North (1990: 3; 1991), 'They are humanly devised constraints that structure political, economic and social interaction'. These institutions include two types: formal regulations (political constitution, legislation, etc.) and informal regulations (social rules, conventions etc.). North's idea of institutions has supported and enriched the on-going controversy about growth by different researchers. They shed light on the function of institutions, the impact of the control of them by individuals and the probable varied motivations of their change over time (Hodgson, 1997; Lindbladh and Lyttkens, 2002; Morris and Weingast 2004; Scheidel et al. 2007 Lyttkens 2013: 5; Lo Cascio 2006: 215- 234). Moreover, Bresson (2016:15, 16, 170)

emphasises the significant relationship between the economy and the institutions. He stated that the general social and institutional conditions of any society are important data that would represent the economy. This thesis investigates the horse's economic value via its involvement in the Cyrenaican institutions of the army and ephebate.

Scholars of the ancient economy are continuing to investigate the best approach for understanding the ancient economy in particular in Roman times. *The Cambridge Companion to the Roman Economy* (Scheidel 2012) is a recent wide-ranging work on the Roman economy. The contributors present a collection of essays on different themes, which include theory, labour, production, distribution, and outcomes. This approach enabled the researchers to provide a general vision of the Roman economy and avoid the traditional chronological approach. Their general focus was on Roman economic performance from the second century BC onwards. The principal value of this work lies in investigating Roman growth by drawing attention to different manifestations including production, consumption and exchange (Scheidel 2012: 133-77; 266-320). It is worth mentioning that some approaches in these recent works can be adopted for studying grapes and cereals in Cyrenaica. These include determining production, consumption and exchange in a particular city or region in order to measure the economic growth in both Hellenistic and early/mid-Roman periods.

I.2.2 General studies on the Cyrenaican economy

This section introduces the most important previous studies related to the Cyrenaican economy. Despite the limitation of these studies, they provide valuable information including Cyrenaica's location, history, type of soil and others. These allow me to understand the region's potential for growing different types of crops, in particular cereals, and breeding animal such as horses. Some explanation of important epigraphic evidence associated with cereals and vine production are integrated to the case studies of both products in this thesis in chapters III and IV.

Coster (1968) made a number of important contributions to the study of the Roman economy in his book *Late Roman Studies*, three chapters being concerned with the economy and history of ancient Cyrenaica. Chapter V (1968: 104-44), titled 'The Economic Position of Cyrenaica in Classical Times', discusses the geographical location

of the region, its economic resources, and trade connections with the ancient Mediterranean world.

Chapter VI, titled 'Synesius, a *curialis* of the time of Emperor Arcadius' (1968: 145-82), uses the letters of Synesius to attempt to shed light on the functioning of the *curiales*. The author starts by discussing some interesting observations from Rostovtzeff (1926: 460, 468-70) about how Diocletian made no change in the conditions to overtake the membership of the *curiales*. Rostovtzeff argued that regulations increased the burden on ordinary people by raising taxation, consequently leading to economic decline. Synesius as a *curialis* constantly opposed the corrupt governor Andronicus (*Letter*, 130), confronted the tribal invasions and humbly appealed for lower taxation during his famous speech before Arcadius.

In Coster's study there is an important point concerning the first appearance of the camel in Cyrenaica. Based on Demougeot (1960: 209-47), he argued (1968: 134-43) that camels had been introduced to the region by the end of the first century BC. They were used for a variety of different purposes, but were especially associated with the trans-Saharan trade with Fazzan (1968: 136). The depiction of a camel probably dating to the end of the fourth century AD was discovered recently on a mosaic floor at ancient Taucheira, which suggests that these animals were perhaps common in the region at that time (Ahmed Buzaian, pers. comm.).

Stucchi's imposing *Architettura Cirenaica* (1975) is an excellent starting point for any study of the region, as it summarises approximately seven decades of scientific urban excavations and surveys of Greek and Roman Cyrenaica. It covers the major cities as well as many distant settlements and oases. The study provides the first systemic classification of the architecture of ancient Cyrenaica, from the beginning of Greek colonisation until the Islamic invasion in the middle of the seventh century AD. However, Roman cities make up the lion's share of this study, as they overlaid early Greek towns and continued until the Islamic intervention. Despite the predominance of the architectural aspects of the study, it nonetheless contains valuable information about the economy of the region, and explicitly testifies to the Roman expansion across Cyrenaica. It also shows that despite the region having passed to Roman administration, it maintained a strong relationship with the neighbouring regions of Greece which were also under Roman rule.

Applebaum's study *Jews and Greeks in Ancient Cyrene* (1979) is considered a major contribution to the study of ancient history and the economy of Cyrenaica. It uses textual, archaeological and epigraphic evidence to discuss many aspects of Cyrenaica's history and agriculture. The work focuses especially on the Greek and Hellenistic periods, with particular discussion on the Jewish presence in the region and the issues that ultimately led to unrest among the Jewish population. The conflict lasted from AD 115 to 117, and had a negative impact on the economy and population of the whole region.

Chapter III provides extensive details about Cyrenean agriculture in the fourth century BC and argues that there were notable agricultural products in the area, attested most prominently in the inscriptions of the *demiourgoi* found at Cyrene (1979: 87-97). He also provides an in-depth discussion of the celebrated inscription (or the Cereal Stele), which commemorated the consignments of 805,000 *medimnoi* of cereals sent to more than 40 Greece cities in the late fourth century BC (1979: 97-109). The Ptolemies showed particular interest in cultivating the land of Cyrenaica. They introduced new elements into Cyrenaican society and made lands available to themselves through tenancy and political confiscation. This subsequently led to the emergence of the royal lands (1979: 109-26). Applebaum argues that the Cyrenaican economy, as with other ancient economies, was primarily based on agriculture. However, it is clear from previous chapters that the export potential of Cyrenaican agriculture was considerable, and Applebaum rightly questions the size of imports and the extent to which the region depended on its own produce.

André Laronde (1987) wrote an outstanding history of Cyrenaica during the Hellenistic period, from the fourth to early first century BC. The work is marked by the extensive use of monumental, epigraphic and numismatic evidence supported by literary sources, and offers particularly useful information on the coinage of Cyrene (chapter XIV) and the beginning of the gold issues in the second half of the fifth century BC. Laronde believed that securing a gold supply from Africa was impossible, due to the long struggle with Carthage and the lack of a well-established trans-Saharan trade route, which resulted from poor relations with the native Libyans. However, new evidence dated to the late centuries BC and the early Roman period, has shown that Libyans, in some oases, were settled societies reliant on agriculture and trade (Mattingly and Sterry 2013). This fact can be considered a sign of a better relationship between Greek/Roman settlers and

Libyans. Therefore, re-evaluating Cyrenaican trans-Saharan trade, in the Hellenistic and Roman period requires more investigation.

Laronde made a great effort to study the geography, climate, vegetation and wildlife of Cyrenaica, and to determine how the Greeks depended upon the region's agricultural potential to boost their economic performance. The region was connected through a network of roads across Cyrene's territory, which included both of the two terraces between the ports of the coast and the upper escarpments (1987: 257-323). Laronde produced a long list of the agricultural products available at different times in the year (1987: 325-30). He examined how Greeks approached Africa with the aim of controlling caravan routes to obtain gold from Africa. At this time Cyrene thrived, and enjoyed trade with Greece and particularly with Crete. By the end of the fourth century BC Cyrene was renowned for its fertile lands, and was able to relieve Greek cities in difficulties.

Laronde (1994) discussed the fertile soil and abundant water of the lands around the ancient city of Teucheira. Some of these lands depended on irrigation; others were used for seasonal agriculture and animal husbandry. He argued that Teucheira was important from the very beginning of the Greek presence in Cyrenaica. This explains the early arrival of Greek settlers at this site, with the colonists considering it perfect for their new home. His discussion relies, however, on personal observations rather than actual field research. Very little work has been carried out on the fortified farms scattered between Teucheira and Ptolemais (Kraeling 1962: 105-7). Recent reconnaissance of the coastal strip between the two cities has discovered traces of the ancient connecting road, which was c.6 m wide and composed of two separate lanes (Weber and Berger 2016: 23-40). The overall landscape along the coastal strip between Benghazi and further east of Ptolemais is of great archaeological potential, and awaits future work. It is worth mentioning that this coastal area is one of the most important parts of Cyrenaica where Libyans cultivate cereals nowadays.

Christian Monuments of Cyrenaica, published in 2003, is an excellent piece of work built on a long and fruitful collaboration between two outstanding figures in Cyrenaican archaeology, Goodchild and Ward-Perkins. Reynolds made special journeys to Cyrenaica to re-examine many of the sites previously visited by Goodchild and Ward-Perkins, and finally succeeded in publishing their work (Reynolds 2003).

Although *Christian Monuments of Cyrenaica* addressed the late Roman and Byzantine period and focused mainly on the architecture of churches, it also provided valuable information about the cities and countryside of Cyrenaica. The study was confined to churches and other religious buildings, though it often provided succinct introductions to many other visible features scattered around those surveyed sites, and paid special attention to those which had an industrial character. This provides valuable information about the economic potential of regions that have not yet received adequate attention.

Catani (1985) discusses vine production in Cyrenaica during the Greek and Roman periods using both ancient sources and archaeological evidence. However, he pointed out that the archaeological evidence was not previously well presented, and most studies had focused on cereal and olive production. Catani (1985, fig. 12.1) summarises the evidence from the second century BC based on the *demiourgoi* steles. They reported the prices of agricultural products such as wine and grapes. Catani (1985) stated that white grapes were well-known in the region's coastal areas, while black grapes were conspicuous on hills and high lands and he adds that raisins were popular in Cyrene. By the early first century BC the region had become subject to Roman rule, which expanded beyond the Ptolemaic limits and penetrated into the desert fringes. Their agricultural development was clearly reflected in the agricultural structures distributed across the region and the establishment of new aqueducts, cisterns, wadi walls and terracing lands.

The next chapter addresses the main sources used in this thesis and provides an investigation into some Cyrenaican annual crops and fruit cultivated in the region, in addition to an indication of the common animal breed in the Hellenistic and early/mid Roman periods. This is an introduction to the three following chapters which will include case studies into Cyrenaica's productive capacity of cereals, wine production and horse breeding.

Chapter II : Sources and Agricultural Background

This chapter includes two parts, the first one introduces the thesis' primary sources of information both textual and archaeological and evaluates them. There are different kinds of data representing each period covered by the thesis. The textual documents are the essential sources of our information about Cyrenaica during the Hellenistic period, while the literary sources relating to the early/mid-Roman period are quite limited. Therefore, the available archaeological evidence takes on greater significance for the latter period.

The second part of this chapter presents a general background about Cyrenaica's agro-pastoral economic potential during the Hellenistic and early/mid-Roman periods. This includes a general discussion of annual crops of Cyrenaica, plus figs, almonds and olives and olive oil as examples of Cyrenaica's cultivated fruit. The role of animal husbandry is also introduced. These are followed by an estimation of Roman Cyrenaica's population to assess the consumption of wine in this period. The agro-pastoral background is important because it helps us to draw a general picture about the region's capability for agricultural production and livestock raising. It is also an essential introduction to the three case studies that are introduced in the following chapters.

II.1 The Project Sources

It was essential for me to deal with a wide variety of data in compiling information about the economy of Cyrenaica in the era being investigated. This has helped me to identify the most appropriate data for each period. Therefore, the research has relied on manifold different types of data. These include literary sources, epigraphy, a papyrus and archaeological evidence such as pottery, botanical/faunal remains, coins, sculpture, and the remains of industrial installations. In this section, I shall indicate the thesis data sets and estimate their significance to each period of the research.

II.1.1 Literary:

Different literary references have been used in this thesis because they provide important information relating to the economy of Cyrenaica. These sources mainly range between the fifth century BC and fourth century AD. The relevant texts cover several genres, but the most important one for this project are the historical and geographical

sources because they provide direct and indirect details about the political background, economic condition, natural resources, wildlife and routes of trade and travel. Therefore, a general reading and collection of data from the ancient literary sources has been an essential step. The varied indications of different agricultural products have been gathered and classified in a number of tables. Each one represents data relevant to a particular crop as can be seen in Appendix I. Cereal, for instance, is under the table number A. 1. Also the ancient sources used in each table have been numbered from one onwards. Some of the other agricultural products are briefly introduced to provide a full picture about the annual crops of the region. Cumin and different types of pulse are among them.

The best examples of the pretty abundant relevant literary accounts are Pindar (*The Odes of Pindar: Isthmian and Pythian*), Herodotus (*History*, IV. 155, 157, 158, 159, 170, 171, 198, 199), (Pseudo-Skylax, *Periplus*, 108), Theophrastus (*Historia Plantarum*, IV, 3; VIII. 6), Diodorus Siculus (*Library*, III. 49, 50; IV. 26), Strabon (*Geography*, XVII, 20,21), Pliny (*Natural History*, V. v (33); XIX. 3 (15), Synesius (*Letters*, 109, 106) and others (see App. I). They mention many different types of products such as fruits of all kinds, grains (particularly wheat and barley), legumes and various liquids such as silphium juice, oil, wine, as well as dates and some kinds of wood. In addition, animal husbandry was often mentioned and is thought to have formed an important element within the economy.

The ancient sources include also important information relevant to soil fertility and the abundant rain-fall of Cyrenaica which was esteemed by various ancient writers. The good illustration of this is Herodotus (IV, 158) in the mid-fifth century BC who mentions that the Greeks were escorted by Libyan tribes to Cyrene and told that there they could stay here because there is ‘a hole in the sky’ ‘ἐνθαῦτα γὰρ ὁ οὐρανὸς τέτρηται’. Pindar (*Pyth*, IV. 6) in the fourth century BC emphasised the agricultural potential and referred admiringly to ‘Libya, the fruit-bearing’ [Cyrenaica] ‘καρποφόρου Λιβύας’. In general, most of these texts portray Cyrenaica as a rich and fertile land, with abundant agricultural produce and potential.

However, dealing with information provided by the literary sources is a big challenge. This is because some writers do not mention Cyrenaica by name, but they refer to Libya in general. These statements, therefore, should be carefully used. In addition, these literary texts date from a wide range of periods, covering a millennium from the 5th

century BC to the the 5th century AD. It is important to remember that text was a product of the time it was written in, and that its information does not necessarily apply to other periods.

II.1.2 Epigraphic evidence

The epigraphic evidence is an extremely important source of information for this thesis (see App. II). Of the inscriptions, the Grain Decree or 'Cereal Stele' of Cyrene of 330-26 BC (*IGCyr010900*) and the *demiourgoi* (δημιοεργοί or δαμμεργοί as recorded in Cyrene's lists) inscriptions which dated to the fourth-second centuries BC are among the most interesting and distinctive epigraphic evidence found in Cyrene, and are crucial for our understanding of Cyrene's social, economic and political affairs. They also offer a useful insight into the *chôra's* agricultural economy, contemporary units of measurements, the prices of goods, and the religious aspects of the town.

The Grain Decree of Cyrene is a remarkable testament to the region's economic potential, in particular the cultivation of grain. This inscription commemorates a consignment of 805,000 *medimnoi* of grain which was sent to Greece in the late fourth century BC, and indicates that Cyrene supplied more than 40 Greek cities with cereals during a food shortage, including Athens herself. Part of this evidence lies in its detailed record of the amount delivered to each city (Applebaum 1979: 97-109; *SEG* 9. 2; *IGCyr010900*). The decree was found at Cyrene in 1922 and has been discussed by many scholars in the last century, including Laronde (1987: 30-6), Oliverio (1933c), Tod (1948: 273-6) and others. Some elements of the text and remarks are still controversial. The grain quantity, its measurement and the word σῆτος are going to be discussed in detail in chapters III.

In addition, the *demiourgoi* stelae are the most important epigraphic evidence that display direct economic information on Cyrene, spanning in time from the fourth to the second century BC. These important inscriptions comprised a roster of names and listed agricultural products, followed by their fixed prices, and depicted the total annual income with the expenditure statement from the recorded proceeds, the balance in hand and weighing units (*SEG* 9. 11- 44; Applebaum 1979: 87). Although these lists provide the annual or semester (six months) products which were cultivated on the lands devoted to the God Apollo only, they provide an important point of reference for the different

products which were cultivated in Cyrenaica in this period. Oliverio (1933b) published the first of these kinds of texts. Subsequently, there has been a dramatic increase in interest in the *demiourgoi* inscriptions (Catani 1985; Chamoux 1988; Dobias-Lalou 1985; 1993; Fraser 1958; Gasperini 1967; 1986; 1990; Laronde 1987: 241, 325; Marengo and Paci 1998; Oliverio et al. 1961/62). However, recently the projects *IGCyr* and *GVCyr* have combined and translated these inscriptions and the other Greek Cyrenaican inscriptions to English, Italian and French languages and they are now available online with Arabic translation to the introduction and some of the Greek inscriptions. [These are now becoming a part of the international project *Inscriptions of Libya* (InsLib)]. It is important to mention here that about 32 *demiourgoi* inscriptions have been collected from the *IGCyr* project with a personal access kindly given to me by Professor Catherine Dobias-Lalou in 2015, and me being accepted as an external member of the team to provide the Arabic translation.

In this thesis, I have classified and reinvestigated the accounts of these documents. They recorded wheat and barley and other agricultural products from the fourth to second centuries BC. I have classified them into two groups each prepared in a separate table (Appendix II). The first one entitled (II. C. 1. Barley, wheat and their by-products in the fourth century BC), includes data relating to 17 inscriptions. The second table entitled (II. C. 2. Wheat, barley and their by-products at the third and second centuries BC), includes data from 8 inscriptions. This classification has been made based on the different features of this epigraphic evidence. The group concerning the third and second centuries is more detailed, it includes various sorts of legumes, unlike the first group which just mentioned the term 'legume'. Additionally, the products in the second group were recorded by semesters, each one includes crops across sixth months. These tables are designed to include the important information about each product which is needed in the discussion. They provide the proposed number of each inscription in this project, for example: DMI 23 is an abbreviation of 'demiourgoi inscription number 23'. They also include the product name in English and Greek, date, quantity, price, note if it is required and some references. The name of a particular product is purposely not included as a category in some tables if it is devoted to one kind only of a product and its name is already already existed in the table's title, such as that of cumin (see App.II.A. 1. Cumin (κύμινον)).

It is important to mention that products mentioned in the *demiourgoi* evidence of the fourth century BC appeared generally without identification of their units unlike those of third/second centuries BC. However, because the measurements (cartload and net) of the three kinds of hay have been recorded in fourth century BC and used also in the two following centuries, in this thesis, I have considered that measurements of other products used in those latter centuries are also used in the fourth century BC.

The main problem of these lists is that some of them are incomplete and lacking some important information such as the product name or the price of a named product. Nevertheless, the available data were an essential source for my discussion in chapters II, III, IV and VI. The total number of the *demiourgoi* inscriptions used in this research is 32; 20 date back to the fourth century BC and the other 12 dating to the third/second centuries BC. The abbreviations of these inscriptions and their corresponding numbers in the *IGCyr project* are given in Table II.1:

N. in the thesis	N. in the <i>IGCyr</i>	N. in the thesis	N. in the <i>IGCyr</i>
DMI 1	011400	DMI 17	012910
DMI 2	009420	DMI18	013400
DMI 3	011500	DMI 19	013700
DMI 4	011600	DMI 20	013800
DMI 5	011700	DMI 21	014200
DMI 6	011800	DMI 22	014300
DMI 7	012100	DMI 23	014400
DMI 8	012200	DMI 24	014500
DMI 9	012400	DMI 25	063900
DMI 10	012500	DMI 26	014600
DMI 11	012700	DMI 27	107150
DMI 12	013000	DMI 28	012800
DMI 13	013100	DMI 29	012900
DMI 14	088100	DMI 30	013200
DMI 15	088200	DMI 31	013500
DMI 16	088300	DMI 32	014100

Table II.1: The numbers of the *demiourgoi* inscriptions (DMI) used in this thesis and their corresponding numbers in the *IGCyr project*

The honorific and ephebic inscriptions are another fundamental source of data that have been used here. These were mainly published in the *IGCyr* and *GVCyr* project and the current project of the Roman Inscriptions in Cyrenaica (*RICyr*). The latter project will produce a digital publication of *RICyr* based at King's College, London. It is a huge collection of inscriptions, from Cyrenaica, many gathered by Professor J. M. Reynolds, including some which have not been studied yet. Charlotte Roueché has kindly offered me personal access to this unique work. The most interesting example of the honorific

inscriptions is the decree of Aleximachos from Tocra dated to the first century BC. It was published in *SEG* (26. 1817) and by Laronde (1987: 474-78) and Reynolds (1976). The decree demonstrates that Arsinoe (Tocra) honoured the citizen Aleximachos (Ἀλεξίμαχος) because he supported his city with cereals when it was suffering from the lack of grain and it was facing shortage of money to buy its need from Lepcis Magna. This indicates that there were price increases for cereals in the first century BC. Some important economic information can be detected from this decree including trade relationship between this city and Lepcis, indicating that Tocra seems to have been connected to the Roman economic network. Additionally, the inscription may support the common idea that there was a period of rather troubled conditions and instability in the first century BC in Cyrenaica generally. Moreover, it can be considered as evidence of the wealth of Lepcis and its new rights of commercial traffic (Munzi et al. 2004).

II.1.3 Papyri

The Papyrus Vaticanus Graecus II of Cherronesos (Ras et-Tin, east of Darna) is the only piece of this kind of data used in this thesis. The papyrus has been examined in detail by Catani in 1985. It is one of the most important documentary sources regarding grape cultivation and wine production at the end of the second century AD (Catani 1985:150). The contents of this papyrus have been used in chapter IV in order to identify the extent to which grape cultivation was important to the region, including the less fertile areas. The account also may reflect the Cyrenaican pattern of grape cultivation.

The papyrus provides an important account about the agriculture and viticulture in the area between the Cyrenaican Pentapolis and western Marmarica. It records data relating to the wine production between AD 175-190. This is a significant data about viticulture in the Cherronesos district. The main information provided concerned the area of plots, wine measurement (*ceramion*), the production type, average production of each plot in five consecutive years, income of each plot in *denarii* for a particular year. The provided numbers allow me to estimate the percentage of the production in five years as well as the income in a given year from an *aroura* (The *aroura* is 237.5 m²). They also enable me reassess Catani's suggestion that the production of wine was quite low in this area and this is likely due to the typology of viticulture practised rather than to the size of the plot.

II.1.4 Medieval Arabas and early/modern European travellers

The accounts of the medieval Arab travellers and early modern European travellers, especially those who visited Cyrenaica in the eighteenth and nineteenth centuries AD, are another valuable source of information on the region's economy and have all been considered in this research. Of course, information from these sources is useful primarily as a point of comparison for agricultural potential, rather than as providing direct information about antiquity. A summary of the main types of these sources is chronologically addressed in the following points:

- Al-Idrisi (الإدريسي) was an Arabic historian and geographer (AD 1099-1164). Some important information relating to Cyrenaica was reported in his book entitled *Kitab Nuzhat Al Mushtaq fi Ikhtiraq Al Afaaq* (كتاب نزهة المشتاق في اختراق الافاق). These include indications of a maritime commercial relationship between the region and Egypt and trade with Sudan across the African Sahara. In addition, he reported cultivation of different products in Cyrenaica and offered his own interpretation of the reasons behind the Cyrenaican tribes' wealth.
- Abu al-Fida (أبو الفدا) was also an Arabic historian and geographer (AD 1273-1331). In his work (*Taqueem al-buldan* تقويم البلدان), he refers to the export of animals and agricultural products from the port of Ptolemais to Alexandria.
- Al-Aiashe 'العياشي' is an Arab traveller who reported his trip in AD 1661-63 in a book entitled *Aiashian Trip* (الرحلة العياشية) 1661-63. The most interesting references to the region's economic potential is the writer's classification of various animal by-products that were brought from the al-Jabal al-Akhdar (areas around Cyrene) and exported from the port of Benghazi to Tripoli and Tunisia.
- James Hamilton was a British traveller, who visited the region in 1852/3, and wrote a book called *Wandering in North Africa* about his voyages through Cyrenaica. This book considers the region's economic condition using the writer's personal observations. The work includes the fertility of the province's lands, methods used to cultivate cereals, the region's potential for growing olives trees and the exchange of some products between Cyrenaica and the African Sahara.

- Manfredo Camperio (1881), an Italian traveller, and Giuseppe Haimann (1882), who led a scientific mission to Cyrenaica, both provide some significant statistical data which has also been taken into consideration.
- J. W. Gregory was a geologist who led an ITO scientific mission to Cyrenaica in 1908, to investigate the possibility of establishing a Jewish settlement. He provides us with valuable information about the region's ecology and its economic resources. He published his article 'Cyrenaica' in *The Geographical Journal* in 1916. This is another important reference to the region's vegetation because it reports the wild and cultivated plants in Cyrenaica and it was based on academic inspection.

II.1.5 Agricultural surveys

Modern Italian studies and the FAO (Food and Agriculture Organisation of the United Nations) surveys have also been taken into consideration especially those associated with estimating the extent of the agricultural lands or the volume of cereal production. The Italian studies which were conducted in the 1930s are examples (Bertarelli; Bonacelli cited in Applebaum (1979: 90-4)). These included figures for the quantity of grain produced from cultivated lands per hectare, in the records of the Italians after their reclamations (the process of expanding the cultivated lands). I have halved their recorded quantities in considering the probable annual cereal production of Cyrenaica in antiquity. These studies generally are dated to 1932 and onwards, and reflect the Italians' concern for agriculture in Cyrenaica.

In addition, this thesis benefits from the studies of the FAO of 1950s and 1960s. They include an investigation of the rain distribution, soil types, judgments of the land used for growing cereal, statistics of cereal production and other products, in addition to their recommendations for growing some plants in Cyrenaica. These have helped me in recognising the land that is most suitable for cultivating cereals and grapes.

II.1.6 Visual art

Among the important archaeological data used in this thesis are some pieces of visual art dated to different periods. The Pharaonic artwork known as 'Teheno's board' is an interesting example. It was found in Abydos in Upper Egypt and dates to the fourth millennium BC (Figure II.13). The board evidently shows goods gained by Egyptians

from the Libyans after a battle (Gardiner 1961: 394). The goods included different kinds of animals and olives branches, suggesting the fertility of the region. Of course, this piece of evidence does not tell us anything about agricultural production during classical antiquity, but it offers contextual and comparative information about the agricultural potential of the land. Another significant sculptural relief represents the scene of a nymph being crowned by the local deity, Libya. This iconography dates to the second century AD. The scene demonstrated vineyards and bunches of grapes surrounding the nymph. Marshall (1997:179) considered it to be a personification of the city of Cyrene. Although there are many Roman copies of this relief sculpture, the most famous is that discovered in the temple of Aphrodite of Cyrene now displayed in the British Museum (see Figure IV.10). Iconographic representations of horses have also been taken into consideration. Figures of four-horse chariot with driver and a relief sculpture of a heroic equestrian type are the most important evidence. They have been used in the case study on Cyrenaican horses (see Figures V.7, 15). Horse iconography represented on the ephebic inscriptions are regarded as evidence of the Cyrenaica's concern of breeding horses and using them in entertainment.

II.1.7 Numismatics

Plants and animals depicted on coins dated to different periods are also important sources of information. The value of this kind of data lies in their reflection of some political and cultural aspects of Cyrenaican societies. The coins that depict silphium and horses are the most significant pieces of evidence used to support arguments related to those two subjects (see figures II.5, 6, 8, 9 and figures V.16).

II.1.8 Bio-archaeological and archaeobotanical studies

Despite limitations of the bio-archaeological and archaeobotanical studies, they have been included among the source of this project. Barker (1979; 1985) examined animal and bird bones retrieved from the Berenice excavations and considered them a significant evidence that reflected on the agricultural and economic life in Cyrenaica. He clearly demonstrated the relevance of the transhumance model in raising animals in Cyrenaica. Barker (1979) based this on Johnson's (1973) human model, although neither discussed the nature or circumstances in which land use was regulated between non-migratory residents and nomads. Barker (1979; 1985) concluded that sheep and goats

were the most frequently consumed species for most of the city's history, while cattle and pig were less common. He mentioned that the related evidence of woollen manufacture suggests a production which could cover only local demand. Nonetheless, the industrial connections of purple dye processing plant, which were recently discovered at Euesperides, is a strong indication of an inter-regional woollen cloth commerce (Bennett et al. 2000; Wilson et al. 1999; 2001; Wilson 2006). An investigation of the animal bones found in the extramural Sanctuary of Demeter and Persephone at Cyrene is also significant work because it provides more information about the ancient diets in the eastern part of the region (Crabtree and Monge 1987; Crabtree 1990). This allows an identification and comparison of the animals which were bred in Cyrene and that in Berenice. Sheep was probably one of the most common bred animal in ancient Cyrenaica. Their breeding has continued nowadays in the region to be a main economic activity. Moreover, manufacture of wool can be regarded as a sign of the spread of craft production, which can be equated with one of Hopkins' growth features (1980; 1983: xv-xxi, 2002: 190-230).

Remains of some low-quality barley seeds were recovered from early Roman deposits in Berenice. Webley (1979) investigated these samples, and supported Johnson's opinion which considers barley to be the essential diet in the classical periods that was harvested and consumed in the same ways that the inhabitants of the modern rural Cyrenaica do (cf. Applebaum 1979: 91, 94).

Preliminary archaeobotanical investigations from Euesperides (Pelling and al Hassy 1997; Wilson et al. 2005) shed some light on the economy of the site between the sixth and the third centuries BC. Plant remains were presented in varying quantities; among them grape seeds were the overall dominant species, fitted well with the characteristics of wild grape (*Vitis vinifera* spp. *Sylvestris*). Grapes appear to have been a favoured fruit in Euesperides, though it is not clear yet whether they were locally cultivated or regionally imported (Wilson et al. 2005).

II.1.9 Amphorae production and trade at ports

The Cyrenaican amphora is the main commodity that can be used by researchers to identify the region's trade. Therefore, some of the available studies from the region have been integrated with other evidence in order to investigate Cyrenaica's economic

interactions during the Hellenistic and early/mid-Roman periods. Göransson (2007) investigated the ancient trade in goods carried by amphorae on the basis of quantification through form series and fabric analysis. The material examined was retrieved during the excavations conducted at Euesperides (modern Benghazi) between 1999 and 2006. The study extended from the late Classical to the early Ptolemaic periods (400-250 BC) and raised questions about the major commodities exported from Cyrenaica and the role of the port of Euesperides in overseas trade. Wine and oil are among the commodities likely to have been exported, although probably the most-exported good was silphium, which was traded to many Greek cities. Göransson pointed out that Euesperides imported substances transported by amphora throughout the Mediterranean Sea on a large scale, as trade extended throughout the region.

In addition, Riley (1979) contributed to the study of Hellenistic and Roman coarse pottery in Cyrenaica and North Africa, examining material found at Berenice (modern Benghazi) in excavations conducted between 1970 and 1975. The most important results were the identification of new amphorae types manufactured locally over the period AD 100-200. Evidence of Berenice's mid-Roman exports comes in the form of Amphora 8, found at Veneto and Ostia (Ferrarini 1993). This indicates that there were some overseas exports, although their contents are uncertain. This thesis attempts to identify the probable contents of MRA 8 via the relevant contemporary textual data.

Furthermore, Recent excavations at Erythron (modern Latrun), 25 km east of Apollonia, have revealed evidence of pottery production found in the abandoned Roman bath complex. Mazou and Capelli (2011) examined the excavated material and argued for the presence of on-site local pottery manufacturing. The pottery assemblage was composed of a large quantity of mid-Roman amphora-1 types, produced mainly between AD 100-200. The mid-Roman amphora 1 was clearly imitated in Erythron. Fabric analysis proved that local production facilities were making this type of amphora, and they can be linked to the remains of oil and wine-making at Erythron.

II.1.10 Kilns as evidence of local manufacturing of amphorae

In terms of manufacturing amphorae, it is important to note that examples of local pottery kilns have been identified in Cyrenaican cities and most of them are dated to the Hellenistic and early/mid-Roman periods. These are important in investigating the

region's probable production of oil and wine. There are around 38 kilns discovered at Euesperides, Tocra, Berenice, Ptolemais, Hadrianopolis, Kambut and Marsa Lukk (Buzaian 2000; Hulin 2008; Hulin et al. 2009; Jones and Little 1971; Lloyd 1977; Mazou and Capelli 2011; Riley 1976; 1979; Wright 1963). In addition, recently, Hesein (2014: 172-187) has discovered ten kilns in three coastal sites to the east of Apollonia and integrated them in his PhD. Undoubtedly, this number of kilns in Cyrenaica provides good evidence for an export production by these amphorae.

II.1.11 Industrial installations

Cyrenaica's ancient industrial facilities are scattered fairly equally among urban and rural sites, but archaeological projects are often attracted by monumental buildings rather than industrial remains. Cyrenaica's industrial archaeology has great economic potential but is still an under-explored field. Therefore, the evidence related to wine or oil production and woollen manufacture provides further important data that is used in this thesis.

The archaeological excavations at Balagrae brought new momentum to industrial archaeology in Cyrenaica. The excavations took place at the eastern end of the settlement a short distance east of the sanctuary of Aesculapius. Brief summaries of the results of the current excavations have appeared in several publications (Buzaian and Bentaher 2002; 2006; Bentaher and Buzaian 2010). The excavated elements were composed of vats, treading floors, the remains of large vessels (*dolia*) whose bases were still firmly cemented to the ground, built-up and rock-cut tanks, and a large cistern. It would be of special interest to examine the relationship between the wine-making complex and the adjacent temple, especially before the Jewish revolt in AD 115.

Stucchi (Attia and Stucchi 1975: 251-95) investigated archaeological evidence in Wadi Senab (about 20 km south-west of al-Beida) and recorded details about a Roman settlement that seems to have been thriving between the fourth and sixth centuries AD. The archaeological evidence included an open-air wine press and an oil press chamber. These industrial installations are of special interest, and they suggest that the settlement possessed great agricultural potential of oil and wine production (Gambini, in Attia and Stucchi 1975: 277-86). The agricultural activities in this Wadi may date earlier to the Hellenistic period. This hypothesis is based on the interpretation of engraved images of

possible ploughs depicted on the internal walls of the Hagfa el Khasalia, some 4 km west of the settlement (Purcaro, in Attia and Stucchi 1975: 287-94). The presence of a bathing facility (Luni, in Attia and Stucchi 1975: 266-76) in the settlement suggests that profitable agricultural activity took place here which allowed the construction of such luxurious installations to serve the residents of the settlement.

The work of Catani at Siret Gasrin el-Giamel is considered a landmark study of rural Cyrenaica. Catani (1976; 1998) presented the results of the excavations conducted in the city of al-Beida, 12 km east of Cyrene, and brought to light the remains of two separate complexes (Catani 1976; 1978; 1998). There were more industrial elements further south, placed above the ground and in an underground chamber. All were related to a specific manufacturing process, which was most likely wine-making. The main elements are 16 vats, the capacity of each one around 750 litres. The archaeological evidence suggests that the two buildings date to the period between the fifth and sixth centuries AD. Although this industrial evidence dated to the late Roman period, it represents the region's economic potential for olive oil and wine production. Data, of various industrial features connected with wine production in Cyrenaica, dating to different periods are collected and classified in Appendix III. A and B.

To sum up, several different sources of evidence including ancient literary sources, inscriptions and archaeological evidence, have been used in this thesis. These data represent information for diverse products and for various periods. Therefore, it is not possible in most cases to investigate a product in all periods with the same type of data. It seems that literary and epigraphy references are the main data available on the products dated to the Classical, Hellenistic, and Medieval/ early modern (AD 1100- 1950s) periods. However, archaeological evidence is more relevant to the products of the Roman periods (see Table II.2). It is worth mentioning that the absence of evidence related to some articles in a period means very little. For example, pulses are indicated by literary and epigraphy references and by some archaeobotanical samples in the Classical, Hellenistic, and early-Roman but the absence of evidence for these products in the mid and late-Roman period does not mean too much because they were included in textual references from the Medieval era. The importance of the literary data of Medieval and early modern (AD 1100-1950s) periods can be confirmed by its indication of all the products mentioned in table II.2, except silphium which was already extinct in Cyrenaica

during the Roman times. Also, they sometimes provide quantities of production or number of animals exported from the region and these were formal statistics or based on the writers’ personal observations.

In addition, although some data used in this research date to periods beyond the core period, they provide significant information that could support other references from another period. This is because the thesis investigates agro-pastoral items and the region’s weather that we do not think have changed from the Greek period to the present time. The Cyrenaican sheep for instance, which were represented by the ‘Teheno’s board’ in the fourth millennium BC (Figure II.13 below), are well represented by archaeofaunal data from Berenice, dated to the Hellenistic and early/mid-Roman periods. They are also still one of the most significant features of the region as some statistics from the 1940/60s have shown (see figures II.16 and 17 below). This picture can also be applied to the literary sources such as those of Pindar. The figure of Cyrenaica’s fertile soil and its high productive capacity of grain which was indicated by Pindar, Aeschylus and Herodotus in the fifth century BC were also highlighted by other writers over time from the Hellenistic to the early modern periods. Cereals are a case in point (see App.I. A. 1).

Period	Classical (5 th - end 4 th BC)			Hellenistic (Late 4 th - 1 st BC)			Early-Roman (Late 1 st BC- AD 1 st)			Mid-Roman (AD 2 nd and 3 rd)			Late-Roman (AD 4 th -7 th)			Medieval/ early modern (AD 1100-1950s)		
	L	E	A	L	E	A	L	E	A	L	E	A	L	E	A	L	E	A
Data type																		
Product																		
Cereals	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	-	-	✓	-	-
Silphium	✓	-	✓	✓	-	✓	✓	-	-	✓	-	✓	-	-	-	-	-	-
Grapes/ Wine	✓	✓	-	✓	✓	✓	✓	-	✓	-	-	✓	-	-	✓	✓	-	-
Oliv./oil	✓	✓	-	-	✓	-	✓	-	✓	✓	-	✓	-	-	✓	✓	-	-
Almonds	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	✓	-	-
Pulses	✓	✓	-	-	✓	-	✓	-	✓	-	-	-	-	-	-	✓	-	-
Horses	✓	✓	-	✓	✓	✓	✓	✓	-	✓	✓	-	✓	-	-	✓	-	-
Sheep	✓	-	-	-	-	✓	✓	-	✓	✓	-	✓	✓	-	-	✓	-	-
Cattle	✓	-	-	-	-	✓	✓	-	✓	✓	-	✓	✓	-	-	✓	-	-

Table II.2: Various types of data representing different items in different periods (L= Literary; E= Epigraphy; A= Archaeology evidence including Archaeobotanical and bioarchaeological data)

II.2 Agricultural Background

This part provides a brief examination of some of the Cyrenaican agricultural plants and animal breeds in order to assess the region's potential for nursing these kinds of activities during the Hellenistic and early/mid-Roman periods. This part includes four sections. One is devoted to the general annual crops. These include varied kinds of agricultural and some wild products such as silphium. The second section discusses different kinds of fruit which have been cultivated in the region such as figs, almond and olives. The third section presents the most common animal bred in the region including sheep and others. However, cereals, grapes and wine production and horses were excluded from these sections because they are the subjects of detailed case studies in the next three chapters. Finally, the total size of Cyrenaica's population has been approximated in the fourth section.

II.2.1 The general annual crops of Cyrenaica

Cyrenaica's diverse weather and landscape led to the emergence of a number of different economic sources. The natural vegetation and the varied activities relevant to the land use, particularly in agriculture, were an important economic resource of the region in the Hellenistic and Roman periods as identified in the ancient literary (App. I), and other archaeological data. This section discusses the annual cultivated and wild products, which included three spicy products, cumin, garlic and onion in addition to various pulses which were probably exported. Furthermore, wild plants especially silphium (τὸ σίλφιον) have been examined with a focus on its contribution to Cyrenaica's economy.

II.2.1.1 Seasonal cultivated and wild plants

Our information about the seasonal cultivated plants in Cyrenaica comes mainly from the literary sources and the epigraphic evidence, in particular the Hellenistic *demiourgoi* inscriptions (App. II. A, B). However, the important wild plant (silphium) of Cyrenaica is highlighted by various ancient literary documents and some other archaeological evidence, though not excluding the epigraphic evidence. The cultivated spices, the pulses and silphium as a wild plant are discussed in the next three sub-sections:

II.2.1.1.1 The cultivated spice plants

Cumin (τὸ κύμινον)

Cumin (τὸ κύμινον) is an annual product of the parsley family which grew in ancient Greek time in the Mediterranean terrains (Davidson 1999: 238). Cumin was used in the Greek and Roman periods for several purposes, for example as a medicine (Aretaeus, *T. A. D.*, I, 2, 3; II, 4). It also has a variety of uses in food preparation, which have been identified from the work of the Roman cookery writer Apicius in the first century AD. Interestingly, Apicius specifies that Libyan cumin should be used in one of his recipes (Apicius, I, xviii. 34). Although Apicius' hint is probably the only intimation of the use of Cyrenaican cumin in the ancient literary sources, it can be considered an important indication of how this plant was traded (Applubaum 1979: 93).

The epigraphic data of the Cyrenaican *demiourgoi* inscriptions may support the possible commerce of Cyrenaican cumin by indicating it was among the important products of the region in the fourth century and the Hellenistic eras. They display its price, which ranged between 2 and 6 drachmas in the fourth century and between 7 and 20 drachmas by the third and second centuries BC (App. II. A. 1, 2). In addition, cumin had an advanced placing in the list of the *demiourgoi* documents (see figures II.10, 12). It was mentioned after the two staple products - cereal and pulses - in all the fourth century texts and in a majority of the third and second centuries BC inscriptions. Although archaeological evidence for cumin in Roman Cyrenaica is so far absent, it is important to mention that cumin is currently used broadly for a variety of purposes in Cyrenaica. Boiling dried cumin with water is commonly used as a treatment for stomach-aches, especially for toddlers, and it can be found in any modern Cyrenaican kitchen.

Garlic (τὸ σκόροδον) and onion (τὸ κρόμμυον)

The epigraphic evidence suggests that garlic was called σκοραδα in the Cyrenaican dialect, rather than by its common name (σκόροδον). Unlike cumin, the inscriptions of the fourth century BC mentioned neither garlic nor onions (*SEG* 9. 33, 35, 37, 43; *SEG* 18.743). They do appear alongside other products in the third and second centuries BC, along with records of their prices and the unit of measurement. Although they were the last recorded products before the types of hay in the *demiourgoi* inscriptions, and so far there is no evidence they were exported, garlic and onions seem to have been as important

as cumin in Cyrene during this era. This figure can be inferred from the graph which shows the similar percentages of *demiourgoi* inscriptions mention cumin, onion and garlic (Figure II.1).

The Hellenistic epigraphic documents of Cyrene show some new products which were probably introduced by the Jews who were sent by Ptolemy I Soter, son of Lagos (367- 283 BC) or his son Ptolemy II Philadelphos according to Josephus (*Ap*, II. 33). Applebaum (1979: 118) and Crawford (1973: 350-63) discussed the introduction of various products to Egypt and Cyrenaica, including garlic by the Ptolemies. It is thus right to see evidence of this plant in Cyrenaica at the beginning of the third century BC, between 290-280 (*SEG* 18.743). This may demonstrate Cyrenaica's valuable economic position as a part of the Ptolemaic territory. Moreover, the principal value of showing the presence of these plants in the *demiourgoi* documents lies in providing a full picture of the exploitation of the productive land by the Ptolemies and reflecting a good economic level of life at Cyrene, where people were growing exotic foods in these two centuries of the Hellenistic period.

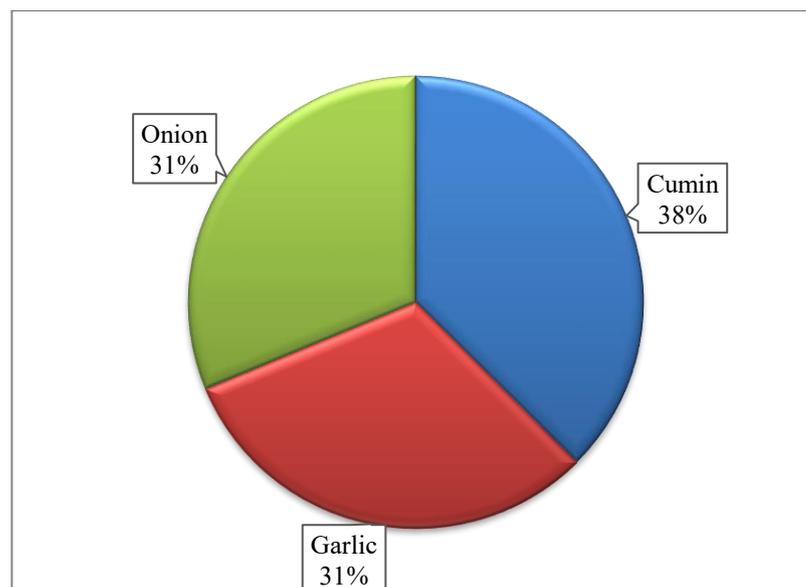


Figure II.1: The percentage of *demiourgoi* inscriptions' which mention cumin, garlic and onion in the second/third centuries BC.

II.2.1.1.2 The cultivated Pulses (τὰ ὄσπρια):

In its wider context, the word pulses (ὄσπρια) refers to fresh greens, legumes and all the seeds of beans, peas, lentils and similar plants (Catherine Dobias-Lalou, pers.

comm.). Pulses are known products alongside wheat and barley in the Greek world according to many literary sources. Pausanias (VIII. 15. 3, 4) and Plato (*Critias*, 115b) are two such cases, although these sources do not directly mention Cyrenaican pulses. The epigraphy, specifically the accounts of the *demiourgoi*, indicates their presence from the fourth century BC. Unfortunately, no specific kind of pulse can be identified in this period. This picture of a variety of species of vegetables and legumes, all of which were called pulses, is clearly represented by the use of the word ὄσπρια in all the *demiourgoi* inscriptions of this epoch (App. II. B.1).

Our information about pulses at Cyrenaica in the two following centuries is richer. This is because the epigraphic documents of this period become more detailed. The quantity of legumes is now recorded twice per year; once in the first six months (πράτας ἑξαμήνω) and again in the second six months (δευτέρως ἑξαμήνω). The value of the epigraphic documents of these two centuries lies in the information they contain about the different types of pulses. These include peas (πίσσαι), beans (φασήλοι) and chick-peas (ὀρόβοι), Figure II.2 has demonstrated (App. II. B. 2: DMI 19, DMI 20, DMI 25). The cultivation of these three kinds of pulses seems to have been limited, as far as we can tell, from the Hellenistic epigraphic data, as they appeared only once or twice, unlike the other kinds of pulses, and their prices were more expensive too. For example, the price of peas reached 24 drachmas per *medimnos*, while the price of beans, chick-peas and lentils did not exceed 12 drachmas. Moreover, it is important to mention here that after listing the named legumes, the *demiourgoi* used the term (τᾶλλα ὄσπρια, the other pulses). This undoubtedly implies that other types of legumes and vegetables were also grown. These were probably less important because they were cheaper than the named pulses (App. II. B. 2: DMI 22).

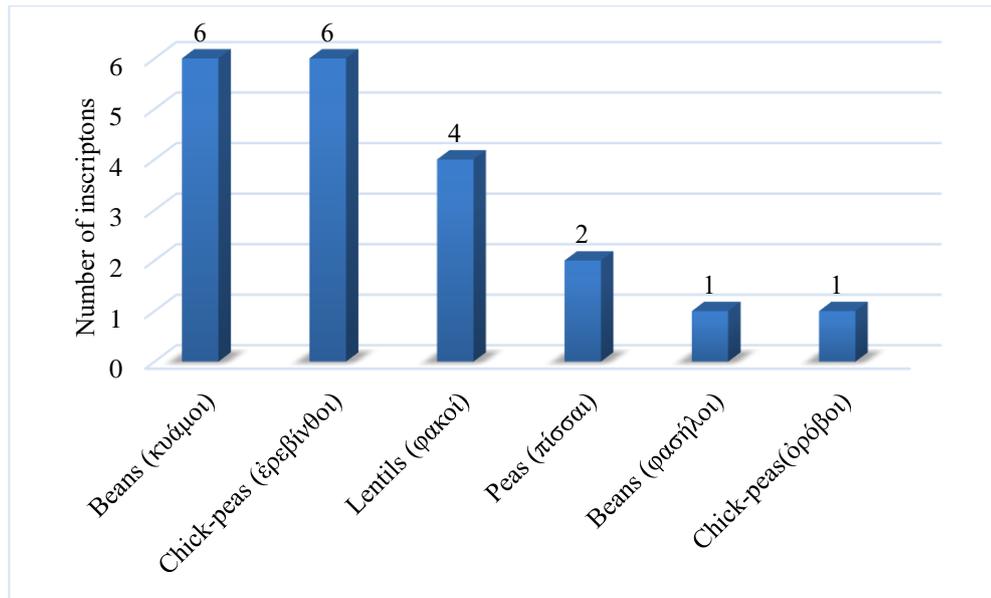


Figure II.2: The number of the *demourgoi* inscriptions which indicate different types of pulse in the second/third centuries BC.

However, the kinds of legumes most commonly found in the region seem to have been beans (κυάμοι), lentils (φακοί) and the type of chick-peas called ἐρεβίνθοι which are distinct from the previously-mentioned type (ὀρόβοι). These are clearly indicated by the inscriptions of the *demourgoi* that date to the third and second centuries BC. In some of them, in particular those which can be considered to possess incomplete inscriptions, beans (κυάμοι), lentils (φακοί) and chick-peas (ἐρεβίνθοι) are recorded directly after wheat and barley in the first and second semesters. They are also mentioned in the inscriptions much more frequently than peas (πίσσαι), beans (φασήλοι), chick-peas (ὀρόβοι) as can be seen in figure II.2. Furthermore, the quantities of these bean, lentils and chick-peas appear closer to the quantities of wheat and barley, or higher, as represented by two of the *demourgoi* inscriptions that dated to the second century BC (App. II. B. 2; C. 2: DMI 23, DMI 24).

II.2.1.1.3 The wild plants: Silphium (τὸ σίλφιον), the curative and spicy plant:

Cyrenaica is today rich in wild plants, including a variety of types that can be used as human food, such as jujube, artichoke and types of fungus such as truffle in addition to other plants for animals. However, our information about the wild plants of Cyrenaica, in Greek and Roman time is modest (App. I. B.2.1-3,5). The ancient writers name few of them such as ivy (ὁ κισσός) (Pseudo-Skylax, *Periplus*, 108), Cypress (ἡ κυπάρισσος) and

Christ's thorn (ὁ παλίουρος) (Theophrastus, *Hist.Pl.*, IV, iii. 3). According to Theophrastus (*Hist.Pl.*, IV, iii. 3), the fruit from the latter was used to produce sweet wine.

Another important wild plant was the Lotus (ὁ λωτός). This was an essential food and was used in wine-making by some tribes. Furthermore, people used its wood as fuel, and two of the ancient literary sources hints that it may have been used in certain handicrafts (App. I. B. 2.4). Euripides (*Helen*, 167. Lin 170) confirms that the Libyan flute was made from lotus. Theophrastus (*Hist.Pl.*, IV, iii.4- 5) mentions that the lotus root was used by the Cyreneans for dagger handles and decorative work, and its wood was used for pipes and many other things. Nevertheless, the best-known wild plant in Cyrenaica is silphium, (τὸ σίλφιον) in Greek and silphium (laserpitium) or Laser (the silphium juice) in Latin. This unique plant received a great deal of attention during the last century, and remains a controversial matter. Silphium intrigues historical and archaeological scholars and has attracted their attention, which has led to the creation of a number of significant research studies. Gemmill (1966: 295-313) and Chamoux (1985: 165-72) is the most important academic work on this plant in the last century. Gemmill (1966: 295-313) provided a useful analysis and lists the main publications on silphium at that date. In addition, Ascitti (2004, 2, 27, 114/5) recently gathered and analysed very interesting data from the Greek and Roman writers. She emphasised the important economic role of Cyrenaican silphium. Although the following years marked a turning point in archaeological research with the introduction of the environmental approach to archaeology, unfortunately the botanic remains of this ambiguous plant have yet to be identified in samples taken during the excavations in the region. However, these botanical sample studies are very limited and they were taken from the cities, while silphium grew in the pre-desert.

However, the literary documents supply a considerable amount of information on silphium, including the area where the plant was grown, and refer implicitly to its fame throughout the Greek and Roman worlds. In addition, they inform us about silphium's characteristics and economic potential, and explain the plant's many medical and culinary uses (App. I. B. 1). The Greeks' passion for the plant was immeasurable, and while they tried to cultivate it they ultimately failed. Ancient records tell us also about the factors that finally led to its extinction, although the accounts presented tended to be enigmatic. In the late fifth century BC, Herodotus mentioned the silphium on two occasions in his

detailed description of Cyrenaica. The first time (IV, 169), he stated that the plant's geographical habitation extended from the island of Platea to the mouth of the Gulf of Syrte. On the second occasion (IV, 192), he mentioned the plant during his account on the animals which lived in the area of nomads. He refers to weasels which were living in silphium.

The geographical area where the plant was grown is still a subject of controversy and argument. Nevertheless, there is almost an agreement with Herodotus (IV, 169) and Pliny's narratives (*NH*, V. 5 '33') that the plant thrived in the southern fringes of the province, and covered an area stretching roughly from the Gulf of Syrte in the west to the Gulf of Bemba in the east (App. I. B.1.1, 10). Thus, from those two writers and other hints such as Theophrastus (*Hist.Pl*, VI. iii. 2, 3) and Strabo (XVII. 3. 23), silphium seems to be grown as a wild plant of the pre-desert fringes of Cyrenaica in this mentioned area (App. I. B.1.9,13). It probably grew sporadically in the Wadis, depending on the erratic rainfall of those areas as indicated on the map (Figure II.3).

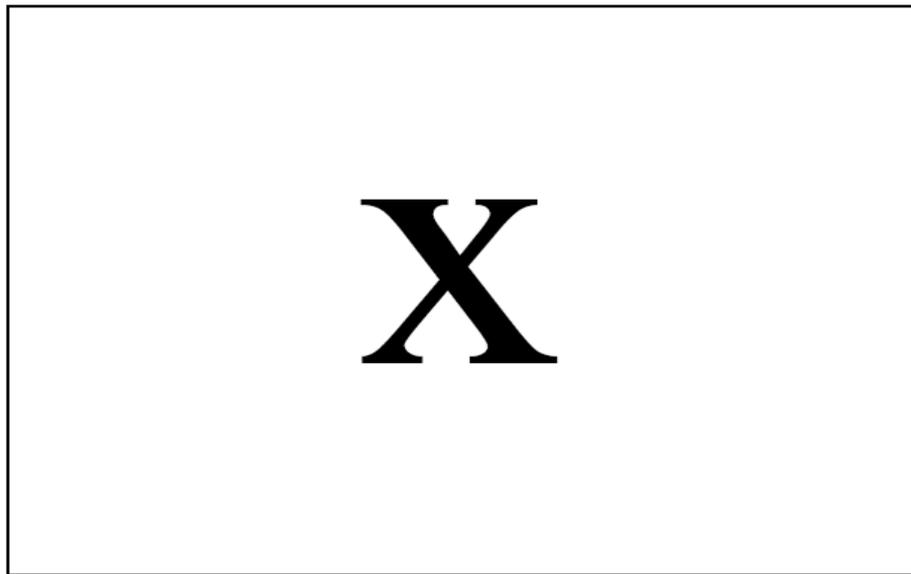


Figure II.3: Map of area where silphium grown (Catani 1985: 155 Fig. 12.3)

In short, while the silphium of Cyrenaica was highlighted by many ancient sources in different contexts and over many periods, its most frequent attestations are dated to the fourth century BC (Figure II.4). The most significant allusion is the letter cited by Athenaeus (*Deipnosophists*, XIV, 17), from the Athenian comedian and writer, Antiphanes, who lived in 408-334 BC. The letter indicates that stalks of dried silphium from Libya were among the available commodities in Athens (Λίβυς τε καυλός

ἐξηρασμένος ἀκτῖσι θείαις σιλφίου παραστατεῖ) (App I. B.1.5). Based on this, it seems that silphium exports from Cyrene probably featured strongly in the mid-fourth century BC. However, the literary references to silphium of the first centuries BC and AD reflect its lower level of production. This can be seen in the works of Strabo and Pliny. Strabo (XVII. 3. 20) for instance stated that silphium was smuggled to Carthage by the Cyreneans instead of wine. In addition, in the first century AD Pliny (*NH*, XIX. 14, 15) mentioned that 30 pounds in weight (c.14 kg) of silphium juice were brought from Cyrene to Rome during the consulships of C. Valerius and M. Herennius (93-54 BC). He also indicated that at the beginning of the civil war Caesar took out 1500 pounds (c.680 kg) of silphium juice from the public treasury, alongside gold and silver.

Although 1500 pounds of silphium juice is a considerable quantity, its location in the public treasury in Caesar’s time is probably an indication of its scarcity and it may have been collected over many years. Silphium’s scarcity in the first century BC was probably a sign it was trending towards extinction in the first century AD. This can also be seen from the decline in reference to silphium presentation in the second and third centuries AD (Figure II.4). The accounts of literary documents from the first three centuries AD in general reported information relevant to the history of the plant and its extinction. Pliny (*NH*, XIX. 15; XXII. 48.) discusses silphium’s extinction many times. For example, he mentions on one occasion that the present generation remembers only a single stalk of silphium, which was sent to the Emperor Nero.

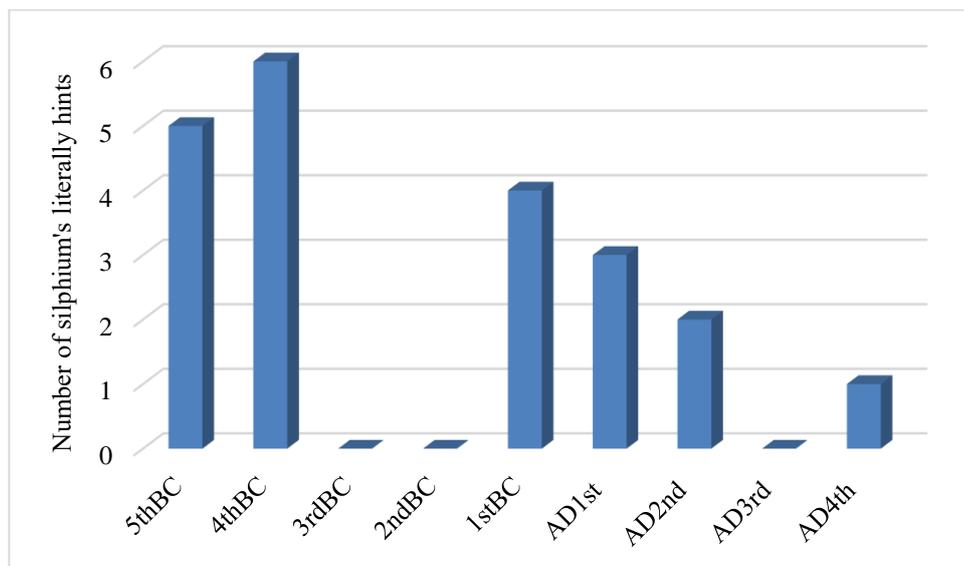


Figure II.4: The number of the references to silphium in the literary from the fifth century BC to the fourth century AD.

Silphium's decline and extermination appears to be due to its over exploitation. Theophrastus (*Hist.Pl*, VI. iii. 1, 6) mentions that silphium was greatly fattening for sheep in the spring. Additionally, he states that herds in the winter, in his time, were grazing in the southern steppe, where silphium was grown. Pliny also (*NH* XIX. 15) believes that overgrazing was one of the reasons that eventually led to the extermination of silphium. Furthermore, the later policy adopted by the *publicani* of bidding and contracting for the lands and taxing their production, may have made the situation worse (Applebaum 1979: 207; Coster 1968: 117, 119). Silphium grows in the area of Libyan tribes, but they seemed disincentivised from protecting it by taxation. Actually, it is likely that it was simple greed that led to overexploitation with not enough thought to sustainability.

Although to date Cyrenean silphium is still absent in the epigraphic evidence, it is represented in a diverse array of archaeological data including coins, iconography with statues, or with architectural elements and one piece of pottery. The first coins representing the silphium are dated to 570-480 BC. These bear large silphium fruits and two small fruits (Robinson 1927: Pl. I. 2; V. 3) (Figure II.5). The fruit or the full plant appears on the coins dated to 525-480 BC (Robinson 1927: Pl. II-V). This figure of silphium dominated the obverse of coins up to 308 BC (Robinson 1927: Pl. X.6) (Figure II.6).

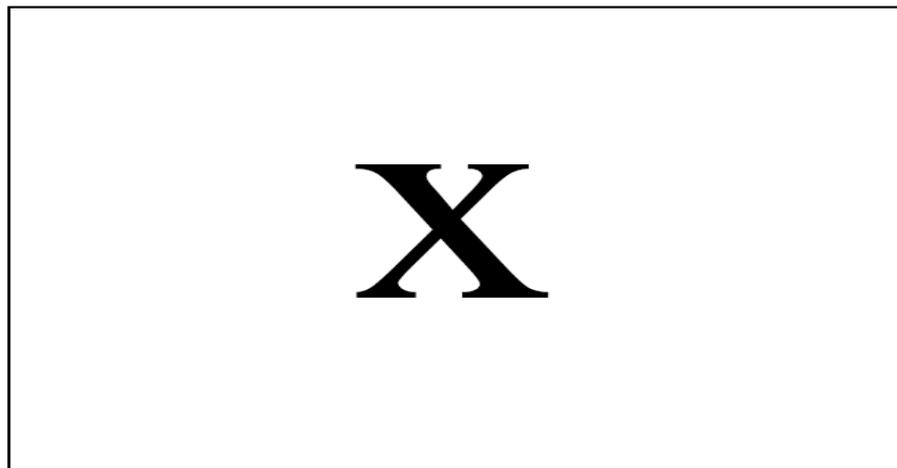


Figure II.5: Obv. Two fruits of silphium. Re. One fruit of silphium. Attic drachma 570-480 BC (Robinson 1927: Pl. V. 3).

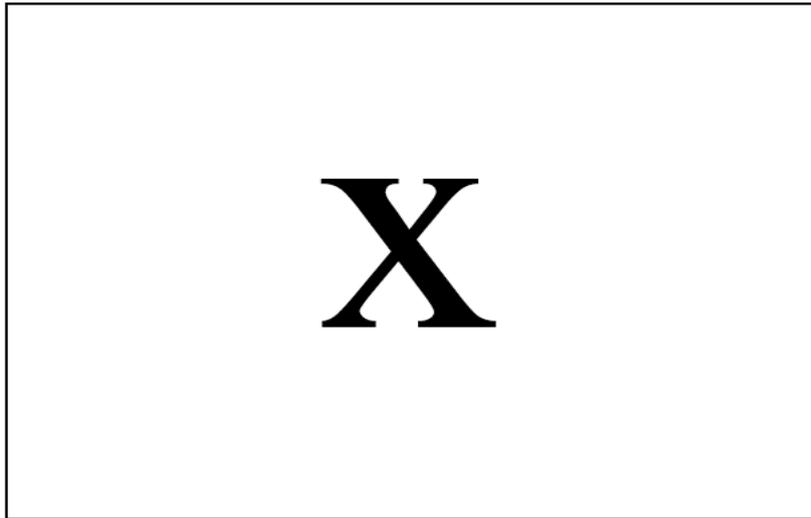


Figure II.6: Obv. full representation of Silphium. Rev. Head of Zeus Ammon. Tetradrachm. 435-308 BC. (Robinson 1927: Pl. X. 6)

In addition, some iconographic representations of the plant are found on capitals of columns from Cyrene with others from the sacred sanctuary of Asclepius at Balagrae. These have been dated to the second century AD when the plant was already very rare. The silphium icons were reused after the Jewish revolt, especially during the second century AD, when Roman art was distinguished by its tendency to revive the old features of Greek skills (Fabbricotti 1993: 27-33).

Furthermore, the potential economic importance of silphium is precisely reflected by the scene on the cup of Arcesilaos II which is dated to the sixth century BC (Figure II.7). On this cup there is an important representation of the king himself who supervises the process of weighting and shipping the production of the plant (Ascuitti 2004: 114-16). Another archaeologically interesting representation of silphium can be found in the two kinds of terracotta statue with silphium only or with silphium and gazelle, dated to the fifth century BC. One example of the former type is now available in the British Museum (number 1979, 0405.2). Ascuitti (2004: 113-14) and Fabbricotti (1993: 30) indicate that the figure in the terracotta statue mirrors a local cult, in which representation of the silphium production which may relate to the Libyan goddess as can be interfered from the status style clothing.

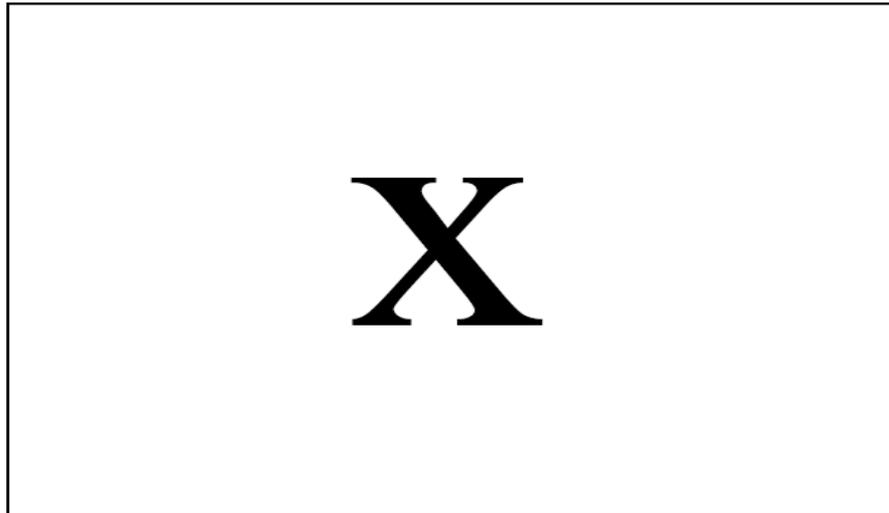


Figure II.7: The cup of Arcesilaos II dated to the sixth century BC. Source: Images for silphium of Cyrene

Silphium probably had a positive impact on the Cyrenaican economy. The plant did not impact on the territory's prime agricultural land (as it evidently only grew wild in the pre-desert), and was a potential stimulus for surpluses of other products as silphium's high value would have cross-subsidised the transport of cereals or oil to overseas markets. Silphium also may have helped in the establishment of economic relations between the Libyan tribes and both the Greeks and Romans. These tribes possibly relied on the Greeks and Romans to sell their products, and undoubtedly the latter benefited from reselling it. Silphium's economic contribution seems to have continued up to the first century BC, if one considers the indications of the plant in the ancient literary sources of this era (see Figure II.4 above).

However, production of the plant may have begun to decline from the second half of the fourth century BC, or with the beginning of the Hellenistic period. This can be inferred from its appearance on the reverse of the coins instead of its obverse, especially those dated to 375- 250 BC (1927: Pl. XVI. 7, 9, 13, Pl. XVII. 6, 7, 8. 12 and others). In some cases, the plant appears with other different elements such as crabs and palm trees on the reverse side of a coin and the head of Zeus or another god on the obverse (Robinson 1927: Pl. XXVI. 2) (Figure II.8). In other cases, an animal or plant is depicted on the coin's obverse, while silphium appears on the reverse. This can be seen in some coins, dated to 300 BC, where a gazelle in a field with jerboa and bunch of grapes has been depicted on the obverse and silphium on the reverse (Robinson 1927: Pl. XXV. 13, 15; 18) (Figure II.9). Replacing an animal or plant instead of the figure of Zeus on the obverse

of the coins which had silphium on the opposite side, is probably an implicit indication of its economic devaluation. The presence of silphium on Cyrenaican coins declined after 277 BC, to the degree that traces of the plant can be seen on some restruct coins. Coins from Euesperides are a good example of this (Robinson 1927: Pl. XXX. 8-10). But the changes could reflect broader fashions of representation on the coinage due to new rulers. The jerboa, which was an important part of the silphium's habitat as Wartenberg (2016: 54) suggested, was depicted on obverses. This may reflect the Cyrenaican tendency to represent figures from the surrounding environment rather than following the new fashions. Jerboa is still part of the arable lands of Cyrenaica nowadays. In addition, literary references to silphium can be compared to those of cereal (App. I.A.1 and I.B.1). The context of these testimonies especially those of the first centuries BC and AD, as has been discussed, was the collapse of the economic role of silphium. If so, questions should be asked about what were Cyrenaica's economic mainstays from the Hellenistic period onwards. Chapter III discusses in detail various data relevant to cereal production as one of the probable essential economic resources instead of or alongside silphium.

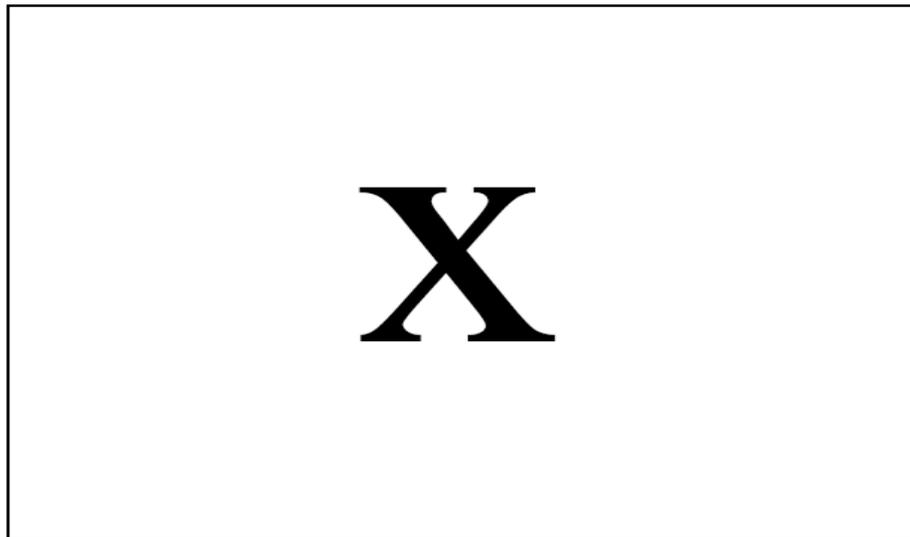


Figure II.8: Obv. Head of Zeus-Ammon. Rev. Date palm, small silphium plant left, crab right.
c.308-277 BC (Robinson 1927: Pl. XXVI. 2)

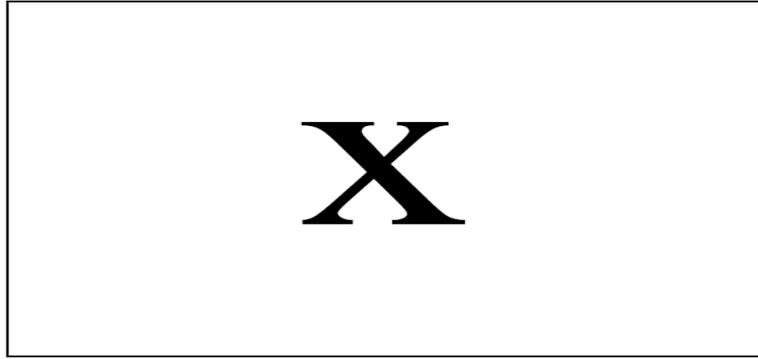


Figure II.9: Obv. Gazelle in field with jerboa and bunch of grapes. Rev. Silphium dated to 300 BC (Robinson 1927: Pl. XXV. 18).

As can be seen Cyrenaican silphium seems to have been one of the region's most important traded commodities, especially during the Battiad epoch. This is reflected in the plant's archaeological illustrations, especially the local coins, and the frequent allusions made to the plant by literary sources. The latter directly and indirectly demonstrate that silphium was well-known throughout the Mediterranean world as a commercial product exported from Cyrenaica.

To conclude this section devoted to the diverse annual crops of Cyrenaica in both the Hellenistic and Roman periods: these crops are clearly identified by the *demiourgoi* inscriptions of the Hellenistic era. In particular, varied kinds of pulse were grown in Cyrene. Some of these are represented in high quantities, providing good evidence of the region's economic potential. They probably were associated with trade activities and may have contributed to the economy of Cyrenaica in the Hellenistic period. In addition, some exotic food has been investigated including cumin, garlic and onion in the 3rd and 2nd centuries BC. The wild silphium plant also seems to have had an important economic role during the Battiad regime.

II.2.2 Figs, almonds and olives and olive oil as examples of Cyrenaica's cultivated fruit

Different kinds of fruit seem to have been cultivated in Cyrenaica from the classical period. Some of these types were indicated by the literary documents and epigraphic data. As the region in general lacks excavations, our knowledge is still poor. However, the *demiourgoi* inscriptions, in particular those of the fourth century and Hellenistic period,

are important evidence of the nature of fruits in Cyrenaica. The main fruits recorded in the fourth century are fig, olives, and grapes, although raisins and olive oil, produced from grapes and olives are also mentioned. However, almonds and wine are represented in the data of the third and second centuries BC. This section is devoted to examine discussion of figs, almonds and olives and olive oil production in the region during both the Greek and early/mid-Roman eras.

Figs and almonds will be introduced first, followed by olives and olive oil. The latter will be evaluated carefully, because the representative archaeological data relating to oil production is quite close to that of wine, and also because olive oil was one of the most important traded commodities in both the Greek and Roman periods. Since archaeological data on figs and almonds is very rare, I have relied on information derived from the textual sources such as Pseudo-Skylax, Synesius and others (Appendix I). In addition, figs were well presented by the *demiourgoi* inscriptions of the fourth and third/second centuries BC, though almonds are only mentioned by those of the third/second centuries BC. Epigraphic data, which has been collected from the *IGCyr* project is essential in this regard. The recorded products in the *demiourgoi* inscriptions are classified in separate tables. All fruits have been presented under the title D. Fruits and their products in Appendix II. Each table includes the important information used in this research. Figs and olives have each been presented in two tables, one with data from the fourth century BC and the other with data from the third/second centuries BC together, as they had similar features. However, the data on almonds has been presented in one table because almonds were absent from the texts of the fourth century BC. In addition, Greek and Roman literary indications of these fruits have been collected and classified in Appendix I. Olives, grapes and dates have been addressed under I. A. 2; I. A. 3; I. A. 4 respectively because there are sufficient documented hints about them. The other named fruits were collected together in one table in I. A. 5.

II.2.2.1 Figs (σῦκα or σῦκων)

Alongside dates, grapes, pomegranates and olives, figs are one of the most common Mediterranean fruits and have been consumed from the Neolithic age. The earliest allusion to figs was made in 2900 BC by the Sumerian king Urukagina (Janick 2005: 3, 18). It may have been domesticated in the Mediterranean area at the same time as olives and grapes. In the Greek period, figs were mentioned in many literary documents from

the fifth and fourth centuries BC. Aristophanes (*Peace*, line 1320) and Theophrastus (*Hist.Pl*, V. 5) are among the earliest writers who referred to the fig in classical times. Furthermore, the fig is also recorded in several pieces of epigraphic evidence dated to the end of the fifth century BC onwards, from a number of different Greek regions such as Attica, the Aegean islands and others (*IG I³ 422*; *SEG 15: 517*; *IC I xvii 17*).

In Hellenistic Cyrenaica, figs are indicated in the *demiourgoi* inscriptions of the fourth century many times by the word σῦκα. Grammatically, its form is a plural neuter nominative noun (singular τὸ σῦκον). The word refers to fruit produced by the fig tree (συκέα or συκῆ). The prices ranged from between 4 obols and 1 drachma (6 obols) per *talent* (c.27.40 kg) (*App. II. D.1*). Prices were probably also recorded in the fifth century BC, but it is impossible to assess this suggestion because the epigraphic evidence of this period is in a very poor condition.

In addition, this product was represented by the *demiourgoi* inscriptions of the third and second centuries BC. In these two centuries, figs were represented by the term ‘ὁ σύκων, ὄνος or συκ-εών, ὄνος’ in most inscriptions. In terms of grammar it is another form represent the fig fruit. Its form is singular masculine nominative noun, which means fig-yard. However, the interesting point is that the term ‘σύκων’ was also recorded twice per year, in the first and second semesters (*App. II. D. 2*).

A possible interpretation of recording the term σύκων twice per year in the third/second centuries BC lists is that the word probably represents the dried fig at least in one of the semesters. This seems to be reasonable if one bears in mind that August and September are the time of harvesting figs in Cyrenaica. The appearance of the word ‘fig-yards’ in the documents of both semesters may also show an interest in regulating production, or at least increasing yields over those two centuries BC (Manolis Pagkalos pers. comm.). If so, this may suggest a possible trade in dry figs from Cyrene, alongside other agricultural exported products in the Hellenistic period.

Furthermore, an indirect indication of the fig’s importance can be found in the Sacred Law of Cyrene, dated to 330-325 BC (*SEG 9.72*; *IGCyr016700*). This evidence indicates the significance of the cultivation of figs alongside grapes in Cyrene (see patterns of grape cultivation in chapter IV). This probably shows the increasing value of cultivating figs and grapes in Cyrene from the fourth century BC.

The *demiourgoi* inscriptions of the third and second centuries BC indicate that the fig-yard was valued at 6 drachmas (36 obols) per *talent* (App. II. D. 2). It is worth noting that, if the *talent* of Cyrene that appeared in the evidence of the second and third centuries BC, was equal to c.27.40 kg or around that (Attic *talent* is c. 27.40 kg), this scale may have been aimed at retailers rather than ordinary people. If this was the case, commercial activity probably occurred in the Hellenistic period based on figs and possibly other agricultural products. This can also be considered a sign of increased Greek concern with cultivating this product in Cyrene in the Hellenistic epoch.

The cultivation of figs may have been a widespread practice across the whole region and does not seem to have been exclusive to Cyrene. The majority of the fruit seeds discovered at Euesperides belonged to figs and grapes and have been dated to the classical period (Pelling and al Hassy 1997; Wilson et al. 2005).

Evidence for the presence of the fig in Cyrenaica during the Roman period is almost completely absent from both the literary and archaeological evidence. However, in the fourth century AD Synesius (*Letter*, 148) mentioned that the fig-tree and the vine were two of the main subjects of Cyrenaican songs representing divine protection for crops. This indication may implicitly signify the value of the fig in the region, despite the lack of evidence in the Roman period. Furthermore, planting figs seems to have continuing importance for farmers of modern Cyrenaica. This appears in the report of the FAO (1969: 90), which states that 80 farms had been planned to be implemented in the area around Al Hania and Al Useta around Cyrene and Balagrae. The area of each farm was 4 hectares, and half a hectare of each was devoted to cultivating figs. In addition, the FAO project of 1969 suggested figs and a number of other fruit trees should be given a high agricultural priority in Cyrenaica (1969:156). In modern Cyrenaica the fig is one of the most common fruits and is available in a number of different varieties.

II.2.2.2 Almonds (ἀμυγδαλαί)

The almond is one of the stone fruits domesticated in Asia during the Late Neolithic and Bronze ages (Janick 2005: 3). Its cultivation spread to the Mediterranean area around the middle of the fifth century BC (Micke 1969: 1). Theophrastus (*Hist.Pl*, I. 9. 6; VII. 13. 6; II. 2. 9) mentioned almonds many times and his works include information about the almond tree's root, flowers, climate requirement and more. The earliest literary

testimony about Cyrenaican almonds comes from the account of Pseudo-Skylax, (*Periplus*, 108) in the middle of the fourth century BC. He described a garden near Euesperides, where different types of trees had been grown including almond trees (ἀμυγδαλαί).

However, the *demiourgoi* epigraphic evidence of the fourth century does not mention almonds. The earliest epigraphic testimony of this crop in Cyrenaica appears in the inscriptions dated to the third and second centuries. In these texts, the almond is represented by the local word (ἡ ἀμυσγέλα), which reflects the Doric linguistic effect. It is somewhat different to its common name (ἡ ἀμυγδάλη), in the other Greek provinces. The product was recorded in both semesters of the year reflecting the good storage properties of almond. According to the *demiourgoi* inscriptions, there were two sorts of almond in this period. One possessed soft shells, and was called ἀμυσγελᾶν μαλακᾶν in the accusative case. This kind seems to have been of better quality than the other type, as it was more expensive according to one of the *demiourgoi* inscriptions (App. II. D. 3. DMI 20). The second kind of almonds had hard shells, and was recorded in the accusative case as well (ἀμυσγελᾶν σκληρᾶν). It is important to mention that both kinds are indicated in each semester as in the inscriptions DMI 22, 24 (App. II. D. 3). The price of soft-shelled almonds appears in three inscriptions. Two of them list its price in the first semester at 15 and 64 drachmas per *medimnos*, while the third displays the price in the second semester at 15 drachmas per *medimnos*. Unfortunately, almonds with hard shells appear in only one inscription, where they are priced at 6 drachmas per *medimnos* (DMI 22). As both sorts of almond were represented in the same inscription and the same semester, it is possible to distinguish the economic value of each. In the second semester, soft-shelled almonds were sold at 15 drachmas per *medimnos*, while hard-shelled almonds were 6 drachmas per *medimnos*.

Because of the considerable epigraphic evidence for almonds in the *demiourgoi* inscriptions and their advanced position in the list with dry and liquid products, they were probably an item of trade from the Hellenistic period at Cyrenaica (Figure II.10). If so, soft-shelled almonds were more likely to be traded, if one takes into consideration their high price of 64 drachmas per *medimnos* (App. II. D. 3. DIM 21). Also, the big difference in price between both types of almonds may suggest a matter relevant to their marketing. Almonds were among the contents of the ship found in *Kyrenia* (a city on the northern

coast of Cyprus) which is good evidence that this product was traded in the Hellenistic period (Gibbins 2001: 224). The ship dated to 310-300 BC, and contained about 10,000 bags (c. 20 tonnes) of almonds.

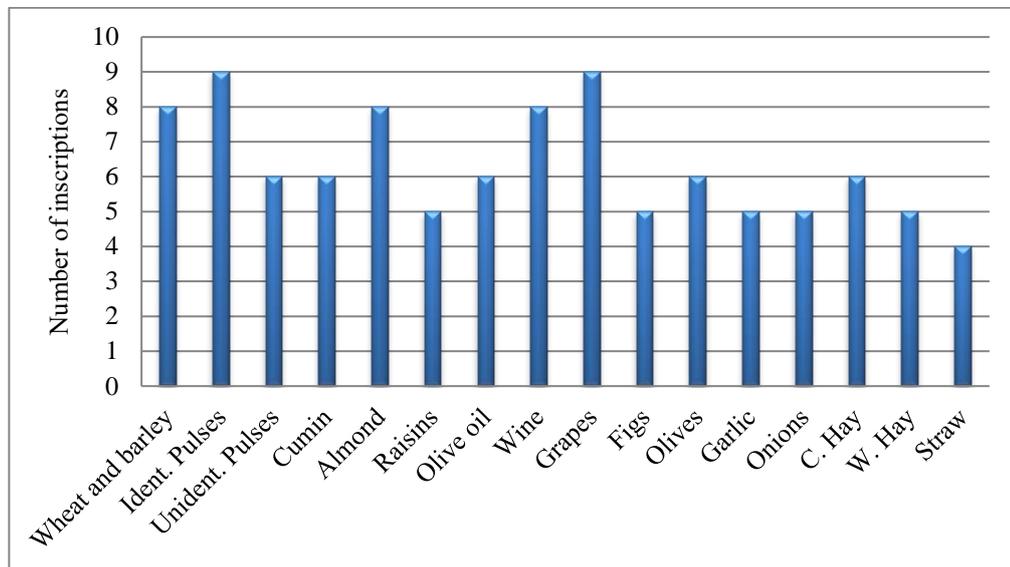


Figure II.10: The number of 3rd and 2nd BC *demiourgoi* inscriptions mentioning each product, arranged according to the general order of citation of the crops in these inscriptions.

There has been no indication of almonds in the Cyrenaican archaeological and historiographical evidence of the Roman period so far, although its economic value was high during the Italian occupation. For instance, in 1937 the Italians promoted cultivation of three fruit-bearing in the western and eastern parts of Libya. In Cyrenaica they planted 150,000 olive trees, 190,838 almond trees and 1,918,045 vines (Allan and McLachlan 1773: 59). The number of almond trees cultivated is clearly higher than the number of olives (Figure II.11). This may demonstrate that contemporary Italian farms had greater interest in growing almonds. It probably indicates the suitability of this tree to the Cyrenaican environment, and it reflects the significant economic contribution of this cultivated commodity.

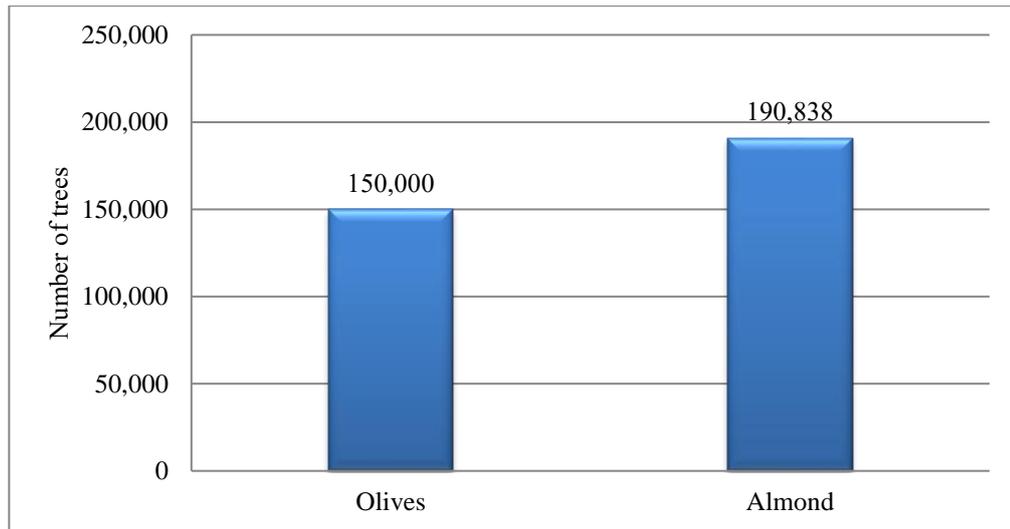


Figure II.11: The number of the olives and almonds trees cultivated in Cyrenaica in 1937 by the Italian farmers.

In addition, the FAO's report of 1966/7 (1996:176) considered almonds as the second most important product in Cyrenaica after grapes. It was also among the fruit recommended by FAO for cultivation in the 80 farms of Al Hania and Al Useta mentioned above. It recommended that almonds should be grown together with figs in one of the four proposed hectares of each farm (FAO 1969: 90). Furthermore, the FAO project of 1969 recommended that the almond should be among the specific plants to receive a particular agricultural consideration in Cyrenaica (1969:156). Alongside groundnuts and olive oil, almonds were the main traded commodities during the 1960s by the Libyan National Agricultural Bank (FAO 1969: 61). This modern evidence of the economic importance of almonds coupled with their considerable appearance in the Hellenistic epigraphy, therefore probably indicates that the absence of evidence of the plant in the Roman period is likely to be due to a lack of excavations. It may also suggest that almonds were among the more important commercial agricultural commodities traded during both the Hellenistic and early/mid-Roman period.

II.2.2.3 Olives (ἐλαῖαι) and olive oil (τὸ ἔλαιον)

Olive trees seem to have been known in Cyrenaica long before the Greek occupation. The earliest iconographic evidence of this plant comes from Pharaonic Egypt. On one side of the Teheno's board, there is a scene depicting trees and variety of animals (Figure II. 14). The trees probably represent olives (Gardiner 1961: 394). If so, the question that should be asked here is whether these olive trees were wild or cultivated in

the region of Cyrenaica. A recent analysis of palynological data, collected from three Wadis al-Rejel, Murgus and al-Athrun, has found that the plant was cultivated in Cyrenaica probably in the earliest Greek occupation in the archaic era (Hunt et al. 2002:1-8).

The Cyrenaican Greek historiographical evidence indicated olives from the fourth century BC. The first testimony that olives were cultivated in Cyrenaica appears in the account of Pseudo-Skylax (*Periplus*, 108). The writer refers to the varieties of trees that were cultivated in a garden near Euesperides. He mentioned both cultivated (ἐλαῖαι) and wild (κότινοι) olive trees and others. In the same century, Theophrastus (*Hist.Pl*, IV. 3.1) provided a very important information about this plant. He describes the very beautiful olives of Cyrenaica, and sheds light on the great quantity of its oil were available “...ἐλαία τε κάλλισται καὶ ἔλαιον πλεῖσον...”. In the Roman period, Diodorus (III. 50. 1) stated that olives and vineyards were cultivated in a large area around Cyrene alongside wheat. However, the most valuable literary indication of the presence of olive oil at Cyrenaica is dated to the 2nd century AD. This related to the writer Scaevola (*Digest*, 19. 2. 61. 1. VII, transferred in Digest of Justinian, XIX). He referred to a cargo of grain and olive oil exported from Cyrene to the Italian city Aquileia. The olive oil quantity was 3,000 *metretai* (μετρηταί), about 120 tonnes (Attic *metreta* (μετρητής) = 39.1 litres) (Bresson 2016: 173; about the *metretai* see App. IV. B).

The region seems to have continued exporting its olive oil production even in the fourth century AD, as attested in some of the letters of Synesius (*Letter*, 134, 148), who mentioned twice that olive oil was exported from Cyrene in his time. He also described the region's olive oil, including its excellent quality and its varied usage, such as an ingredient in cakes (App. I. A. 2. 8, 9). The varied attestations of Cyrenaican olives and their oil in ancient Greek and Roman sources can be considered evidence of their important economic contribution in those eras. This is also implied from the considerable number of olive presses found by a recent survey (Buzaian 2009; Menozzi et al., 2014: 71-2; Wilson 2004: 149; Personal communication with Buzaian who is currently doing a PhD on Olives of Cyrenaica). More than 60 presses have been found in Lamluda which is a typical example. The archaeological artefacts and industrial installations related to olive oil and wine production have given us a new perspective on the scale of Cyrenaica's trade with local and external markets. The large number of amphora kilns discovered at

the coastal sites mentioned in the chapter IV is important evidence of local olive oil and wine production (see table IV.7). These architectural elements probably date to the Roman period.

The Cyrenaican olives (ἐλαῖαι) and their oil (ἔλαιον) are well represented by the epigraphic data. The earliest testimony appears in the Cyrenean *demiourgoi* inscriptions of the fourth century BC (App. II. D.4). Both products were indicated alongside other commodities, as mentioned above. Their prices were also revealed by this epigraphic evidence. Olives cost between 4 obols and 1 drachma and 1 obol per *medimnos*, while olive oil cost between 8 to 10 drachmas per *smireus* (σμιρεύς) (about this unit see App. IV. B). These two products were recorded at the end of the *demiourgoi* stelae of the fourth century BC (Figure II.12).

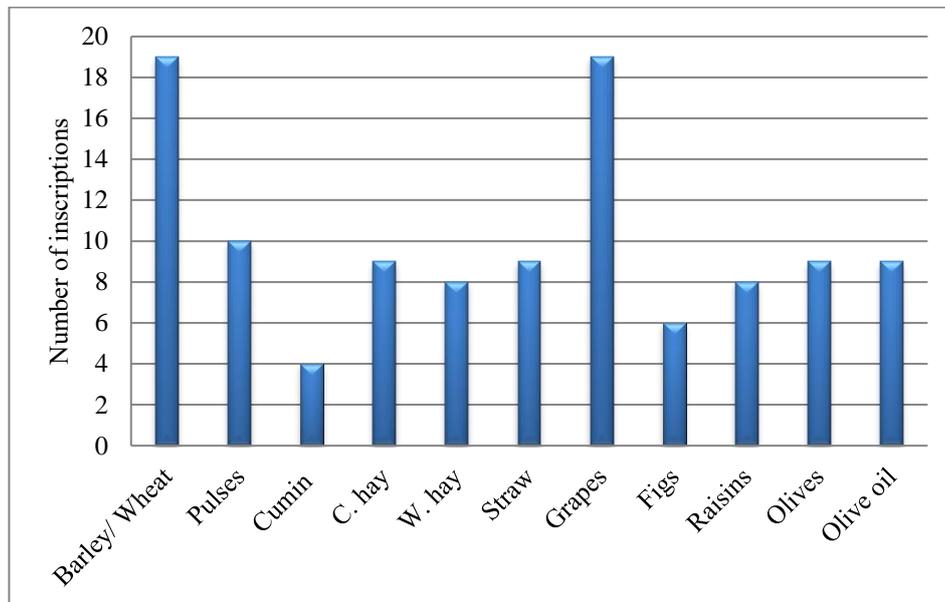


Figure II.12: The number of the fourth century BC *demiourgoi* inscriptions mentioning each product, arranged according the general order of citation of the crops in these inscriptions.

However, the references to olives and oil in the third and second texts are different (App. II. D. 5). The main difference appears in three features, including their sequence in the list of products, their measurement unit and their high prices. In terms of their position in the list, they were recorded separately. Olive oil is represented after cereals, identified and unidentified pulses, cumin, almonds and raisins, while olives were represented later but before onions, garlic and types of hay (see Figure II.10 above).

In addition, olives were measured in quantity by medimnos, and the oil was indicated by a unit called smireus (σμίρεος). This will impair a fair comparison of Cyrenaican olive oil and wine prices with those from other regions. Nevertheless, the price of olive oil increased noticeably in the third and second centuries BC in comparison to fourth century prices. Olive oil cost between 7-33 drachmas per smireus while olives between 2-7 drachmas per medimnos (App. II. D. 5). This may have more to do with quantity of harvest and quality of production rather than inflation. Local increases and decreases in the price of the olives and their by-products in the last two Hellenistic centuries in Cyrenaica could also be an indication of involving the region in the global market of these items (Table II.3).

Product	4 th BC	3 rd /2 nd BC
Olives	1 <i>drachma</i> – 1 <i>drachma</i> 1 <i>obol</i>	2 – 7 <i>drachmas</i>
Olive oil	7 - 10 <i>drachmas</i>	7- 33 <i>drachmas</i>

Table II.3: Prices of olives and olive oil in the fourth century BC and the third/second centuries BC.

Olive oil changed from being the last recorded crop in the fourth century BC to among the first seven out of sixteen in the second and third centuries BC, which may reflect its growing economic value. Furthermore, olive oil prices fluctuated between 7 or 8 and 33 drachmas. This is probably an indication of the effects of an international market. If so, this would be a sign that olive oil and probably olives as well were being exported in these two centuries. In addition, Applebaum (1979: 122,121) stated that the Ptolemies enforced a tax of 50% on olive oil imported into Egypt. This import tax included even oil imported from the provinces controlled by the Ptolemies. The writer argued that the prices of olive oil in Cyrenaica declined in the Hellenistic period as a consequence of this tax. This interpretation suggests that olive oil was one of the exported agricultural commodities in this era, and also that Egypt was one of the Cyrenaican markets. If so, the price of olive oil at 33 and olives at 7 drachmas as recorded by one inscription, can be considered a representation of a successful trade year before the Ptolemy tax law was introduced. This can be inferred from the high price of almonds at 64 drachmas recorded in the same inscription DMI 20 (App. II. D. 3; D. 5).

The region's agricultural potential for olive tree cultivation was clearly sensed by the European travellers who visited Cyrenaica in the last two centuries. However, in 1817, the Italian Paolo della Cella (1822: 118) reported while that wild olive trees were

widespread in the region, people used butter instead of oil to cook their food. He stated that people in the region did not realise the value of the olive as they did not produce oil. It is important to mention that Hamilton (1856: 80, 126) who visited Cyrenaica in 1852 also reported the presence of considerable numbers of olive trees, despite the ignorance of its planting by the local inhabitants. He also stated that the Cyrenaicans fed the olives to their animals especially goats and sheep instead of producing oil (Hamilton 1856: 80, 126). Hamilton (1856:126) believed large quantities of olive oil could be produced if the inhabitants of Cyrenaica were concerned with cultivating this plant. This expectation arose as he noticed the density of wild olive trees in local valleys and hills during his trip to the region. Furthermore, Camperio refers to an official census of olive trees conducted in the year 1881. This indicated that there were over 111,000 olive trees growing in Derna and the surrounding area.

Other travellers from the twentieth century also highlighted the province's potential for olive production. Giacomo De Martino (1912: 26) for example reported the abundance of olive trees at al-Guba and around Ain Mara to the east of Derna. In addition, Gregory emphasised the lack of trade in olive oil produced in Cyrenaica, though he noticed the great numbers of olives trees (Leake 2011: 34, 125-7). The most likely interpretation of this is that after the Arabs conquest, the people of Cyrenaica turned to pastoralism. They relied on animal products, such as, butter, ghee and animal fats, as an alternative to olive oil. The abundance of these animal products was stressed by the Arab traveller Al-Aiashe (2006: 201) during his trip across the region in AD 1661-63. He reported that enormous quantities of these commodities were brought from al-Jabal al-Akhdar and exported from Benghazi's port to Tripoli and Djerba of Tunisia. The writer indicated also that the prices of these products in Cyrenaica were the lowest he had ever seen. In addition, the census of the French consul of 1850 indicated that Cyrenaica exported over 400,000 kilos (400 tonnes) of butter to Egypt and Malta (Bresson 2011: 89, 90, Wright 1982: 22). This certainly mirrors the sufficient production of animal by-products to the degree that the Cyrenaicans had a surplus to export. Therefore, olive oil was mostly needed locally for lighting, which was probably covered by a limited local production of oil or by imports. The lack of olive oil production was the reason given for closing down the post-colonial Libyan government's olive press of Massah in 1965 (FAO 1969: 167).

To sum up, the region's potential for growing different types of fruits such as figs, almonds and olives seems to be distinctive. Planting olives is in particular reflected by the historiographical and archaeological evidence of the Hellenistic and Roman periods. Furthermore, European travellers of the 19th and 20th centuries noted the wide spread of feral olive trees in the region. However, there is a noticeable ignorance of olive cultivation up to and even after the Italian occupation in Cyrenaica, because of tendency to revert to a pastoral life pattern. Unfortunately, the lack of concern in planting olives for the region has continued up to the present, and local people today buy olive oil from the western part of Libya or from abroad.

II.2.3 Animal husbandry in Cyrenaica

This section assesses the economic significance of Cyrenaican animals during the Hellenistic and early/mid-Roman Periods. These include sheep, goats, cows, donkeys, and camels. However, horses are examined in depth as a case study of rearing animals in the region (see chapter V). These different kinds of animals seem to have been the most common domesticated animals in the region. This impression can be confirmed by the literary documents and some of the archaeological and bioarchaeological data. These Cyrenaican animals were attested early in the Egyptian data of the fourth millennium BC. In addition, two bio-archaeological studies of animal bones from Berenice and Cyrene were used to indicate the main animals, and they were compared in order to identify the most common animal types in the region during the Hellenistic and early/mid-Roman period. The historiographical account is an essential source of our knowledge about sheep, goats and cattle, so the relevant data has been collected and classified in two tables (see Tables D. 1 and D. 2 in Appendix I). Moreover, some modern data has been used to study sheep breeding in ancient Cyrenaica. This included censuses of sheep numbers in Cyrenaica and Tripolitania in 1945, 1955, 1960 and 1965, allowing a comparison to be made for these four years across both regions.

Additionally, camels have received some consideration, especially in terms of their probable period of presence in the region. The probable role of the camel in trans-Saharan trade has also been discussed. However, because there is little direct evidence that camels

were involved in trade during the Roman period, other relevant data from Arabic sources has to be used in this section to highlight its significant role.

However, before investigating the main kind of animal breed in Cyrenaica during the proposed epochs, it is important to assess whether the terrain had the capability to possess a sufficient pasture and it could offer the required fodder when it needed. Important data on the impact of grazing animals especially sheep and goats in some areas can be derived from ancient sources. Considerable numbers of these animals were present in the region, and they had a relationship with certain crops cultivated locally such as cereals. In addition, the *demiourgoi* texts are a valuable resource, provide information about animal feed. Different types of cultivated and wild hay were displayed alongside wheat and barley. The *demiourgoi* texts are classified in two tables in Appendix II. The first table includes inscriptions dated to the fourth BC while the second one presents data collected from inscriptions dating to the third and second centuries BC. These and other crops such as pulses will be used to indicate the extent to which the region could produce various types of animal fodder in the Hellenistic period.

II.2.3.1 Cyrenaica's potential pastoral and fodder capacity

The region in general possessed suitable areas for grazing animals and could supply the required fodder as needed. Cyrenaican animal husbandry was mentioned in a number of Greek and Roman literary resources, and there is also epigraphic evidence of its practise. Theophrastus (*Hist.Pl*, VI, iii. 1, 6) and Pliny (*NH*, XIX. 15) are good examples, and both indicated that grazing sheep and goats had had a negative impact on silphium. This may be an implicit indication that farmers possessed considerable numbers of these animals in both proposed periods. In addition, Strabo (XVII. 19) confirms that the Ptolemaic kings had a monopoly on horse breeding, and that the colts proliferated by a hundred thousand every year. Although Strabo mentioned this phrase when he was describing people lived in the desert, he probably meant Cyrenaica and the surrounding area as well. This is because the writer transferred the report of Callimachus who emphasized breeding horses in Cyrene two times (Strabo XVII. 21). Callimachus said: "our country [Cyrene] famed for its good horses" (μήτηρ εὐπιπου πατρίδος ἡμετέρης). Strabo also refers to the excellent quality of soil which was peculiarly suitable to breeding steeds (Strabo XVII. 21).

ἠὺξήθη δὲ διὰ τὴν ἀρετὴν τῆς χώρας: καὶ γὰρ ἵπποτρόφος ἐστὶν
ἀρίστη καὶ καλλίκαρπος

The city flourished from the excellence of the land, which is very well
adapted for breeding horses, and the growth of good harvests

The value of this text is its clear indication that Cyrene was in a horse-breeding zone or abounding in horses (ἵπποτρόφος) and the city was rich in good crops which would include cereal and their by-products. If this was the case at Cyrene, Ptolemaic kings of Cyrene made a monopoly of this enterprise; they may have expanded the royal lands to reach the silphium growing zone and to search for more extensive grazing areas for their horses. Cyrenaica had at that time large-stud farms that exported their breeds to Egypt (Rostovtzeff 1957: 293, 333, 385, 396). If so, this can be considered a sign of the region's excellent pastoral potential.

The epigraphy of Cyrenaica, particularly the *demiourgoi* data, frequently mentions the production of fodder crop, from the fourth to the second century BC. Wheat and barley seem to have been among the region's main agricultural products, as indicated in the detailed case study on cereals in the second chapter. These products especially barley have been considered as animal food, during the fourth century BC, in the majority of the Greek regions (Applebaum 1979: 98). According to the *demiourgoi* lists different types of hay were sold, with indications of their prices according to their variety (App. II. C. 1, 2). Three types of hay appeared in these epigraphic evidence. Cultivated hay (κάρφη ἥμερα) and straw (ἀχύρων) were by-products of cereals. These are hay or husks left after threshing or grinding wheat and barley. The other type is wild hay (κάρφη ἄγρια) gathered from wild plants. Cultivated hay and wild hay were measured by the cartload in the three centuries, while straw (ἀχύρων) was counted per net. The cost of cultivated hay was higher than that of wild hay, and could be as much as double the price according to inscription DMI 22, which dated to the second half of the third and the first half of the second centuries BC. Indicating the hay measurements in the fourth century BC when the units of most other products were not mentioned may reflect the economic significance of these products. In other words, this probably mirrors the concern of the Cyrenaicans with breeding different types of animal.

Legumes were also used as human and animal food, and various kinds were identified by the *demiourgoi* epigraphy. These were also discussed in detail in the second chapter. The considerable production scale of three kinds of pulses mentioned by two of the second century BC *demiourgoi* inscriptions is probably an important indication of the region's potential for producing various kinds of fodder (App. II. B. DMI 23, 24). Legumes can also provide hay for animals. The significance of harvesting large amount of fodder including barley and different kinds of hay enabled farmers to feed their animal during the winter when grazing was impossible. Hyland (1990: 87) mentions that cereals are essential for feeding horses in order to keep them healthy alongside intensive grazing in summer and a sufficient amount of hay in winter.

II.2.3.2 Ovicaprids (sheep and goats)

Sheep and goats seem to have been one of the most commonly domesticated animals in Cyrenaica. The Libyan ovicaprids have been iconographically identified earlier than the Greek occupation. Their earliest appearance has been dated to the fourth millennium BC. Libyan sheep, for instance, were represented in Teheno's board' from Abydos, which demonstrates goods were looted from the Libyans by the Egyptians (see chapter II). Sheep were depicted on one side of the board, along with another two kinds of animal (Gardiner 1961: 394). The animals appeared in three rows, with oxen at the top, donkeys in the middle and rams at the bottom (Figure II.13). These seem to have been the most important animals bred in Cyrenaica at that time. The presence of the Libyan sheep in Egyptian evidence is an indication of Cyrenaica's long history in breeding this kind of animal.

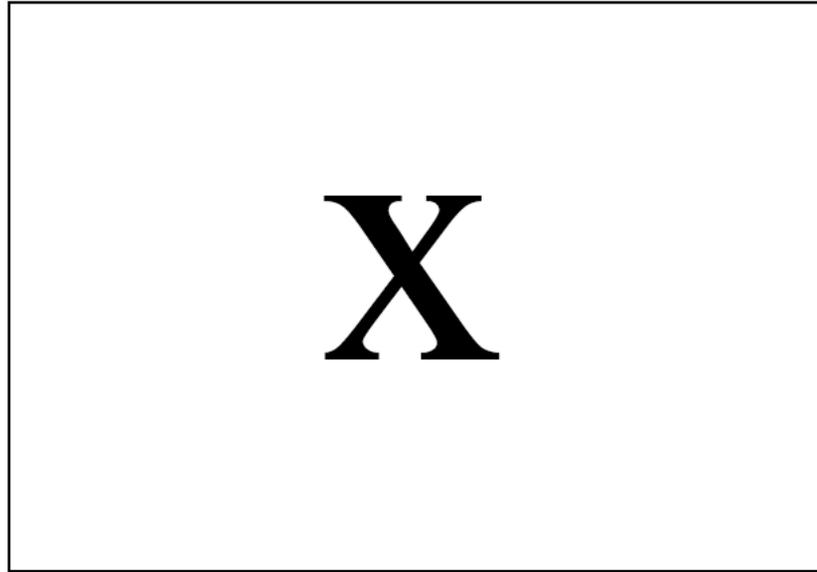


Figure II.13: Relief sculpture of cows, donkeys and rams on 'Teheno's board' dated to the fourth millennium BC (Gardiner 1961: 394).

II.2.3.2.1 Archaeobotanical evidence of ovicaprid breeding

Although environmental studies of Cyrenaica are still underdeveloped, they clearly show that sheep and goat husbandry would have been an essential part of the region's economy. Barker (1979: 11-24; 1985: 121-34) provided invaluable information on the region's agricultural and pastoral economic life based on animal and bird bones retrieved from excavations at Berenice. These data allow us to reconstruct the region's economic life from the second century BC to the seventh century AD. Barker (1979: 11- 24) has explicitly illustrated the transhumance model adopted in raising livestock animals in ancient Cyrenaica. Sheep and goats seem to have comprised the majority of these animals. Barker (1979:12- 21) stated that ovicaprids were the most-consumed species for most of Berenice's history, while cows and pigs were less common. This is based on the quantity of goat and sheep remains found among the domesticated animal bones retrieved from the excavation at Berenice (Figure II.14 and Table II.4). However, as cows produce a much larger weight of meat, they probably had a similar importance to sheep.

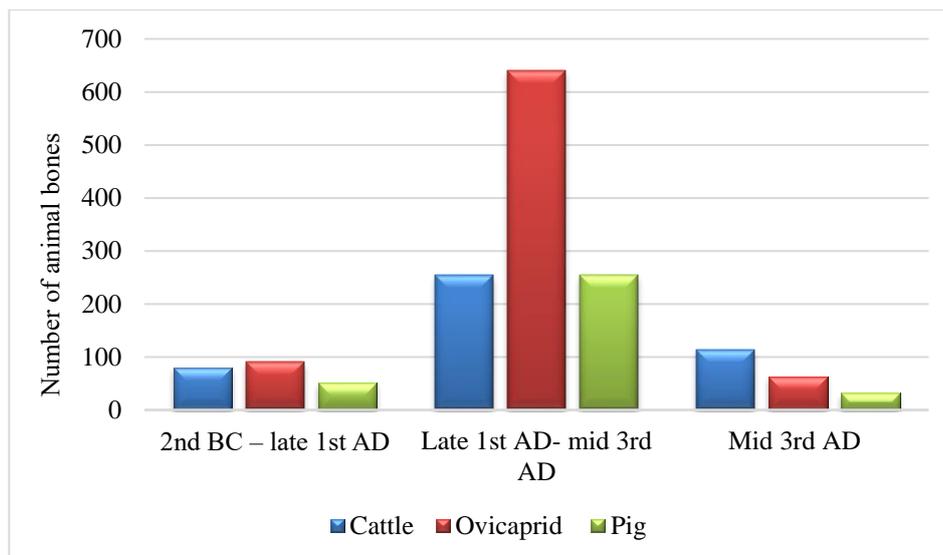


Figure II.14: Numbers of animal bones at Berenice in the period from the 2nd century BC to the middle of the 3rd century AD. Based on data represented by Barker (1979: 12).

Date	2 nd BC – late 1 st AD	Late 1 st AD- mid 3 rd AD	Mid 3 rd AD	Total	%
Cattle	80 (36%)	225 (20%)	114 (55%)	419	27%
Ovicaprids	91 (41%)	641 (57%)	63 (30%)	794	51%
Pigs	51 (23%)	255 (23%)	32 (15%)	338	22%

Table II.4: Bone number of the main consumed stocks and their percentages which found in Berenice and dated to the period between the second century BC and the mid-third century AD.

Considerable numbers of ovicaprids appear to have been present in the period from the late first century AD to the mid-third century AD. Cattle were also present in the period from the second century BC to the late first century AD, and were found in higher numbers than sheep and goats in the mid-third century AD. However, their representation is not comparable to the number of sheep and goat remains found in the period from the late first century AD to the -third century AD. Furthermore, 51% of the total animal bones came from the ovicaprids in contrast to the bones of pigs and cattle in the period between the second century BC and the mid-third century AD (Figure II.15). This figure shows the significance of these animals at Berenice, and may reflect the concern of the Greeks and Romans with controlling the countryside where they practise agricultural and pastoral activities. The honorific decree of Apollodoros of 62-61 BC is a good example of this, as it indicates that Berenice struggled to keep its hinterland under its authority. It also shows that a particular group of people were appointed to be responsible for running the countryside fairs (Laronde 1987: 463-68; *SEG* 28. 1539, 1540).

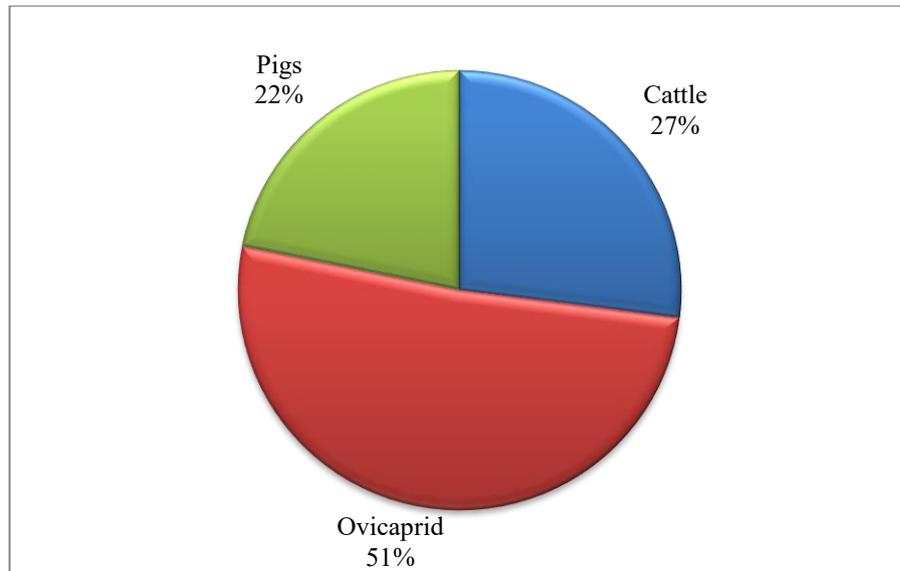


Figure II.15: The percentages of animals' bones found in the period between the second century BC and the mid-third century AD at Berenice.

The economic value of sheep and goats is also demonstrated by another archaeobotanical study which investigated a number of samples of bones collected from Cyrene. An examination of the animal bones found in the extramural Sanctuary of Demeter and Persephone at Cyrene provided more information about the importance of domesticated animals in Cyrenaica (Crabtree and Monge 1987: 139-43; Crabtree 1990). However, more than three-quarters of the bones found belonged to pigs, being the preferred animal of the sacrifices to Demeter. Sheep and goats formed the next largest group after pigs, followed by cattle.

II.2.3.2.2 Literary indications of sheep and goats

The importance of Cyrenaican sheep was indicated several times by different Greek historiographical resources (App. I. D.1). The earliest documental allusion to this was made by Homer in the 9th/8th century BC (*Od*, IV. 85). He mentions fantastical stores about Libyan lambs born with horns, and sheep that reproduced three times a year. In addition, Homer mentioned that there was abundant cheese, meat and good milk for everyone, rich or poor. This may demonstrate that Cyrenaican sheep were known throughout the Greek world from an early time. A number of classical writers also appreciated the value of the region's sheep. Pindar, for instance (*Pyth*, IX. 7), stated that Apollo made the nymph Cyrene the controller of the land (the city Cyrene) which included many sheep (πολύμηλος) and produced many and various crops

(πολυκαρποτάτας). Herodotus also described Cyrenaica on two occasions as the ‘sheep feeder’ (μηλοτρόφος) (IV. 155, 157). The contexts in which Herodotus used the words are very important for two reasons. One is that both contexts implicitly indicated the region was superabundant with sheep. The second is that the word (μηλοτρόφος) used by Herodotus can be associated with Pindar’s term (πολυκαρποτάτας). The latter term frequently indicates a region’s potential for producing a great deal of food that can be consumed by both animals and humans. This leads us to suggest that animals, including sheep were one of the most important economic resources of the region during the Greeks and Romans periods.

Although the historical narratives of Herodotus are still controversial, some of what he wrote about Cyrenaica can be proven. The region’s abundance of animals, which includes sheep, was probably a consequence of the changing life pattern in Cyrenaica to pastoralism after the Arab conquest. This change in pattern appears in the use of animal fats, for example ghee, instead of olive oil as has been discussed above in the section of olives and olive oil. Animal fats from sheep tails, seems to have been one of the important products in the region. For example, an account considering Cyrenaica as ‘sheep feeder’ can be seen in the account of Al-Aiashe (العباشي) 1661/63. Al-Aiashe (2006: 201) highlighted the abundant quantities of animal by-products in the region, including fat of sheep tails which were exported from the port of Benghazi. These products were brought from Cyrenaica. It is important to mention that a recent study of Libyan sheep in north-eastern Libya emphasized this fact, as it found that 95% of them had fat tails (Akraim et al. 2008). Additionally, In the twelfth AD century, Al-Idrisi (الإدريسي) (1099-1164: 310-319) wrote about ships coming to Cyrenaica from Egypt bringing items made from linen and cotton. On their return they carried wool alongside honey, oil, tar pitch, and ghee. Moreover, Al-Idrisi (1099-1164: 316) appreciated the vital trade activity which took place between Cyrenaica and Alexandria, in particular through the port of Ptolemais. Another important example reflecting the contribution sheep made to Cyrenaica’s economy is a census conducted by the French consul in 1850. It demonstrated that some animal by-products were exported from Cyrenaica to Egypt and Malta, while the wool was exported to Italy (Bresson 2011: 89, 90, Wright 1982: 22).

II.2.3.2.3 The modern data applied to ancient sheep breeding in Cyrenaica

Breeding sheep seems to have been one of the main pastoral activities practised in modern Cyrenaica. This can be clearly seen in a number of censuses of sheep and other animals in Libya before and after the appearance of oil (Allan et al. 1973:62). The value of this data lies in its presentation of separate statistics of sheep in two different parts of Libya in different years. One census recorded the number of sheep in the eastern part of the country (Cyrenaica), while the other recorded those in the western part (Tripolitania). Most censuses recorded that the number of sheep in Cyrenaica was higher than in Tripolitania, sometimes more than double the number in Figure II.16. For example, in 1955 1,032,000 sheep were recorded in Cyrenaica, while in western Libya there were only 429,000. A similar picture can also be seen in the number of sheep recorded in 1965. However, the decline in the numbers of the Cyrenaica sheep in 1960 was probably due to a lack of rainfall in the last few years, or may have been because of animal diseases.

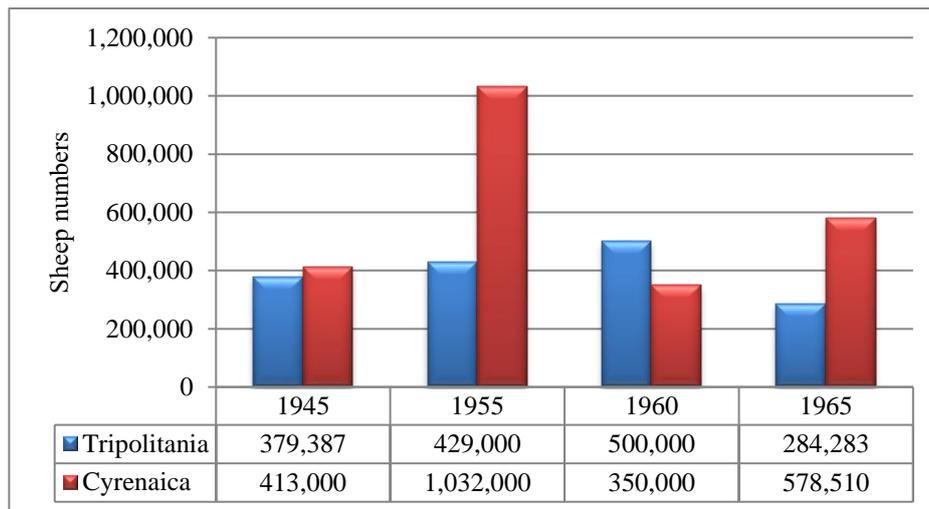


Figure II.16: Sheep numbers at Tripolitania and Cyrenaica in different years (based on data resented in Allan et al. 1973:62).

Cyrenaica's low population density during the last century should be noted (Wright 1969:117). Cyrenaican sheep comprised 60% of the total number of sheep in both parts of Libya. This suggests sheep and wool were exported from Cyrenaica before oil came to dominate the economy (Figure II.17). The high quality of modern Cyrenaican wool, in which distinctive characteristics can affect the woollen manufacture, has been noted by many researchers (Akraim et.al 2008)

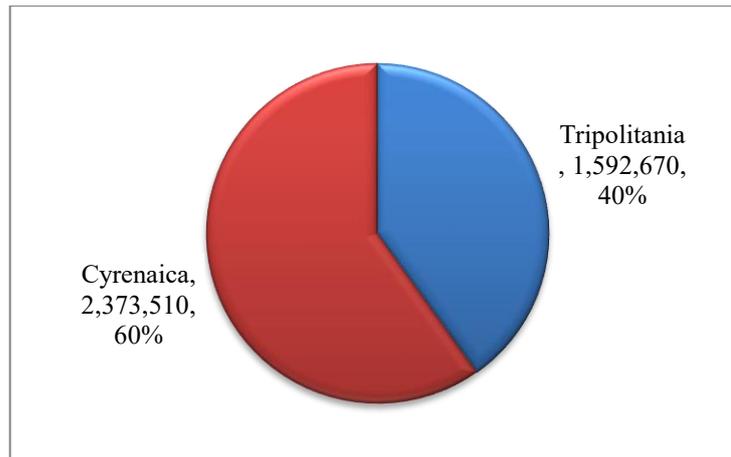


Figure II.17: The total number of sheep and their percentages at Tripolitania and Cyrenaica according to the records of years 1945, 1955, 1960 and 1965 (based on data represented in Allan et al. 1973:62).

Sheep and goats seem to have not merely been part of pastoral livelihoods in Greek and Roman Cyrenaica, but they probably played an important role as part of mixed agropastoralism. As already noted, breeding these animals was associated in particular with cereal cultivation, as they were essential for fertilising the land in the Greek period (see chapter III). This is implicit evidence of the region's excellent environmental potential for breeding ovicaprids.

Furthermore, overgrazing on the part of sheep and goats was probably one of the reasons for the extinction of silphium. The region's plentiful herds of these animals can be seen in a number of historiographical allusions regarding their negative impact on silphium. Theophrastus (*Hist.Pl*, VI, iii. 1, 6) indicated that sheep relied on silphium leaf (τὸ μάσπετον) for pasturing in the spring and winter in the southern steppe, the area in which silphium grew. He mentioned also that 'silphium leaf (μάσπετον) purges sheep and greatly fattens them, and makes their meat wonderfully delicious'. In addition, Pliny (*NH* XIX, 15) stated that silphium made sheep drowsy and goats sneeze. Pliny (*NH* XIX, 15) also frequently declared that overgrazing was one of the reasons that eventually led to the extinction of silphium. These historiographical hints can also be considered significant evidence that considerable numbers of sheep and goats were bred in Cyrenaica during the Hellenistic and early/mid-Roman eras.

II.2.3.3 Cattle

Cattle appear to have been among the most important animals bred in Cyrenaica even before the Greek occupation. They were also represented on ‘Teheno’s board’ mentioned above, which displayed Libyan animals (Gardiner 1961: 394). Oxen may have had a significant economic role alongside sheep and donkeys if one takes into consideration the context of their representation, which may reflect the Egyptian view of the valuable Libyan animals. This can be seen from the manner in which each of the three different animals (oxen, donkeys and rams) were placed in separate rows (see Figure II.13 above).

Cattle seem to have been widely used in the region in the Greek and Roman periods. The earliest historiographical testimony relating to Cyrenaican cows and oxen appeared in the work of Herodotus (IV, 163, 186), though perhaps beef was not favoured by people in Cyrenaica. Herodotus (IV, 186) stated that women in Cyrene and Barce did not eat beef due to the effect of the Egyptian Isis cult. However, cattle appear to have existed in Cyrenaica in fairly large quantities, as attested by the epigraphic evidence. For example, an inscription from Cyrene dated to the fourth century BC records the sacrifice of 120 oxen to Artemis (Vickers and Reynolds 1971-1972). The sacrificial ox (βουθυσία) seems to have also been one of the main features of the Greek celebrations of Apollo at Cyrene. This figure has been represented by a number of the fourth century BC *demiourgoi* inscriptions (*SEG* 9. 11, 13, 16, 17). One of these indicated that one or more oxen were given to some groups who participated in Apollo’s festival (*SEG* 9. 13). For instance, each of the dithyrambic (διθυραμβικός) groups received an ox as a reward for taking part of Apollo’s celebrations. Each one of the tragic dance bands (τραγικός χορός) also received an ox. Moreover, oxen may have been used on Cyrenaican farms because they were considered to be the most important animal in Greek agricultural labour (Isager and Skydsgaard 1992: 89).

The economic value of Cyrenaican cattle seems to have continued in the Roman eras. Plutarch (*Cato the Younger*, 56) reported that Cato drove many cattle with him during his march from Cyrenaica to Carthage. 10,000 men were involved, which is probably an implicit indication that cattle were found in Cyrenaica in large numbers. In addition, at the end of the 2nd and beginning of the 3rd century AD, Athenaeus (*Deipnosophists*, I, 27e) mentioned that cowhides were an important item exported from

Cyrene. At late date, Al-Aiashe's (2006: 221, 222) reported that he was surprised because people in al-Jabal al-Akhdar rode cows and placed the *Hawdaj* (a small tent-like structure made to carry famous individuals or women) on their backs. The more usual animals used for this purpose are camels and elephants. This is probably an indication of the sizable numbers of cattle bred in the region in Al-Aiashe's time (1627-1679), and evidence of the region's potential for cattle breeding.

Cattle may have been the second-most important animal consumed in Cyrenaica after sheep and goats during the Greek and Roman periods. This can be seen from the archaeobotanical evidence of Berenice and Cyrene mentioned above (Barker 1979:12-21; Crabtree and Monge 1987: 139-43) (Table II.4 and Figure IV.14 above). Furthermore, both oxen and sheep are represented in a number of interesting small limestone statues, which probably came from the 'temple of ploughs', or the so-called Hagfa el Khasalia in Wadi Senab (about 20 km south-west of al-Beida) (Fabbricotti 1994: 219-30; Attiya 1974-1975). Most of the sculptures show male animals, with a small number of females. Some of the statues represent sheep and oxen, reflecting the importance of breeding sheep and cattle and mirroring aspects of country life of the region. It is likely that the temple was frequented by local farmers and Roman visitors, and the presence of these statues sheds light on religious and agricultural life in the countryside during the Roman period.

The great contribution of cattle to Cyrenaica's economy can also be seen in some of the literary sources dated to different periods. They mention the breeding herds of cattle, exporting their by-products and the manufacturing locally of cowhides. Al-Idrisi (1099-1164: 316) and Hamilton (1856:167) are examples of this (see 9,10, 12, 13 in App. I. D. 2). However, some important pieces of evidence in this regard must be addressed here. Athenaeus (*I*, 27e.) stated that cowhides and silphium stalk were the most important exported products from Cyrene. The writer seems to have reporting the past history of Cyrenaica, because in the second century AD silphium was already extinct. Cowhides were probably one of the most important animal skin manufacturers at the region in different periods. Additionally, Al-Idrisi (1099-1164: 311) indicated that cowhides were manufactured somewhere in Cyrenaica, probably in Barce. He stated that in the past and now, there were famous manufactures of cowhides and tiger hides, the latter from Aujila (Al-Idrisi 1099-1164: 311). Furthermore, Al-Aiashe (2006: 201) reported that some animal products were brought from al-Jabal al-Akhdar and exported from the port of

Benghazi in 1661/63, among them ghee and animal fats. These were made from cattle, as he specified another type of animal fat was made from sheep tails. Another significant indication of the presence of cattle by-products comes from a report prepared by the French consul in 1850. This report noted that about 11,787 head of cattle and over 400,000 kilos of butter were exported from Cyrenaica to Egypt and Malta. It indicated also that the total annual cattle exports sometimes reached up to 40,000 (Bresson 2011: 89, 90, Wright 1982: 22). Moreover, in 1894 the France consul at Benghazi, Bertrand highlighted the good quality of the Cyrenaican beef (Laronde 1987: 331). He reported that it was a strong contest with the kinds of beef from Tunisia and Russia among the butchers of Malta. The French consular agent estimated that 5,000 or 6,000 heads of cattle were exported each year from Benghazi to Malta and between 40,000 and 50,000 oxen were exported to Egypt (Bertrand 1894 cited in Laronde 1987: 331).

Cattle thus seem to have contributed to the economy of the region in the past and present times. Large number of cattle and considerable quantities of their by-products were perhaps exported from the Cyrenaica including fat, ghee, butter and cowhides. The latter was probably also manufactured locally as some literary references were indicated.

II.2.3.4 Donkeys

Donkeys seem to have been one of the earliest domesticated animals in Cyrenaica, and were broken in by the Libyan tribes. Their appearance in ‘Teheno’s board’ is an important indication of their vital contribution to the region’s socio-economic life from early times (see figure II.13 above). Although the donkey is absent from the Cyrenaican historical evidence dated to the Greek and Hellenistic periods, they appear in Plutarch’s (*Cato the Younger*, 56) account of Cato’s work, when he used donkeys or asses to carry water for his army of 10,000 men. Donkeys were reasonably well represented in the archaeobotanical data of Berenice in the period between the late first and mid-third centuries AD (Barker 1979: 11- 24). They were probably used in different activities including that of grain milling. Finds of mill floors dated to the early third AD, which are connected with the Pompeian type of donkey mill, is probably an indication of a reasonable volume of baking bread activity existed in Berenice at the mid-Roman period (Lloyd 1977:116, 122, 135, 213, 214). This may require involving donkeys in this type of activity.

II.2.3.5 Camels

There is no evidence yet that camels were present in Cyrenaica during the Greek and Hellenistic periods, although it was brought to Egypt from Syria by Alexander the Great and was extensively used in Egypt by the Ptolemies (Fage 2002: 288). The precise date when the camel was introduced to Cyrenaica has yet to be determined. Plutarch's narrative in which Cato used donkeys instead of camels in 47 BC has been regarded as evidence that the camel was absent from Cyrenaica until this date. Coster (1968: 134-36) based on Demougeot (1960: 209-47) believes that camels were introduced to the region by the end of the first century BC and used for different purposes, especially for trans-Saharan trade with Fazzan. Their representation on Cyrenaican coins dated to 67-24 BC may be an indication of this role (Robinson pl. XLII. 1-4, 5). Camel seems to have commercially connected the Cyrenaican coastal cities with the interior of Africa from the early Roman period onwards.

Rostovtzeff (1957: 66, 324, 335-339) rightly emphasizes that the introduction of camels saw the volume of trade with the south of the country significantly increase, especially Fezzan and Africa. This probably started well before the time of Synesius when camels had become common in Cyrenaica, and alongside cattle and horses were the reason behind the wealth of most Cyrenaicans (Synesius *Letter*, 130). However, camels significantly increased the threat posed by the tribes. This was demonstrated in Tripolitania, when the nomads posed a serious threat to the Roman frontier (Mattingly 1984: 165-7). Nevertheless, the introduction of the camel to Cyrenaica seems to have been a contributory factor to its economic boom, because of its use in trans-Saharan trade. Van der Veen et al. (1996: 252, 253) stated that camels were used by the Romano-Libyan farmers for riding and transporting goods. They refer to a figure of a camel caravan engraved on a tomb from Ghirza as evidence of this. Barker et al. (1996: 285) argued that camels were used to supply the Roman army bases in different sites such as Bu Njem as evidenced by indication in an *ostrakon* from this site (for the inscribed text and its translation see: *APIS*). Synesius (*Letter*, 130) also indicated that camels made a great contribution to his wealth. In addition to some data from Medieval and the Ottoman eras, these may be regarded as evidence of the camel's important economic role. For instance, Al-Idrisi (1100-1165: 319) indicated that the Cyrenaican tribes had gained their wealth from camels and sheep. On another occasion he described the trade route which started

from Barce and went to Benghazi, Ajdabia, Awjilah, a small urban city according to him. The trade route then continued from Awjilah to Sudan (Al-Idrisi 1100-1165: 311, 312). No doubt the camel was the principal animal used in these Sahara trade expeditions. In addition, the 1850 French consul report indicated that the commodities exported from Cyrenaica were carried to Alexandria by camel (Bresson 2011: 89, 90, Wright 1982: 22).

To sum up, Cyrenaica seems to have possessed the appropriate environmental requirements required to breed various kinds of animals. Horses, sheep, goats, cows and pigs were probably the most important animals in Cyrenaica during the Hellenistic period. However, camels were introduced to the region during the Roman era and they may have also played an important commercial role in connecting the region with the Sahara. The presented data relevant to sheep and goats in addition to cattle suggests they made a significant contribution to the region's economy. This is an interesting motivation for investigating the horse as a case study of the region's potential for animal husbandry.

II.2.4 An estimation of Roman Cyrenaica's population

Undoubtedly, estimating the consumption of any agricultural production, in a particular city or region, requires clear knowledge of the population size. Therefore, I have assessed the number of potential inhabitants in the region during the Roman period. There are some previous estimations of population numbers for some cities (Applebaum 1979:100- 109; Laronde 1987: 342; Lloyd and Lewis 1977). However, others have not been estimated yet, the Hellenistic/Roman city 'Apollonia' is a case in point. In addition, Cyrenaica's rural inhabitants have not been approximated before. However, building on Wilson's (2011: 184, 185) estimate of the size of the population of most of the Cyrenaican cities in the Roman era, I have calculated the whole region inhabitants in this period. Wilson (2011: 184, 185) provided figures of the probable population number of the main Cyrenaican cities excluding Apollonai of this period at 71,000 people (Table II.5).

City	Walled area per ha	population
Cyrene	123	25,000
Ptolemais	217	30,000
Taucheira	41	6,000
Berenice	?	10,000
Apollonia	<i>c.</i> 12.5	15,000
Hadrianopolis and Barce	?	
Total		81,000

Table II.5: Population number of some Cyrenaican citeis during the Roman period according to Wilson (2011: 184, 185 and with assuming the population number of some other cities).

However, no-one has attempted to calculate the population density of the Cyrenaican countryside in this period. Mattingly's (2011:88) figures for the population density/km² of the pre-desert zone at Wadi Faynan (Jordan) are used here with some consideration to the extraordinarily busy landscapes of Cyrenaica, which allowed a higher population. Furthermore, while the exact number of Roman sites in Cyrenaica is still unknown, it is possible to estimate their number based on Abdussaid's et al. (1984) project which recorded 34 sites located within an area of 100 km². Although Abdussaid's sites are mainly small and there are no towns among them, one could assume from this that each 100 km² contained 1 town, 2 villages, 10 hamlets and 21 minor sites. If so, each 100 km² in Cyrenaica would contain approximately 2,110 people (assuming 1,000 people in 1 town, 400 in 2 villages, 500 in 10 hamlets and 210 in 21 minor sites (Table II.6). I have assumed a town in each Cyrenaican 100 km² because one has been recorded in Wadi Faynan though the zone is pre-desert and Cyrenaica is rich in different kinds of settlement sites.

Type of site	Pop./km2: Wadi Faynan (Jordan) (Mattingly)	Pop./km2: Cyrenaica (my estimation)	No. site in Cyrenaica per 100 km ² (Abdussaid)	My estimation of Cyrenaica's Pop./100 km ² .
Town	600	1000	1	1,000
Villages	100	200	2	400
Hamlets	30	50	10	500
Minor sites	5	10	21	210
Total	735	1260	34 Site	2,110

Table II.6: Wadi Faynan's (Jordan) population density per towns, villages, hamlets and minor sites estimated by Mattingly (2011); Similar sites in Cyrenaica estimated by Abdelhamed (2018); Number of sites in Cyrenaica per 100 km² estimated based on Abdussaid's project (1984).

The Cyrenaican population was concentrated along the sea coast, on the plateau and the Green Mountains (al-Jabal al-Akhdar). Each area had different levels of rainfall and different amounts of fertile land suitable for agriculture. This area represents about 25,000 km². Excluding the rugged terrain, lands devoted to agriculture and the cities, perhaps 8,000 km² of land was inhabited. Using the approximate figure of a population density of 2,110 per 100 km², the total number of rural people would be 168,800 (8,000 km² ÷ 100 km² = 80 sites. Each represents 100 km² and includes 2,110 people) (Table III. 12).

If the rural population was as large as 170,000 during the Roman period, they would make up 240,000 people alongside those inhabitants of the cities, and estimated by Wilson at 71,000. However, the inhabitants of Apollonia, Hadrianopolis and Barce did not count in Wilson's estimation, so it is possible to assume in these cities about 15,000 or more. In this case, the region's total population in the Roman era was approximately 255,000 (240,000 + 15,000).

II.3 Conclusion

This chapter has introduced the main sources used in the thesis and discusses their verity and significance in terms of their representation of the various agricultural products and animals of Cyrenaica. It also provides a general background to the region agriculture through examining the important annual cultivated and wild crops, different kind of fruits which were widely grown, and the most common animals to have been bred in Cyrenaica during the Hellenistic and early/mid-Roman periods. The total population of Roman Cyrenaica including its rural areas has also been estimated in this chapter. The data investigated in this chapter indicated that the regions had a great potential for producing a verity of agricultural products including miscellaneous of annual crops and fruits such as different kinds of pulses, silphium, figs, almonds, and others. The data indicates also that animal husbandry was an important activity practised alongside agriculture. Sheep, goats and cattle were probably the main animals bred in Cyrenaica, and they probably had a significant economic role.

Chapter III : Wheat and Barley: Case Study of Cyrenaica's Annual Crops

III.1 General Introduction

This chapter focuses principally on the Cyrenaica's cereal production. It provides a detailed case study of wheat and barley as examples of annual crops. This includes a detailed investigation of the region's ecology, rain and vegetation, with a focus on determining the requirements of growing wheat and barley and their seed quality alongside the Cyrenaican pattern of cultivating and manuring the arable lands. This is because cereals were one of the main staple foods for the Greeks and the Romans in the Mediterranean world. Their production and trade are important keys that could reflect the economic condition of the region in the Hellenistic and early/mid-Roman era. There is important epigraphic evidence relating to cereal production in Cyrenaica. Therefore, the chapter addresses a particular section to explain the performed approaches for assessing Cyrenaica's productive capacity of cereals during the proposed period. These are mainly based on examining data drawn from epigraphy and historiography. The chapter argues that cereal was one of the principal economic resources of Cyrenaica alongside silphium and it probably became more important than that plant. It argues that the grain consignment exported from Cyrene was purely from wheat and that this was the reason behind its commemoration. It also considers this load as a significant evidence of the region's commercial connectivity during the Hellenistic period.

III.2 Methodology of Assessing Cyrenaica's Agricultural Potential Regarding Cereals

I will examine literary and epigraphic evidence for the levels of grain production, comparing Cyrenaican evidence to material from elsewhere as appropriate. I will then consider these results in the light of contextual information about agriculture in antiquity, and in the context of more modern comparative and ethnographic data about climate, production quantities, and agricultural strategies. Bringing this information together, I shall return to the account of the Hellenistic Grain decree of Cyrene, the data provided by the Hellenistic *demiourgoi* inscriptions of Cyrene which classified in tables in App. II, the collected literary data addressed in App. I and the modern statistics of Cyrenaica's total grain production or exported volumes and estimations of land cultivated with cereals before their reclamations by the Italians and after.

III.3 Wheat and Barley a Case Study of The Annual Crops

The seasonal crops wheat and barley were the staple foods of the Greeks and Romans in antiquity, and were the most commonly traded commodities in many regions. Although they have received the attention of many historians and archaeologists, these crops have never been examined in depth in Cyrenaica until now, even though they are also, as mentioned above, among the most commonly referenced seasonal products during the Hellenistic period. This neglect may be due to the dominant belief that silphium, the best known seasonal crop, was the province's main economic export.

This section, therefore, presents the evidence for these two annual crops. It also investigates their planting requirements, seed quality, and cultivation patterns, with a focus on manuring methods, and estimating their probable production. These crops are used to test the general potential of Cyrenaica's seasonal agriculture and to determine whether they contributed significantly to the region's economy. The importance of cereals as one of the most traded agricultural products from Cyrenaica is also examined.

III.3.1 Environmental circumstances of growing wheat and barley in Cyrenaica

Key to growing any kind of crop is the availability of water, whether via rain or irrigation. The cultivation of wheat and barley is unexceptional in this regard, although barley requires less in the way of nutrition and water. It needs only 250 mm of water, or even less in some cases (Scheidel 2007:410). Meanwhile, wheat has higher requirements and needs between 400- 600 mm or more of rain (FAO 1969:13). This level of rain is available in a small area in Cyrenaica confined around Cyrene, as can be seen in Figure III.1.

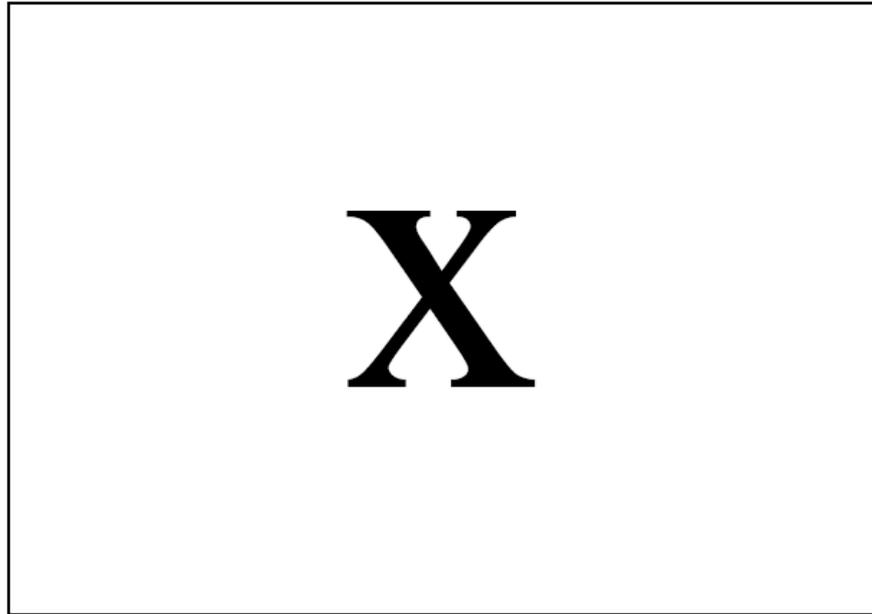


Figure III.1: The average annual rainfall in Cyrenaica (based on Doyel and Maguire 1964).

However, the amount of rainfall is not the only important factor in cultivating wheat in this region. Other important aspects which can affect its production include the soil type and quality, as well as dew and the distribution of rainfall. For instance, when he compared Libyan, Syrian and Arabian red soils, Herodotus (II, 14. 3) said ‘that the Libyan soil is redder’ (τὴν δὲ Λιβύην ἴδμεν ἐρυθροτέραν τε γῆν) than that of Syria and Arabia. This type of land contains a deep layer of *Terra Rossa*, which can reach more than one metre in depth in the most abundant parts (Bresson 2011: 90). Wheat can thus be grown with less than 400 mm of rainfall in this terrain (FAO 1969, vol. III: 12).

This sort of soil with a particular distribution of rainfall can produce wheat on a satisfactory scale. This can be seen in a particular static study of the rainfall levels and the volume yields of wheat per hectare over five consecutive years (FAO 1969:12). This static study, conducted at an area around Barce, found that although 1959/60 saw less rainfall than 1958/59, the scale of wheat production was higher. This was also the case when contrasting 1960/61 with 1962/63 (Figure III.2). The point here is that it is not the absolute volume of rainfall that counts in valuing bumper harvest correlate with peak rainfall levels, but rather rainfall distribution through the year. Another example of the varied effects of growing cereals in this region is the area’s dew precipitation. This can be seen in Theophrastus’ (*Hist.Pl*, VIII. vi. 6) account, which clearly mentions that the

dews are sufficient to water the crop in places with little rainfall. The writer states that the areas around Cyrene and Euesperides were among these places.

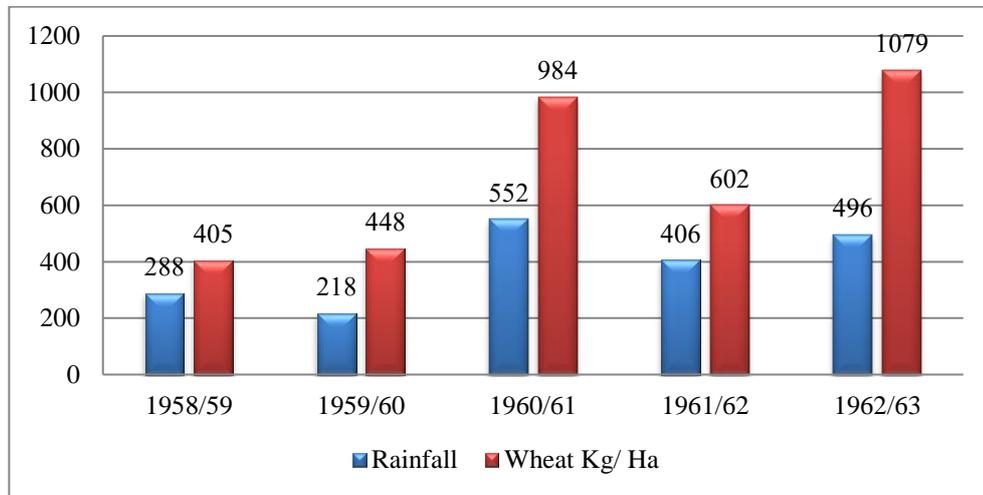


Figure III.2: Annual rainfall and amount of wheat production by kg per hectare from 1958-1963 (an area around Barce) (based on data collected from FAO 1969:12).

Returning to the rainfall at Cyrenaica, it is important to remember the fundamentally erratic tendency of its annual rainfall. A drought is expected to occur in the region every four years (Applebaum 1979: 5, 91). However, the rain levels sometimes exceed expectations as was the case in 1960/61 and 1962/63 (see Figure III.2). In these two years, the annual figure reached about 500 mm or more in an area which usually receives between 300 and 400 mm. This picture of abundant rain for three following years calls to mind the narrative of Diodorus (III, 50) who mentioned that there were rivers around Cyrene where the fertile land produced different kinds of goods alongside the wheat. This narrative is an indication of the Green Mountain's (al-Jabal al-Akhdar) heavy annual rainfall. Despite the occasional drought, abundant rain was expected in most years. Nevertheless, fluctuation in rainfall in some cases confounded farmers' expectations and indisputably affected the grain harvest as in 1958/59 and 1959/60 as (see Figure III.2).

Cyrenaica's excellent soil and the potential for mountain dew to compensate for comparatively low annual rainfall probably extended the area of Greek and Roman grain cultivation beyond what one might expect. This arable land probably included some places where the rainfall reached only 200-250 mm. These are identified by the yellow colour in the rainfall distribution map (see Figure III 1). This figure can be supported by some modern studies, especially a number which were conducted before oil was

discovered in the region in 1961. For example, Cyrenaican wheat was studied by the FAO in the 1950s and 1960s. They recommended growing wheat, barley, peas and forage (fodder) using dry farming in Cyrenaica's coastal area, which possesses reddish-brown soil (FAO 1968: 40).

On the other hand, barley was a practical plant which probably spread over a larger terrain than wheat. Wheat and barley have continued to be the main cereal crops in Cyrenaica even after the discovery of oil. There is a strong cultural relationship between the people and this type of agriculture. Two examples of modern field studies in 1949 and 1967, are good illustrations of this (Allan et al. 1973: 161-22). In 1967, a case study conducted in al Marj (ancient Barce) found that the local grain was the most commonly cultivated product and comprised 93% of the crops in the area under investigation. The other example concerns two case studies performed at Al Gubbah, about 44 km east of Cyrene, conducted at two different periods. The earlier case study, conducted in 1949, found that 77% of the examined land was used to grow grain. The next study, in 1967, also found that cereals cultivation covered 78% of the land reviewed.

To sum up, although these and other studies were unable to identify whether the main cereal crops were wheat or barley, their importance lies in the clear indication of the region's considerable agricultural potential. This can undoubtedly also be considered as significant evidence of the economic value of these crops in the last century. However, the question that remains to be answered in the next sections is the extent to which the Hellenistic and Roman settlers benefited from this economic resource.

III.3.2 The Cyrenaican cereal seeds

In order to recognise the general circumstances of planting wheat and barley in Cyrenaica during the Hellenistic and early/mid-Roman eras, I first focus on the grain seeds and the probable practised patterns of their cultivation.

Unfortunately, the archaeological data in this regard is quite poor. Only two botanical studies of remains of seeds are available: one is from Euesperides, dated to the period between the sixth and the third centuries BC, and another from Berenice, dated to the early Roman era (Pelling and al Hassy 1997; Wilson et al. 2005; Webley 1979: 31). The investigation of Euesperides' samples indicates two types of wheat and barley alongside other crops, but the presence of barley was considerable. Additionally, the

examined remains of Berenice demonstrate barley is predominant, although some of these samples indicated that the barley seeds were of low quality. These were examined by Webley (1979:31), who supported Johnson's view that barley was a staple food in classical times, and that it was harvested and consumed in a similar way to how the rural population does today (Barker 1979: 7, 8; cf. Applebaum 1979: 91, 94). The poor quality of the barley seeds is probably due to low annual rainfall in the Benghazi area. As mentioned above, barley requires less water than wheat, and rainfall can fluctuate from one year to another. Theophrastus (*Hist.Pl*, VIII. vi. 5) stresses this when he mentions that barley can be negatively affected by heavy rain.

Barley grows around both Cyrene and Euesperides. As the sample was retrieved from a coastal zone, the rainfall quantity should be taken into consideration. Growing barley is currently common in the countryside of Benghazi where the environment is relatively harsh.

Some important information on Cyrenaica's cereal seed is to be found in the literary documents, in particular those dated to the fifth and fourth centuries BC. While some this information must be inferred from indirect or ambiguous allusions, these texts are still the main source on the Cyrenaican cereal seeds. The word καρπός which is mentioned by some writers, can be considered indirect evidence of the Cyrenaican harvests which certainly included cereals, as they were the main staple food in antiquity (Aeschylus, *Supp*, 315; Pindar, *Pyth*, IV. 6; Pindar, *Pyth*, IX. 7). However, there are other direct literary references to the Cyrenaican cereal seeds. The most interesting one is that of Pindar (*Isthm*, IV. 54) which indicates that Cyrene was a wheat-bearing (πυροφόρον) area. Another example of the direct indications is a hint from the account of Theophrastus (*Hist.Pl*, VIII. iv. 3). The writer specifies six types of wheat, which were known in his time, including the Libyan one. The author describes its characteristics, which indicate that he was obviously knowledgeable about Cyrenean wheat.

III.3.3 Patterns of growing and manuring cereal in Cyrenaica

The techniques and methods used when planting grain in Cyrenaica in the Hellenistic and early/mid-Roman periods would not have differed too much from the common methods used in the Mediterranean region. Similar techniques of ploughing, sowing, tilling, fertilising, gathering/harvesting, threshing, and crop processing were used

through these areas (Stewart 2007: 46, 49). However, different manuring methods may have been used in Cyrenaica; these will be discussed in the next section. In terms of grain yields, farmers usually keep some seeds back for the next season while the rest of the production would be for the consumption needs of people and animals. The farmers also will have been involved in the market if there was a surplus. In Cyrenaica, these processes can be indirectly inferred from some literary sources and some relevant cultural materials. In addition, the current ethnographical observations on growing cereals can be compared with the ancient ones.

The most important tools used for ploughing grain fields in ancient times were cattle and ploughs. Oxen were the principal animal used in Greek agricultural labour and seem to have been used on the Cyrenaican farms (Isager and Skydsgaard 1992: 89). They appear to have existed in Cyrenaica in fairly large numbers, as attested by the epigraphic evidence. For example, an inscription from Cyrene dated to the fourth century BC records 120 oxen being sacrificed to Artemis (Vickers and Reynolds 1971-1972). Oxen also figure prominently in the Cyrenaican classical literary sources, including Herodotus (IV, 163, 186), Athenaeus, *I*, 27e and Synesius, (*Letter*, 148) (see 1,2, 4, 6 in App. I. D. 2). Moreover, in 1850 Cyrenaica exported 11,787 head of cattle and sometimes up to 40,000 cattle in addition to over 400,000 kg of Cyrenaican butter according to the French consul. These were exported to Egypt and Malta (Bresson 2011: 89, 90, Wright 1982: 22). The importance of cattle in Cyrenaica was appreciated by Al-Aiashe (العياشي) (2006: 201) who listed some commodities brought from al-Jabal al-Akhdar and exported from the port of Benghazi in 1661/63. He mentioned “valleys of honey, fat of sheep tails, ghee and animal fats” the last two could be gained from cows (App. I. C. 1.9).

The image of the plough appears on two types of Ptolemaic coins found at Cyrene. Its first appearance is on the reverse of a bronze coin dated to the late fourth century BC, but not later than 308 BC, while the second representation appeared on the reverse of a gold coin from the Magas period (308-277 BC) (Robinson 1927: 47, 49. Nos. 208 and 223 respectively). Applebaum (1979: 115) provides a detailed explanation about the type of ploughs that was used in Hellenistic times. It possessed a stout horizontal share-beam, into whose upper face the stile and plough-beam were inserted as two distinct parts. The stile was almost vertical, and a horizontal grip projected from its rear side near the head. The plough-beam rose obliquely from the share-beam and turned parallel to it through a

right-angle. Based on the position of the horizontal share-beam which cannot be used for deep harrowing, Applebaum (1979: 114, 124) suggests that the Ptolemies were expanding onto the southern fringes. This implicitly reflects the expansion of royal lands at the expense of Libyan territory. If so, they may have started cereal cultivation in the area of silphium harvesting.

In addition, on the internal walls of the Hagfa el Khasalia there are engraved images of ploughs. This is in a wadi some 4 km west of the settlement of Wadi Senab (about 20 km south-west of al-Beida). These suggest that agricultural activity in the Wadi may date back to the Hellenistic period (Purcaro, in Attia and Stucchi 1975: 287-94). The Wadi Senab settlement seems to have been used in the Roman period as well. Stucchi carried out an archaeological investigation in this wadi in 1972 (Attia and Stucchi 1975: 251-95), and provided details about a Roman settlement which flourished between the fourth and sixth centuries AD. The settlement proper consisted of two caves, along with cisterns, tombs, an open-air wine press and oil press chamber, and a field system. Evidence of industrial activity is of special interest, and strongly suggests that the settlement possessed great agricultural potential (Gambini, in Attia and Stucchi 1975: 277-86). Many wadi walls were constructed across the Wadi, which led to a successful land use practice which achieved sustainable development of the area's natural resources. Agricultural activity in the Wadi may date back to the Hellenistic period (Kenrick 2013: 142; Purcaro, in Attia and Stucchi 1974-1975: 287-94). These engraved images of ploughs and the abundant soil are thus probably evidence of the area's agricultural expansion in the Hellenistic period.

The Hellenistic method of using light ploughing for cultivating cereals has probably been transferred over many generations and was in continuous use right into the last two centuries. The light ploughing cultivating practice is possibly one that suits the Cyrenaican lands when growing cereals. Hamilton (1856) refers to the fertility of the lands located east of Benghazi. He also talked about the methods used to grow cereals at the beginning of November. The figure of fertile land and the traditional ploughing can be seen in the following text:

The soil is rich loam, yielding, without any sort of tilling, abundant harvests of wheat and barley... In autumn, after the first rain, the seed is scattered broadcast on the ground, and over this a light plough of

wood, shod with iron, is drawn, turning up, or rather scratching, to a depth of about two inches. By this process the seed is covered. The husbandman returns to Benghazi, and no other care is bestowed upon the crop until the sower returns in spring to reap it (Hamilton 1856: 167-8).

It is important to mention that Hamilton visited Cyrenaica in 1852 when people in the region were still using traditional tools for their agriculture.

III.3.3. Patterns of land manuring

III.3.3.1 Sheep as part of land fertilisation

Farmers in Cyrenaica probably benefited from the role of sheep in manuring the region's cultivated land. The literary sources indicate that sheep were well-known in the region, and their first testimony is very early, even before the silphium of Cyrene. This can be seen in the *Odyssey* of Homer (IV. 85) who informs us that the sheep of Libya proliferated three times a year and that their milk, meat and cheese was available for all settlers, even the poor. Another important allusion is from the account of Pindar (*Pyth*, IX. 7) which clearly indicates a strong relationship between sheep and cereals. He mentions that Apollo made the nymph Cyrene the controller of the land which was rich in sheep (πολυμήλου) and very abundant in crops (πολυκαρποτάτας). Although the word crops generally refers to different types of foodstuff, in this context, it probably indicates a considerable presence of cereals. On this subject Applebaum (1997: 95-7), in his investigation of farming in the fourth century BC, argued that seasonal sheep transhumance played an important role in fertilising the land. In the winter, sheep graze at the southern slope of the plateau and return to the large northern plain in the spring. Applebaum (1979: 96) argued that Cyrenaica is unlike other areas of the Mediterranean as it benefits from summer grazing, with seasonal immigration of livestock. This took place in the period from May to August after the cereals had been harvested. Therefore, this manner of fertilising lands implicitly contributed to a high cereal yield in Cyrenaica.

Thus, the soil gains a considerable quantity of organic manure, which increases its productive potential. For this reason, Applebaum (1979: 95-6) argued that Cyrenaica was an exception to Stevens' theory (1942, 91-2, cited in Applebaum 1979: 95) that ancient Mediterranean agricultural lands declined because the summer grazing was not allowed

on arable tracts, so they did not benefit from the organic manure which increased soil fertility. The traditional wheat and barley production cycles were different in Cyrenaica compared to other places. For example, in modern Greece, people let their sheep and goats wander over ploughed and sown lands to help fertilise them (Stewart 2007: 48). However, arable land in Cyrenaica was manured before it was ploughed and sown.

Using organic manure when planting cereals seems to have been common in Cyrenaica even in the Classical period. In the festivals of the Thesmophoria (Θεσμοφόρια), on Demeter and her daughter Persephone, the Cyreneans were mixing the sanctified offal of the adult pigs and piglets with the cereals seeds (White 1984: 21). The association of these seeds with these goddesses' cult may reflect the importance of cereal cultivation in the region. It is important to note that animals are still used to fertilise agricultural lands in modern Cyrenaica today. Balancing cereal cultivation with sheep pasturing is a common aspect of farming in the region nowadays. In modern times, the summer grazing of sheep is used to fertilize land with organic manure.

III.3.3.2 Cereals/fallow or pulse rotation

The cereals/fallow or cereals/pulse rotation system seems to have been used in Cyrenaica's arable lands before the Hellenistic era. The epigraphic evidence in figure II.12, from the fourth century BC, indicates pulses were grown alongside different products. In the lists, their fixed place, in sequence directly after barley and wheat, may be a sign of a link between these crops. Applebaum (1979: 91-6, 117) discusses the system used to cultivate lands and the divisions between crop and fallow use at Cyrene. He does not rely only on the *demiourgoi* inscriptions of Cyrene, and supports his arguments using the contents of two Attic inscriptions: a Sunium inscription of 339/8 BC, and a Dyaleis inscription dated to the end of the fourth century BC (Applebaum 1979: 92, 117; *IG II² 2493*; *IG II² 1241* respectively). These pieces of evidence were associated with a land lease matter, and clearly reflect the important connection between growing pulses and the cultivation of wheat and barley.

The Sunium inscription, for instance, indicates that half of the land should be sown with wheat and barley, one-quarter should be devoted to legumes, and the last quarter should be left fallow. Cyrenaica probably used a similar system of land rotation to that of Attica in the fourth century BC. Cyreneans, who supplied many Greek cities with

quantities of cereals during a food shortage in the late of the fourth century BC, is probably evidence of their concern to improve cereal production in their region. This was possibly by using different methods which would have included rotating the arable land between cereals/fallow or pulses. Although the lists of the *demiourgoi* do not explicitly mention crop rotation, the high quantities of pulses alongside cereals is very suggestive, in texts of the second century BC. In the third and fourth centuries texts, quantities are not given, but pulses again were frequently mentioned after cereals in the lists. It is likely that the same basic cultivation system covered the entire period.

On the other hand, the appearance of different types of pulses in the third and second centuries BC is clearly noticeable (Moreno 2007: 15-19). The *demiourgoi* inscriptions mention the named pulses directly after wheat and barley in both the first and second semesters. These included six kinds of pulses, but beans (κυάμοι), chick-peas (ἐρεβίνθοι) and lentils (φακοί) are the most important ones (App. II. B. 2 and Figure II.10 above). Moreover, other types of unspecified pulses were also mentioned. The presence of considerable numbers of pulses and the apparent scale of production or their income (as to whether they represented quantities or income see section II.4.5.2) in some cases, in particular, in the second century BC, makes their use to fertilise the land unquestionable (see Figures II.4 and II.5). However, Applebaum (1979: 117) argues that the abundant and varied appearances of pulses in this period is probably evidence that the amount of land under cultivation had expanded, or fallow land was prevented from being left fallow. Although both interpretations seem to be reasonable, why pulses should have been grown in greater quantities than wheat and barley is uncertain and requires further investigation.

For example, the inscription DMI 24 (App. II) indicates a diverse range of pulses in significant quantities. The quantities of beans and chick-peas are approximately the same as wheat. Lentils and the unspecified pulses also appear in higher proportions than barley. In general, the legumes total 1,012 *medimnoi*, while wheat and barley equal 488 *medimnoi* (Figure III.3). As a result, pulses comprise about 67% of the harvest of this semester, while cereals, which were and are still the main staple food in the region, represent only 33% (Figure III.4). This unbalanced production seems to be due to more than just land rotation, and was probably related to profits from trade.

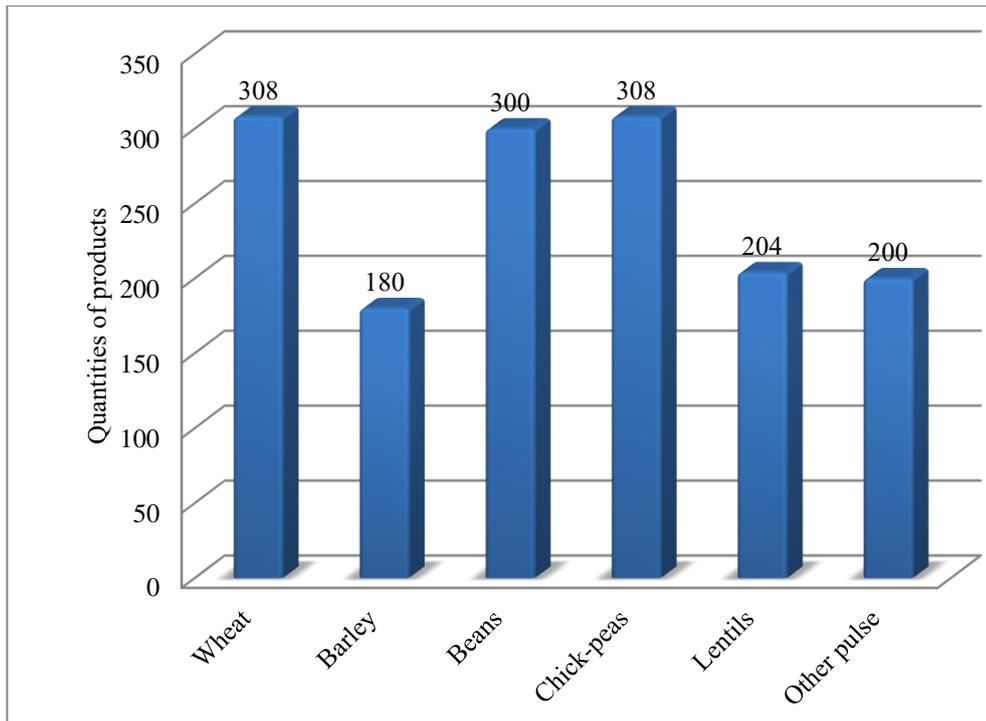


Figure III.3: Volume of cereals and legumes in medimnos in one semester (6 months) based on a *demiourgoi* inscription dated to the second century BC.

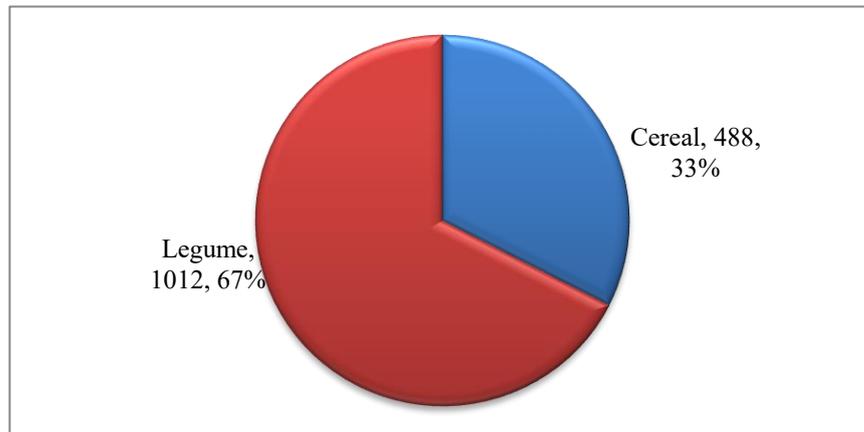


Figure III.4: Cereal and legume production in one semester (6 months) based on an inscription from the second century BC.

In general, while Cyrenaica and the Mediterranean had a similar climate, Cyrenaica's distinctive soil and landscape may have led farmers to different land use patterns when cultivating cereals. Throughout the history of Cyrenaica, arable land was cultivated using three systems. The first was traditional farming, in which a fallow/cereal or cereal/legume rotation method was adopted and the land superficially ploughed with a simple wooden plough. This way seems to have continued from the Hellenistic epoch to the period before the Italian occupation (see above Hamilton 1856: 167-8).

The second cultivation system is the European method, which was introduced to Libya by the Italians in the 1930s. However, this it is more suited to wetlands. This system practises fallow/cereal rotation, but by means of a mechanical steel mouldboard plough that can cause great damage to the natural pasture. The third cereal-planting pattern for cereals is the Australian method of dryland farming (cf. Gregory 1916), which was similar to the methods used in ancient times. It involves adopting a rotation of cereal/medicago (a type of annual legume pasture) and non-deep furrows. Dry farming in Cyrenaica was suitable for the sowing of cereals (Strabo XVII. 3. 23). This area located between the lands close to the sea, which were good producers of trees, and the pre-desert areas where silphium grew, as can be understood from Strabo (see Figure II.3). Pliny (*NH.* V. 5 (33); XVIII. 50) also provides similar references about this matter and he highlights how Cyrenaica's soil, the dew and the weather made growing cereals easier than in other places (App. I. A.1.22).

Chatterton and Chatterton (1984: 157-60) examined the adaptation of the South Australian rotation system of medicago pasture with cereals. The study is based on the 1970s agricultural development plan used in Cyrenaica and Tripolitania, and aimed to allow modern Libyan farmers to advance their farming practises. This study assumed that ancient Libyan land underwent ploughing before being left unsown for a period in order to regenerate its fertility. Land rotation is a form of shifting cultivation where a plot of land is used for agriculture for several years before it is left fallow for a period of time to restore the fertility of soil (cf. FAO 1969: 83-4; Applebaum 1979: 90-6). Furthermore, Applebaum discussed the system used to cultivate the area's arable land and the division between crop and fallow use (1979: 91-6). The representation of a plough on two early Ptolemaic coins found at Cyrene provides information about the type of ploughs used and the style of agriculture practised at the time (Applebaum 1979:115). Their depiction on these two coins hints at the Ptolemaic expansion of royal lands at the expense of Libyan territory (1979: 114, 124).

In summary, a number of literary sources from the Greek era highlighted the distinctive quality of Cyrenaica's cereal, wheat in particular. This clearly demonstrates how far it spread as a commercial commodity. In addition, the techniques used in planting wheat and barley in Cyrenaica were quite similar to those known to have been used in the Mediterranean.

However, the order of the necessary processes for growing cereals was different in Cyrenaica. Land was fertilised by sheep first, and their organic manure was used in the period between harvesting and sowing the crop. This takes about four to five months, and it usually occurs from the end of May to September or October. After the first rain, land is ready for the seeds to be sown, which is followed by light ploughing and no need to plough the land before sowing the seed because of its fertility. Therefore, the steps of cultivating cereal in Cyrenaica started with fertilising, sowing and ploughing. Moreover, the most interesting difference between growing wheat and barley in Cyrenaica and in the Mediterranean is that Cyrenaicans did not require any type of care after they were ploughed. This may be due to the type of soil and grazing sheep and goat in the cultivated lands in summer. These lands benefit from the organic manure of these animals.

III.3.4 Estimating Cyrenaican cereal production in the Hellenistic period using epigraphic evidence, modern statistics and the approximated arable lands

III.3.4.1 An assessment of the consignment of the Grain Decree of Cyrene:

The Hellenistic Grain Decree of Cyrene is significant evidence reflecting the region's potential for producing cereals. Although this evidence has come to the attention of many researchers, it is still an important subject for more discussion. The most interesting study from the last century is that of Applebaum who combined detailed discussion with consideration of previous investigations. In addition, Bresson (2011: 66-95) recently has presented a new point of view which disagrees with previous arguments. This controversy is especially relevant when evaluating the amount of cereal indicated in the inscription in question. The debate around the decree covers its date, the units used, the term *σίτος* (which could refer to food, grain, wheat or barley) and finally the time span of the consignment, which probably reflects the region's productive capacity.

III.3.4.1.1 An assessment of the modern value of the 'μέδιμνος', the unit which was used in the grain decree of Cyrene

Reinvestigation of the volume of grain recorded in the 'Grain Decree' of 331-326 BC is a priority because this inscription is the most important epigraphic evidence. The stated amount of 805,000 *medimnoi* of grain exported from Cyrene at the end of the fourth century BC is striking. However, the value of the Greek Attic unit "*medimnos*" used in this inscription has been estimated in two completely different ways. Previous scholars,

such as Ferri, Oliverio and Zebelev and others, have reasonably dated the Grain Decree to the shortage which occurred between c.331-326 BC (cited in Applebaum 1979: 98; SEG 9. 2; Kingsley 1986:171). However, the information of the unit used, (μέδιμνος), is a more important matter as it affects modern attempt to quantify the amount of cereal mentioned. This section, therefore, focuses on the question of the quantity and the number of yearly harvests that this consignment may have represented. Applebaum (1979: 99) concurs with Oliverio and Zebelev who state that the consignment of 805,000 *medimnoi* was exported over two years, 402,000 *medimnoi* (221,420.41 quintals or 22,142 tonnes) in each one. This means that the whole amount equals about 442,840.82 quintals or 44,284 tonnes. Fulford (1989:173) also suggests a quantity of cereal close to 48,000 tonnes. These scholars rely on the fact that one Attic *medimnos* is equivalent to 51.84 litres (Applebaum 1979: 97, n. 137).

However, Stroud (1998: 45-56) produced a new value of the so-called Attic *medimnos* through his detailed analysis of the Athenian grain tax law. In particular, his translation of lines 21-25:

The buyer of the tax will weigh out the wheat at a weight of a *talent* for five-sixths and the barley at a weight of a *talent* per measure (*medimnos*) dry and free from darnel (Stroud 1998: 54-5).

Stroud (1998: 54-5) explains that if one *medimnos* contained 6 *hekteis*, the five-sixth *hekteis* of the heavier wheat weighed the same amount as 1 *talent*, between 26.46 and 27.72 kg. One *medimnos* of wheat thus weighed roughly between 30.86 and 32.34 kg. One Attic *medimnos* (μέδιμνος) of barley equals one *talent* (τάλαντον). Bresson (2011:87) considered the average weight of a *medimnos* of barley at c.27 kg, and that of wheat at c.31.5 kg. Then, he approximated the general average of them together at 27.40 kg. This figure has been used by Bresson (2011:66-95) in his reinvestigation of the Cyrenean grain decree, and shall be used in this project as well. According to Bresson's calculation (2011: 87) the 805,000 *medimnoi* weighed 220,057 quintals or 22,057 tonnes ($805,000 \times 27.40 \text{ Kg} \div 100$). This is about half of the figure calculated by Applebaum mentioned above.

It is important to mention that the modern measurement units which used in these statistics are the quintal (100 kg) and tonne (1000 kg). These are considered in all calculations in this project.

III.3.4.1.2 Cereal production quantities: Cyrenaica and others at the end of 4th BC

Limited quantities of cereal were recorded during the Greek and Roman periods. An inscription from Eleusis (*IG II² 1672*) includes a particular volume of cereal production. The identification of a specific quantity of cereals also enables a fair comparison with the inscription of Cyrene. This inscription indicates that the total production of Attica in 329/8 BC was 339,925 *medimnoi* of barley and 27,062.5 *medimnoi* of wheat, as recorded by the epistatai (ἐπιστάται) officials in charge of all public works of Eleusis.

Additionally, the inscription identifies that the sums contributed by the dependent cities was 340,475 *medimnoi* of barley and 120,375 of wheat (Garnsey 1988: 98-9; *IG II² 1672*). The total volume of cereal of Attica presented in this inscription was thus 377,000 *medimnoi* while the total from dependent territories was about 460,850 *medimnoi*. It is thus possible to consider initially that Cyrene's exported volume (805,000 *medimnoi* or 220,570 quintals or 22,057 tonnes) was part of Cyrenaica's production and then compare it with the figures from Attica and the dependent cities (Figure III.5). As a result, it appears that the Cyrenaican surplus was more than twice as much cereal as Attica produced and about one-third more than the total production of the other dependent cities. Even if one considers that the volume of the dependent cities represents a surplus, it is, nevertheless, clear that Cyrenaica could produce outstanding quantities of cereals. Two important questions shall next be discussed: to what extent does this figure demonstrate the region's productive potential for cereals? Did the region's agricultural capacity enable it to produce this volume of cereal in one season, or did it take longer?

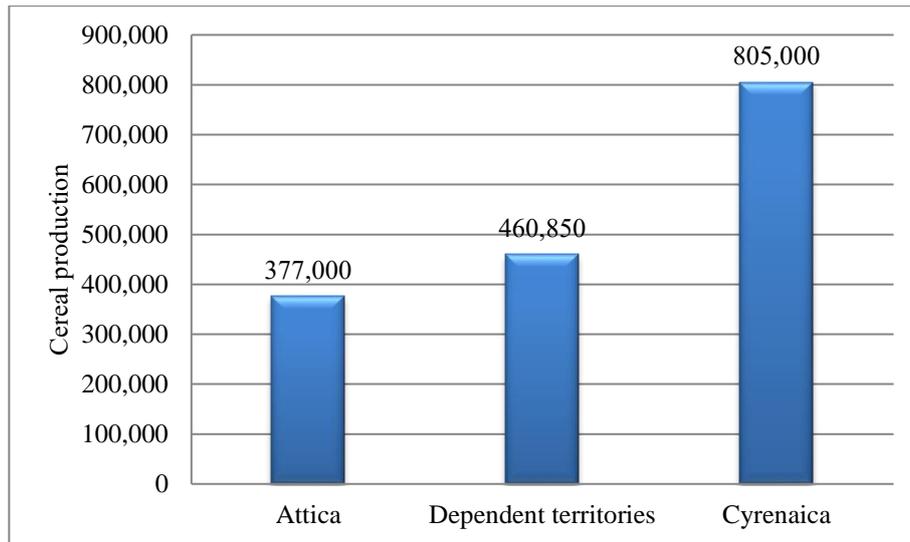


Figure III.5: The cereal quantities per *medimnoi* of Attica, the dependent cities in 329/8 BC and Cyrenaica in 331-326 BC.

III.3.4.1.3 Cyrenaican cereal production statistics before the Italian land reclamations

The Italians started expanding Cyrenaica's agricultural lands after 1931, when they executed Omar al-Mukhtar and controlled the whole country. It is therefore possible to test any recorded scale of grain production in Cyrenaica before this date and compare the possible surpluses with the Hellenistic quantity (Bresson 2011: 87). Wright (1982: 22 cited in Bresson 2011: 89, 90) addressed the region's grain citing an example from 1850. He refers to the official statistics recorded by the French consul of various products exported to Egypt, Malta and Italy. Cereal was the first product mentioned in this record, identifying that 212,700 quintals (21,270 tonnes) were exported. Furthermore, Records indicate that 43,858 quintals (4,385 tonnes) of wheat and 465,450 quintals (46,545 tonnes) of barley were harvested in 1926 (Laronde 1987: 33). The sum of both was 509,308 quintals (50,930 tonnes). Bresson (2011: 87) stated that the 1926 cereal amount, which represents more than double that of the fourth century BC, was probably obtained from the whole region including the fertile western lands of Cyrene. The question thus is whether there was a surplus from Cyrenaica's cereal production of 1926. The region's population in 1922-23 was estimated at 182,000 inhabitants (Buru 1960: 182) and adopting Garnsey's (1988: 102) figure of the average annual consumption of cereal per capita in the Greek period at 175 kg would allow a surplus of c.19,000 tonnes ($182,000 \times 175 = c.32,000$). However, the surplus would be less than this, it may only 5,000

tonnes if one bears in mind the animal fodder and the needed seeds for growing cereal in the following year. Therefore, if it is fair to assume that average annual consumption per capita in the last century is still the same as that of the Greek time and the 50,930 tonnes were gained from the whole region, the 1926 production may represent quite a poor harvest.

Thus, modern sources indicate that Cyrenaica's total production of cereal was 50,930 tonnes (probable surplus at 5,000 tonnes) in 1926 and 21,270 tonnes of surplus in 1850. The latter is quite close to the surplus of 331-326 BC 22,057 tonnes as demonstrated in Figure III.6. Bresson (2011: 87) estimates that in a good year Cyrene and the other parts of the region especially the western terrains could produce 810,000 quintals (81,000 tonnes) of cereals. If so, both exported figures of 1850 and 331-326 BC represent about a quarter of the total region production (Bersson 2011: 91).

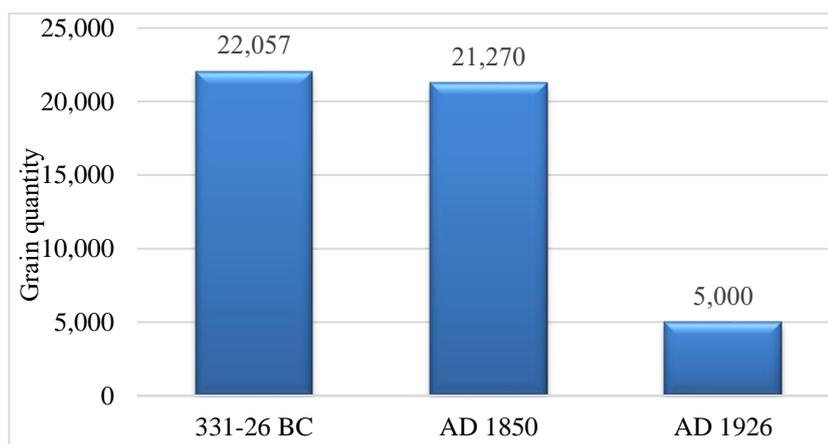


Figure III.6: The quantities of cereal in tonnes of the ancient decree of Cyrene, and another two modern statistics.

However, Bresson estimates the 1850 quantity (21,270 tonnes) as roughly 400,000 Attic *medimnoi*, or approximately 50% of the region's exported quantity at the beginning of the Hellenistic epoch (2011: 87, 88). In fact, this arithmetic seems to be inconsistent because the 1850 quantity (21,270 tonnes), according to his approach, should represent 776,277 Attic *medimnoi* ($212,700 \text{ quintal} \times 100 \div 27.40 = 776,277.372 \text{ medimnoi}$). Therefore, the quantity of cereal exported in 1850 (21,270 tonnes) was very close to Hellenistic Cyrene's export of about 22,057 tonnes. Considering fluctuation in annual rainfall, the differences between these two figures seems to be within normal limits (see Figure III.7). But if the ancient surplus was from Cyrene only, it would suggest a higher

overall production, and this would open a large question. This question is discussed in detail in section III.3.5 below.

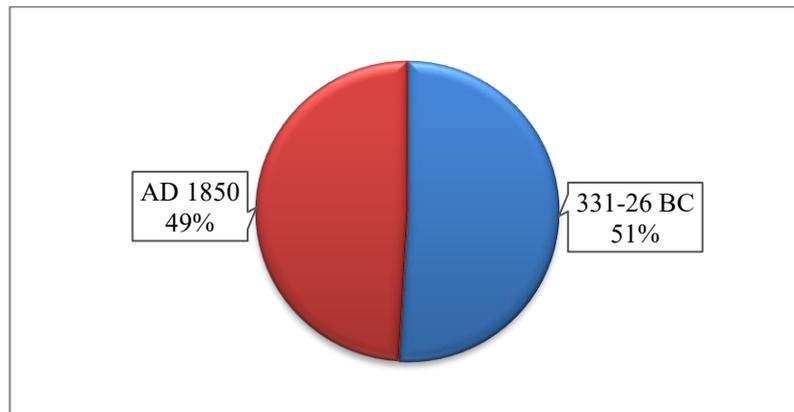


Figure III.7: The percentage of the cereal quantities exported from Cyrenaica in the Hellenistic period and in 1850 AD.

III.3.4.1.4 The cereal yield of the land reclaimed by the Italians

Although the cereal yield of the reclaimed land does not represent the region's production during the Greek and Roman periods, it is possible to consider it as being about double the ancient production. The cereal production of the post-land-reclamation can be calculated based on some statistics of lands that were cultivated with cereal. Applebaum (1979: 91) addressed statistics of the areas where grain was cultivated in the year 1934/5. The Italian and Arab farmers used about 82,052 hectares to grow cereals of which about 20,982 hectares were under wheat and 61,070 hectares were under barley. In order to measure the quantity of grain which could be produced in 82,052 hectares, the productive capacity of one hectare of the region should be considered. The grain yield of the plateau around Cyrene is estimated at between 1.25 and 2.5 tonnes per hectare (Applebaum 1979: 100). In addition, Laronde (1994: 27) states that Tocra's figure were 9.94 quintals (*c.*1 tonne) for barley and 7.60 quintals (0.75 tonne) for production of wheat per hectare in the year 1922/23, in an area that usually receives only about 200-225 mm of rainfall. Bearing in mind Cyrenaica's higher rainfall and different landscape, it is legitimate to assume that one hectare could produce 16 quintals (1 tonne and 600 kg) of grain. Harvesting 82,052 hectares could therefore produce about 1,312,832 quintals (131,283 tonnes) of wheat or barley. Assuming that half of this amount represents the ancient production of the region, gives a figure of approximately 656,416 quintals (65,641 tonnes) of cereals. This figure is higher than the exported quantities in 1850 and in the

Hellenistic period (see Figure III.8). The lower figure of production in 1926 is probably due to the effect of low rainfall.

A surplus of cereals seems to have achieved from Cyrenaica’s harvest in the year AD 1934/5, allowing me to model a production of c.65,641 tonnes from an area equivalent to that cultivated in ancient times. The population of Cyrenaica in these years was about c.137,000 inhabitants (Buru 1960: 182). If so, considering Garnsey’s figure which approximates 175 kg as the yearly consumption per capita, 137,000 inhabitants would consume about 24,000 tonnes (137,000×175). Thus, in the years AD 1934/5, the region’s surplus of cereals would make up c.42,000 tonnes (65,641-24,000). This figure would be comparable to those of the Hellenistic period and that of AD 1850 if about fifteen tonnes of cereal was subtracted from the 42,000 tonnes to be part winter-feed for livestock and part seeds for future cultivation. Thus, the approximated surplus is about 27,000 tonnes (42,000-15,000) of cereals.

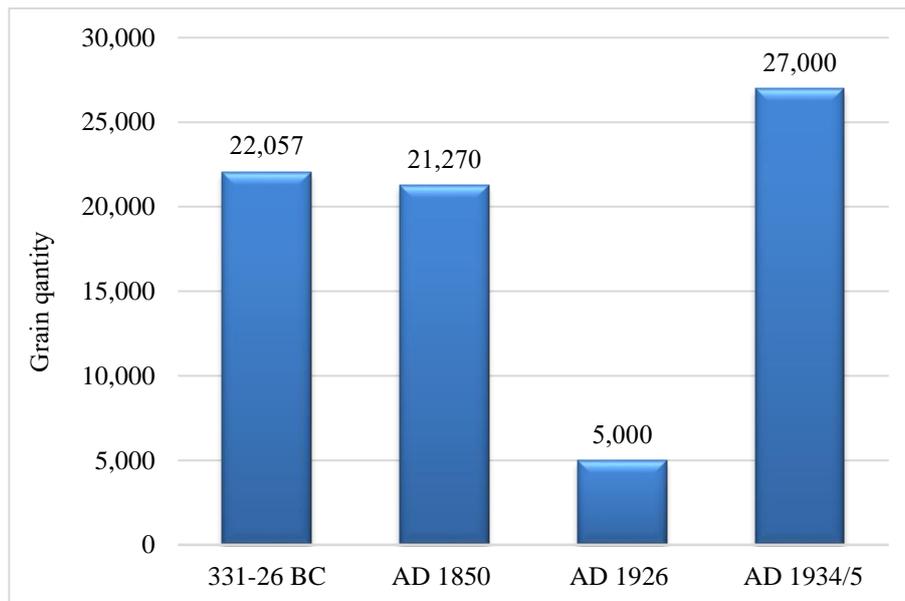


Figure III.8: Cyrenaican cereal production in tonnes of the Hellenistic period and before/after the Italian reclamations of the agricultural land in 1932.

III.3.4.2 Primary estimation of Cyrene’s cereal production based on a *demiourgoi* inscription

The *demiourgoi* inscription DMI 23 (App. II. B. 2, C. 2) is another important unique piece of epigraphic evidence, dated to the second century BC. The inscription lists huge quantities of six different products or income gained from selling each item (SEG 9.42).

Among them are numerical data of wheat and barley, which may provide some extra information about Cyrenaica's capacity to produce these two crops. The inscription was published by Oliverio (1933b: 142-3, No. 41). He interprets these numbers as indications of prices. However, these numbers are very high in contrast to the prices mentioned in some *demiourgoi* inscriptions dated to the fourth and third centuries BC and they are not comparable to other numbers mentioned by an inscription dated to the second century BC (App. II. B. 2, C. 2. DMI 24). Both of DMI 23 and DMI 24 indicate quantities of wheat, barley, beans, chick-peas, lentils and other pulses, though the quantities in the inscription DMI 24 are smaller than those represented by inscription DMI 23. It is important to mention that I have used these numbers as quantities in this thesis although Rosamilia (2017: 143) has considered them as the total revenue earned from selling some quantities of each product. This matter has been discussed in detail in my forthcoming article on legume production at Cyrenaica. According to the epigraphic evidence both from Cyrenaica and the other Hellenistic districts, cereals' prices did not exceed 32 drachmas for wheat and 18 drachmas for barley (Amemiya 2007:68). It is therefore impossible to believe that these high numbers could represent prices. The new reading of the text by Dobias-Lalou is as follows:

Ἰαρεὺς. Δαμιεργέντων [Ζ]εὺς Ἐ--, --υς Ζα--, --γόρα Ἀρ--. [Κα]ρποί
 ἐτιμάθεν· πράτας ἐξαμῆνω σπυρῶν μέδ(ιμοι) μ δ ἦ β κριθᾶν
 μέδ(ιμοι) μ β ἦ δ χ κυάμων μ δ ἦ β ἐρεβίνθων μ ζ ἦ β φακῶν μ ζ ἦ β
 τᾶλλα ὄσπρια μ γ ἦ ε [--] δευτέρως ἐξαμῆνω σπυρῶν [--] κριθᾶν [--]
 κυάμων [--] ἐρεβίνθων [--] φακῶν [--] τᾶλλα ὄσπρια [--] (about the
 Greek numbers see App. IV. D)

Gods. Priest So-and-so, being damiergoi So-and-so son of E, So-and-
 so son of Z, goras son of Ar, the crops were estimated; [--] First
 semester: wheat, 42 000 medimni; barley, 24 600 medimni; beans, 42
 000; chick-peas, 72 000; lentils, 72 000; other pulses, 35 000, second
 semester: wheat [--]; barley [--]; beans [--]; chick-peas [--]; lentils, [--];
 other pulses [--] (Dobias-Lalou *IGCyr014400*).

As the text indicates, there were two types of products: cereal, which includes wheat and barley and pulses, which includes beans, chick-peas and lentils in addition to other unidentified pulses (see Figure III.9). Each product is followed by its quantity.

Unfortunately, the text is in a bad condition and quantities from the second semester are missing. However, products in the second are listed in the same order as in the first semester. Since the same order is used in the majority later *demiourgoi* inscriptions for both semesters, it is reasonable to assume that the importance of each good is reflected in its position in the text. For example, wheat is probably more important than barley, and beans are more important than chick-peas and lentils despite the large quantities of the latter two crops. This organisation or list of products is clearly illustrated by the inscriptions DMI 22, 23, 24, 27 (App. II. B. 2). These represent crops series in of one semester or two.

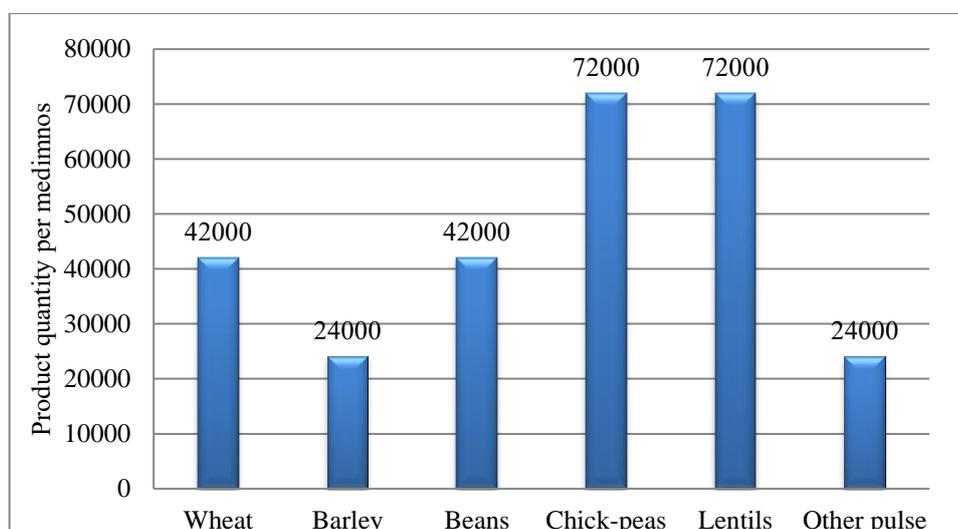


Figure III.9: Quantities of various products based on a *demiourgoi* inscription dated to the second century BC.

This inscription is valuable because it indicates that the harvest of the first semester produced 42,000 *medimnoi* of wheat. This volume can be compared with the quantities of wheat recorded in the inscription of Eleusis of 329/8 BC, although they are not contemporary (Garnsey 1988: 98-101; *IG II²* 1672). However, they have similarities as both date to the Hellenistic period, and the land and weather are still the same. The Eleusis inscription states the quantities of wheat of many cities and islands. Skyros, Imbros and Lemnos had the highest figures for wheat production quantities, and they were considered among the main sources which were supplied Athens with cereal during the fourth century BC. This can be identified from the Athenian Grain-Tax Law of 374/3 BC (*SEG* 48. 96; Bresson 2016: 105).

Comparing the wheat produced volumes in the Hellenistic Greek cities shows that Lemnos had the highest volume (see Figure III.10). However, Cyrene's yield was close to that of Imbros and higher than that of Skyros.

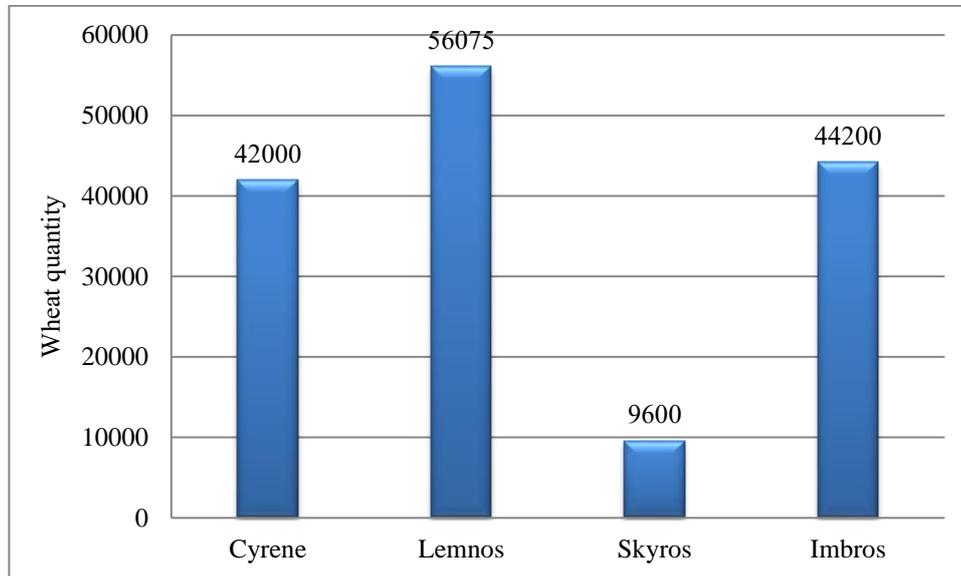


Figure III.10: The wheat yield in *medimnoi* of Cyrene in the second century BC and Lemnos, Skyros and Imbros in 329/8 BC based on epigraphic evidence

In addition, the numerical data provided by the inscription DMI 23 allows us to calculate the cereal production in the following year. This would be possible if one considers the rotation and manuring regime of the land in Cyrenaica. Based on this rotation, farmers should plant wheat and barley in the next season, which should be in the following year, instead of beans, chick-peas, lentils and other unidentified pulses. Therefore, the total production of these pulses, which comprises 210,000 *medimnoi*, would represent wheat and barley in the first semester of the following year. As the text represents wheat at 42,000 *medimnoi* and at barley 24,000 *medimnoi* their total is 66,000 *medimnoi* (64% wheat, and 36% barley). These percentages should be borne in mind in order to estimate the quantity of wheat and barley in the putative amount of 210,000 *medimnoi*. Thus, the wheat volume was about double that of barley; it would comprise about 140,000 *medimnoi* and barley would be 70,000 *medimnoi*. If so, wheat production at 140,000 *medimnoi* in one semester compares positively with the volumes of the three comparable Greek islands.

However, cereal production was probably much higher and it may have been double that of pulses. This is because Cyrenaica yields a larger volume of cereals per hectare

than legumes, as can be see from some statistics of the production of legumes during the years 1957/58 (Kroeller 1960: table 9). These indicate a production per hectare of dry beans at 500 kg, broad beans at 800 kg and chick-peas and lintels at 375 kg each per hectare. Therefore, as the average production of cereals per hectare in Cyrenaica is 1600 kg, as mentioned above, it is possible to calculate the number of hectares that were used in the Hellenistic period to produce each quantity of any kind of legume, and then consider the yield if the same area of land was sown with wheat or barley. For example, for beans, the statistics of 1954/58 recorded a production of dry beans and broad beans at 500 kg and 800 kg per hectare respectively. Assuming the highest figure of 800 kg represents the Hellenistic broad bean production per hectare, 42,000 *medimnoi* (c.1,150,800 kg or 1,151 tonnes) would be the yield of 1,438 hectares (1,150,800 ÷800) (see Table III.1). If these 1,438 hectares were cultivated with wheat, they would produce c.2,301,600 (1,438 ×1600) or 2,302 tonnes. The approximated wheat volume is about double that of beans.

Dry beans' qua. in <i>medimnoi</i>	<i>Medimnos</i> to kg	N. of ha. cultivated beans	Wheat prod. of 1,438 ha.
42,000	1,150,800 (42,000×27.40)	1,438 (1,150,800 ÷800)	2,301,600 (438 ×1600)

Table III.1 An estimation of wheat production in an area that was planted with 42,000 *medimnoi* of beans in the Hellenistic period, and with consideration to the different volumes of each crop could be produced per hectare.

Another suggestion can be made for estimating grain production based on this inscription. Since the crops mentioned in the first semester have been recorded in the same order in the second semester, albeit their volumes are missing, it is possible to approximate their amount. Assuming production of wheat and barley in the second semester is the same as in the first one, about (42,000 + 24,000 *medimnoi* = 66,000 *medimnoi*) of wheat and barley would have been produced. The probable annual total production of these two crops, in the inscription would thus have been 132,000 *medimnoi*, wheat comprising c.84,000 *medimnoi* and barley c.48,000 *medimnoi*. Therefore, although these quantities cannot be directly compared to the exported amount of the Grain Decree because they represent the production of Apollo's estates only, the annual production of 84,000 *medimnoi* of wheat would put Cyrene ahead of the three compared quantities from Lemnos, Skyros and Imbros. It also reflects the productive soil of Cyrene mentioned for example by Pindar (*Isthm*, IV. 54) and Diodorus Siculus (III. 50. 1).

III.3.4.3 Estimating the cereal production of Cyrene based on the expected cultivated lands

The next issue is to determine the probable permanent cultivated area of Cyrenaica in the Hellenistic and early/mid-Roman periods in general with a particular focus on Cyrene. This could help me to assess whether Cyrene had enough arable lands which would have enabled there to be a surplus of such cereals for export, like that of the Hellenistic period. Applebaum (1979: 105) estimates the region's land which may have been used for planting wheat, barley, various kinds of pulses and vegetables at 200,000 hectares. Applebaum (1979: 105) and Bresson (2011:90) argue that 80-90% of the region's agricultural lands belonged to Cyrene. Applebaum (1979: 105) estimates Cyrene's arable land at 129,642 hectares, while Bresson (2011:90) approximates it at 180,000 hectares. However, some hints in the literary sources should be considered, in particular those which shed light on the grain capacity of Euesperides. For instance, Herodotus (III. 91) placed Barce alongside Cyrene as contributors of cereal with Egypt to cover the tributes of the Persian king. In addition, Theophrastus (*Hist.Pl*, VIII. vi. 5) also refers to successful cultivation of barley in the area around Cyrene and Euesperides.

Furthermore, archaeologically, two botanical analyses of seeds from Euesperides and Berenice indicate that barley seeds predominated over other plant seeds. The seeds from Euesperides have been dated to the period between the sixth and the third centuries BC and those of Berenice to the early imperial period (Pelling and Hassy 1997: 1- 4; Webley 1979: 31). This mirrors the importance of growing cereal in the area around these cities. Moreover, the fertile lands around the ancient city of Teucheira were discussed by Laronde (1994: 23-9), who argued that this city was important from the very beginning of the Greek presence in Cyrenaica. This explains the early arrival of Greek settlers, who most likely to be benefited from these abundant lands.

Modern studies also highlighted the productive land of al Marj (Barce). As mentioned above cereals dominated the area investigated near this city in 1967 (Allan et al. 1973: 122-61). It comprises 93% of products growing in this area. Furthermore, recent research highlights the apparent yield gap of wheat and barley in Libya indicating that al Marj (Barce) is the second productive area of these crops after Murzuq in the south-west (Lariel 2015: 45, 46).

For these reasons, it seems Applebaum and Bresson's argument that Cyrene's land comprised 80-90% of the province's total cultivated area is an exaggeration. It is reasonable to consider that the cultured terrain of Cyrene represented 60% of the province's total area. For further clarification of this mathematical discussion, the different approaches to estimating Cyrene's cultivated lands are summarised in Table III.2 below. Despite my lower estimate of the percentage of Cyrenaican arable lands held by Cyrene (at 60%), the city nonetheless seems to have controlled the largest amount of arable lands in the region. One question that needs to be asked, however, is whether Cyrene's arable lands of 60% would produce a surplus cereal production, which would have allowed exports at least in some years.

Reference	All Cyrenaica	Proposed percentage of Cyrene	Cyrene
Applebaum (1979: 105)	200,000	80-90%	160,000-180,000
Bresson (2011:90)	200,000	90%	180,000
Abdelhamed (the researcher)	200,000	60%	120,000

Table III.2: Approaches to estimating the percentage of cultivated land in hectares in Cyrene

If Cyrene controlled about 120,000 hectares, 60,000 hectares at least may have been used to grow wheat and barley as they were the main staple foods throughout the Greek and Roman worlds. As has been explained above, in a good year, the hectare productive capacity could reach 16 quintals. If so, 60,000 hectares can be expected to produce around 960,000 ($60,000 \times 16$) quintals (96,000 tonnes) of cereals. This volume is equal to about 3,503,649 *medimnoi* ($96,000 \text{ tonnes} \times 1000 \div 27.40$). Quarter of this quantity (875,912.25 *medimnoi* or 24,000 tonnes) is very close to the Hellenistic exported quantity from Cyrene. Thus, the putative production of 60,000 hectares at 960,000 quintals is quite close to Bresson's (2011: 91) estimate of 810,000 quintals. Bresson (2011: 91) suggested that around 25% of Cyrene's annual grain yield may have been exported in Hellenistic times. He stated that there was some doubt about this high level and recommended further investigation.

However, in view of the previous analysis and discussion, it seems that Cyrene confidently entered the global grain market. Producing 805,000 *medimnoi* (22,057 tonnes) of cereals requires only about 13,785 hectares ($22,057 \text{ tonnes} \div 1600 \text{ kg per hectare}$) while the agricultural lands that belonged to Cyrene were at least about 120,000 hectares. The exported amount in the Hellenistic era was not very high and represents 27% as Bresson expected (2011: 91) (Table II. 1). It is only 23%, so less than the quarter

of annual cereal production of Cyrene in a good year. It is important to mention that a quarter of the cereal production after reducing the cultivated land of Cyrene from 90-80% to 60% is about 24,000 tonnes. This is a little higher than the exported volume mentioned in the Grain Decree (22,057 tonnes), therefore, most likely also was just part of the yield of only one year and from Cyrene alone. Nevertheless, if this was the case, why did the Cyreneans commemorate the Hellenistic consignment?

III.3.5 The Hellenistic consignment: Wheat or Barley

It is unquestionable that Cyrenaica exported cereals from the Hellenistic period onwards. The exported amount from Cyrene to a number of Greece Hellenistic cities is probably the most important proof of this. However, examining this shipment indicated that the quantity was merely a quarter or less of Cyrene's total cereal production. This suggests that this large quantity probably included only wheat. Despite the fact that the word mentioned in this evidence is $\sigma\tilde{\iota}\tau\omicron\varsigma$ 'corn' or 'grain', Foxhall and Forbes (1982: 41-99) translated this term which used in the Greek period to 'wheat' because it contains higher calorie per kg than barley and this could meet the human body need. They used also some literary indications to support their argument. Herodotus (VII. 187.2) is a case in point (Foxhall and Forbes 1982:56). If so, the word $\sigma\tilde{\iota}\tau\omicron\varsigma$ mentioned in the Grain decree of Cyrene is perhaps also referring to wheat. It is important to mention here that Wilamowitz-Moellendorf suggested, sometime before 1930 (cited in Applebaum 1979: 98), that the exported Hellenistic quantity was wheat, and Applebaum (1979: 98) supported his view but with some doubt. However, they do not provide sufficient evidence to support their argument and they estimated the value of the consignment to be double the amount approximated in this research. For the reasons outlined below, this thesis argues also that the Hellenistic cereal consignment sent from Cyrenaica contained wheat only, and this was perhaps the reason for its commemoration.

III.3.5.1 Wheat shortage in the other regions

Wheat shortages seem to have occurred outside of Cyrenaica in many Hellenistic cities and regions. This can be demonstrated by some of the epigraphic evidence. The Eleusis inscription of 329-328 BC, which was contemporary to the Grain decree of Cyrene, is a good illustration of this view. It shows that the quantities of wheat available in many cities were much lower than those of barley (table in Garnsey 1988:98; *IG II*²

1672). For example, the total barley harvest of the Attic cities was 339,925 *medimnoi*, while the wheat harvest was only 27,062.5 *medimnoi*. In addition, another piece of epigraphic evidence demonstrated the shortage of wheat in the Hellenistic era via the Sicilian city of Entella. This is a decree honouring the people and communities who supplied the city with grain in the period around the middle of the third century BC. This decree is notably concerned with the high quantities of wheat granted and the low volume of barley. The importance of this evidence is that names of both wheat and barley indicated. According to this decree, the city received a total of *c.* 440 *medimnoi* of wheat (στροποι) and *c.* 80 *medimnoi* of barley (κριθαι) from different communities. It also received a total of 470 *medimnoi* of wheat and 30 *medimnoi* of barley from individuals (Austin 2006: 242. No.131; *Ent.* A1 (V Nenci); *SEG* 30. 1121) (Figure III.11). These inscriptions reflect wheat shortages experienced by some Greek cities in the beginning of the Hellenistic era.

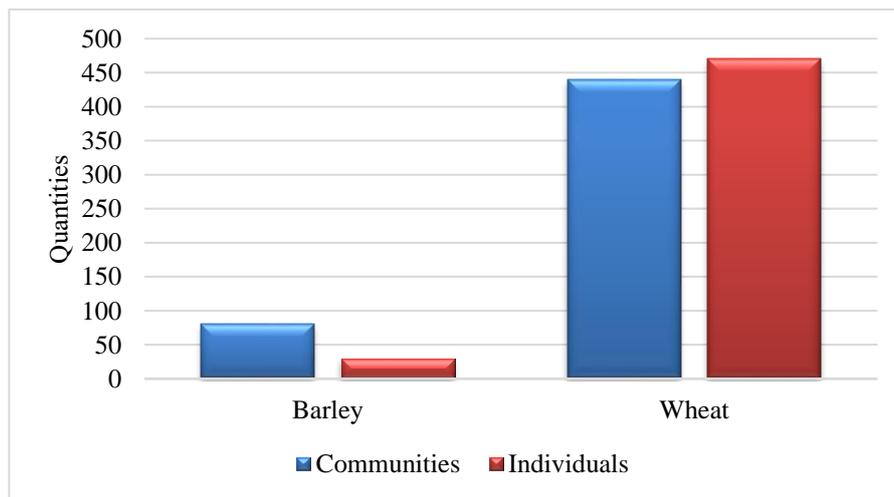


Figure III.11: Volumes of wheat and barley per medimnos donated to the Sicilian city, Entella in the middle of the third century BC.

Additionally, the lack of wheat in the Mediterranean region can be seen by comparing cereal prices per *medimnos* in Cyrenaica with those of other regions in the fourth century BC. In this respect, the epigraphic data indicates Cyrenaican crops were cheaper. According to the *demiourgoi* inscriptions, the price of barley ranged from between 1 to 2 drachmas per *medimnos*, while wheat cost from 1 drachma 4 obols to 3 drachmas per *medimnos* (App. II. C.1). However, Applebaum (1979: 108) listed the prices outside Cyrenaica at 1 drachma 4 obols to 2 drachmas and 5 obols for barley and 3 to 5 drachmas for wheat. In other words, the diversity of barley and wheat prices outside

and inside Cyrenaica is chiefly to reflect relative abundance or scarcity (Figure III.12). Applebaum (1979: 108) argues that these differences in grain prices may have encouraged Cyrenean farmers to export their surplus production of this basic commodity. Wheat would be more profitable, as the differences in its price at the two comparable places represent higher costs (Table III.3). In the motherland, the difference between wheat and barley rates are noticeable, wheat comprised 64% and barley 36%. Since wheat prices were almost double those of barley, it is probably a sign of wheat shortages in the 4th century BC (Table III.4).

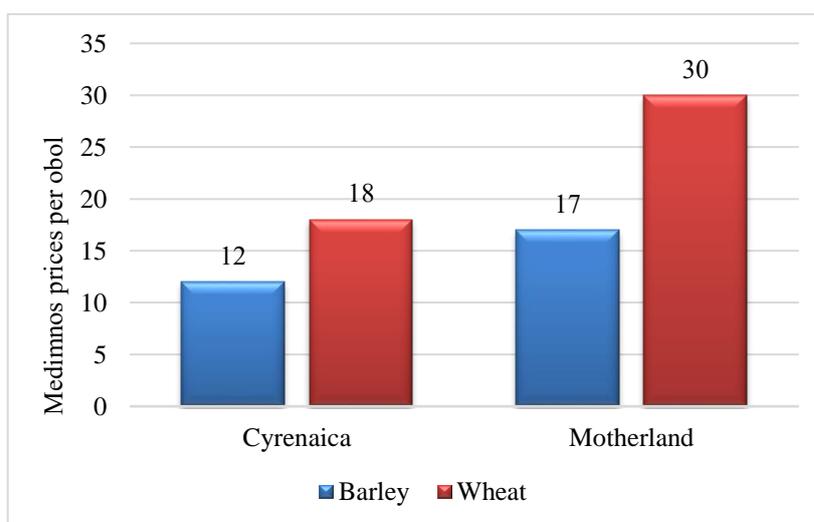


Figure III.12: A comparison of the highest prices of wheat and barley per medimnos in Cyrenaica and the Greek motherland in the 4th century BC. 1 drachma = 6 obols.

Product	Price in Cyrenaica	Price in motherland	% Difference
Barley	2 drachmas (12 obols)	2 drachmas and 5 obols (17 obols)	5 obols (42%)
Wheat	3 drachmas (18 obols)	5 drachmas (30 obols)	12 obols (67%)

Table III.3: The highest price of wheat and barley in drachmas and obols per medimnos recorded in Cyrenaica and the Greek motherland in the 4th century BC.

Product	Price	% Difference
Barley	2 drachmas 5 obols (17 obols)	36%
Wheat	5 drachmas (30 obols)	64%

Table III.4: The highest prices of wheat and barley in drachmas and obols per medimnos recorded in the Greek motherland in the fourth century BC.

III.3.5.2 Regional prices in the 4th and 3rd/2nd centuries BC

Locally, the difference in price between wheat and barley in the fourth century BC is quite modest in comparison to the 3rd/2nd centuries BC prices. This is clear especially when each case's records are compared in the same inscription. In the 4th century BC, the

biggest price difference was 1 drachma per *medimnos*. For example, in the inscription DMI 3 (App. II. C. 1) the price of wheat was 2 drachmas while barley cost 1 drachma per *medimnos*. Their prices were otherwise much closer, as in DMI 1 and DMI 4 (App. II. C. 1), and in only one case did both products have the same price at 1 drachma and 2.5 obols (App. II. C. 1. DMI 6).

On the other hand, in the third century BC the price of wheat is recorded as increasing to between 8 and 9 drachmas, as in DMI 18 and 25 respectively (App. II. C. 2). Unfortunately, only the inscription DMI 22 displays the price of barley (App. II. C. 2). It dates to the second half of the third and the first half of the second century BC. This indicates that wheat cost 5 drachmas while barley cost 2 drachmas 1 obols. In other words, the result of comparing the highest prices of both products in the fourth century BC and third/second centuries BC reflects that the price of wheat changed from 3 to 9 drachmas, while barley rose from 2 drachmas to 2 drachmas 1 obol (Figure III.13 and Table III.5). While the price of barley increased by 1 obol only, wheat increased by 6 drachmas (36 obols). This clear increase in the price of wheat in the 3rd and 2nd centuries BC is perhaps because more wheat was exported to the global market, creating a degree of local scarcity.

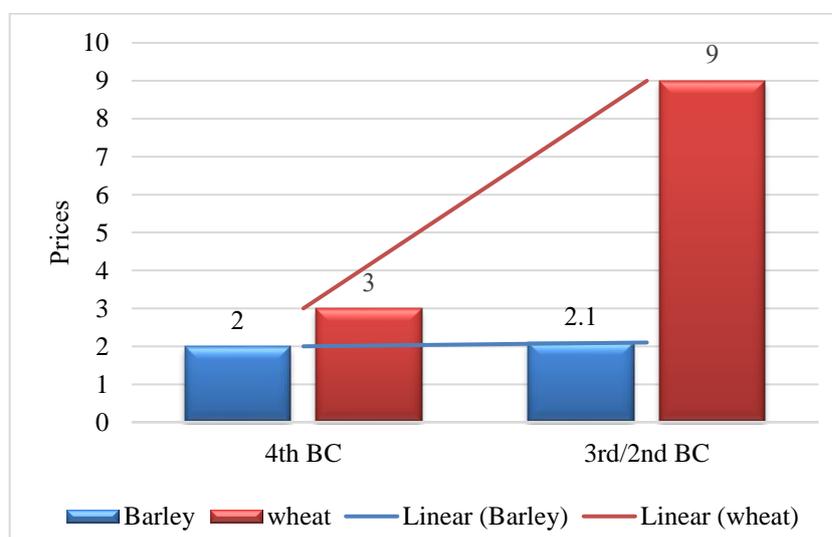


Figure III.13: Comparing the highest prices per drachma and obol of barley and wheat in the fourth BC and the third/second centuries BC.

Per medimnos	The 4 th BC	The 3 rd /2 nd BC	Increase
Barley	2 drachmas	2 drachmas 1 obol	1 obol
Wheat	3 drachmas	9 drachmas	6 drachmas (36 obols)

Table III.5: The average increases in barley and wheat prices in the fourth BC and the third/second centuries BC at Cyrene.

The noticeable increase in the wheat price to reach 9 drachmas per *medimnos* in DMI 25 is worthy of examination. This increase is more likely due to the impact of inter-regional markets on wheat rather than a poor harvest, for several reasons. Firstly, the high cost of wheat in the third century BC is also shown in other *demiourgoi* evidence at 8 drachmas (App. II. C. 2. DMI 18). Secondly, the prices of cultivated hay (κάρφη ήμέρα) per carload and straw (ἄχυρα) per net in some of the *demiourgoi* evidence are important to interpreting this. Since cultivated hay and straw (ἄχυρα) are by-products of wheat and barley, their prices should show similar trends. Although the price of straw is missing from the inscription in question, the price of the cultivated hay is recorded. Additionally, both types of hay appeared in the other two inscriptions and clearly indicate that a proportional relationship existed between wheat and its by-products (DMI 20, DMI 22). There was a direct relationship between the price of straw and cultivated hay and wheat in those two inscriptions (Table III.6). In DMI 22, wheat represented a lower price than that of DMI 20 and, subsequently, the straw and the cultivated hay indicated also less cost. Moreover, the cultivated hay appeared in the same inscription, DMI 25, where wheat cost 9 drachmas, and cost 32 drachmas per cartload. In contrast, the cultivated hay respectively cost 65 and 40 drachmas per cartload according to the inscriptions DMI 22, DMI 20, while wheat cost 6 and 5 drachmas only (Table III.7). A price of 32 drachmas for cultivated hay probably indicates a good harvest, and increasing wheat prices were perhaps the result of marketing this good outside the region.

Reference	Wheat	Cultivated hay	Straw (ἄχυρων)
DMI 20	6	65	20
DMI 22	5	40	10

Table III.6: The relationship between the cost in drachma of wheat per medimnos and straw per net and the cultivated hay per carload (red arrows represent decline and green arrows represent growth).

Reference	Wheat	Cultivated hay
DMI 22	5	40
DMI 20	6	65
DMI 25	9	32

Table III.7: The relationship between the cost in drachma of wheat per medimnos and cultivated hay per carload (red arrows represent decline and green arrows represent growth).

III.3.5.3 Swapping the sequence of barley and wheat in the *demiourgoi* inscriptions of Cyrene

The sequence in which cereal products were presented in the epigraphic evidence in Cyrene reflects a change in the position of wheat over time. All texts of the *demiourgoi* collection of the fourth century BC recorded barley before wheat, while those of the third/second centuries BC listed wheat before barley (App. II. C. 1, 2). This change does not seem to have been merely an accident, but is probably related to the significance of wheat as traded commodity at Cyrene.

III.3.5.4 Quantities of wheat and barley in the *demiourgoi* inscription of Cyrene

The quantities of wheat and barley displayed in the Cyrenaean *demiourgoi* collection include only two texts from the second century BC (App. II. C. 2, DMI 23, 24). In both wheat appeared in higher volumes than barley. In the first indication, the wheat's volume is 42,000 *medimnoi* while barley's is 24,000 *medimnoi*. In the second record, wheat is 308 *medimnoi* while barley is 180 *medimnoi*. Although the second indication shows much lower quantities, the relationship between the two cereals remains more or less identical with wheat representing 64% or 63% of the total grains (Table III.8). Cultivating larger volumes of wheat may suggest it was being exported.

Inscription	Wheat	%	Barley	%
DMI 23	42,000	64%	24,000	36%
DMI 24	308	74%	180	26%

Table III.8: Quantities of wheat and barley production and percentages (App. II. C. 2).

III.3.5.5 Wheat of Cyrene in ancient documentary sources

Wheat grown in Cyrene is mentioned by many literary documents on different occasions (App. I. A. 1). For example, Pindar (*Isthm*, IV. 54) described the area around Cyrene as wheat-bearing (*πυροφόρον*). Another promising literary indication of this comes from the work of Theophrastus (*Hist.Pl*, VIII. iv. 3), who described Cyrenaican

wheat as one of the six kinds of wheat known to exist in his time. This maybe reflects the status of trade in the region's wheat in the fourth century BC. Nevertheless, Polemon Periegetes (Polemon of Athens) (*Fragmenta*, Caput II, Ἑλλαδικός, B, Argolica XII), in the second century BC, made the most important mention of wheat exports from Cyrenaica. He frequently indicated sending wheat from Cyrenaica to Argos. This perhaps referred to cereal shipments sent from Cyrene at the beginning of the Hellenistic period contained wheat (πυρός):

ὥς ἐν τῇ Ἀργείᾳ σπαρέντος τῶν πυρῶν σπέρματος, ἐκ Λιβύης Ἄργου μεταπεμψαμένου. διὸ καὶ Δήμητρος Λιβύσσης ἱερὸν ἵδρυσεν ἐν τῷ Ἄργει, ἐν Χαράδραις οὕτω καλουμένῳ τόπῳ, ὡς φησι Πολέμων (Aristides, *Παναθηναϊκός*, Vol. I. 188. 12, Cited in Reimer 1829: 321, 322)

The seed of wheat was sown in Argos and he had ordered them from Libya. That is why the sanctuary of Demeter Libyssa ('Libyan') was founded in the place called Charadrai in Argos, as Polemon reported (Author's translation).

The importance of Polemon's hint lies in his use of the word 'wheat' (πυρός) and his mention of the city Argos. This city was among those whom received considerable quantities of cereals according to the Grain Decree of Cyrene discussed above. It received 50,000 *medimnoi* of cereals, which is the third largest quantity after that of Athens, which received 100,000 *medimnos* and Olympias which obtained 72,600 *medimnoi* (IGCyr010900). The significance of Cyrene's wheat can be understood also from the shrine of Demeter of Libya (Δήμητρος Λιβύσσης) that was established in Argos. This is probably an indication of the whole region's importance to the cereal trade. In addition, appreciation for the cult of Demeter of Libya is perhaps an implicit reference to Cyrenaica's fertile lands and its productive capacity for cereal in general and wheat in particular.

It is important to mention that the importance of the cult of Demeter and her daughter Persephone (Kore) during the Greek, Classic and Hellenistic eras at Cyrenaica can be understood from the variety of relevant literary and archaeological data. The largest extramural sanctuary of Cyrene was devoted to the cult of these goddesses. The

city also possessed another temple of Demeter and Persephone in the agora (Callimachus, *Hymn VI*. 1, 2; Kane 1985: 237-48; White 1981:13-3; 1987: 67-84). Demeter's sanctuary clearly expanded from the Hellenistic period onwards to exceed in size and complexity even her largest sanctuaries in mainland Greece and Asia Minor, such as at Corinth, Priene and Pergamum. This is probably a hint of Cyrenaica's increasing concern with growing cereal at this time and after (White 1981: 19; 2008, 161-162 Cited in Constantinou 2014: 42, 43). Furthermore, in Roman Cyrenaica, the worship of Demeter and Persephone (Kore) has been of much concern. This can be seen in the number of epigraphic dedications to both goddesses in the first and second century AD. The inscriptions C.937 and C.938 from Cyrene and the [unpublished] inscription T.17 from Taucheira (Tocra) are good examples of this (*IRCyr*). The most interesting epigraphic dedication mentioned that Kore presides over grain, and has been dated to the late second and beginning of the third century AD:

Ἑλβία Τειμαρέτα κατ' ὄναρ χρησμών λαβοῦσα ἀνέθηκε Δήμητρι καὶ
Κόρηι Κόρης ἄγαλμα τὴν ἐπὶ τοῦ σείτου (*IRCyr.C.910*)

Helvia Timareta, having received an oracle in a dream, dedicated to Demeter and Kore, this statue of Kore (who presides) over the corn (Reynolds: 462-63 with some change).

Furthermore, despite the limited archaeological evidence relating to the importance of the Cyrenaican wheat, the literary documents clearly highlight its value. They usually talk about Cyrenaican cereal in general, but in some cases, specify whether they are referring to wheat or barley. These frequent mentions represented wheat more than barley, and they demonstrated the significance of wheat in each literary context (Figure III.14 and App. I. A.1. 1, 10). For example, Theophrastus (*Hist.Pl*, VIII, iv. 3) determines six types of wheat that were known in his time and, he says, that they take their names from the areas where they were cultivated. The wheat from Libya is the first one to be mentioned in his list. However, barley, also from here, is mentioned in literary sources once and in a less significant context. Theophrastus (*Hist.Pl*, VIII. vi. 5) indicates the cultivation of barley in different places, including the lands around Cyrene and Euesperides where zones received little rain but the dews provided the plant with the water they needed.

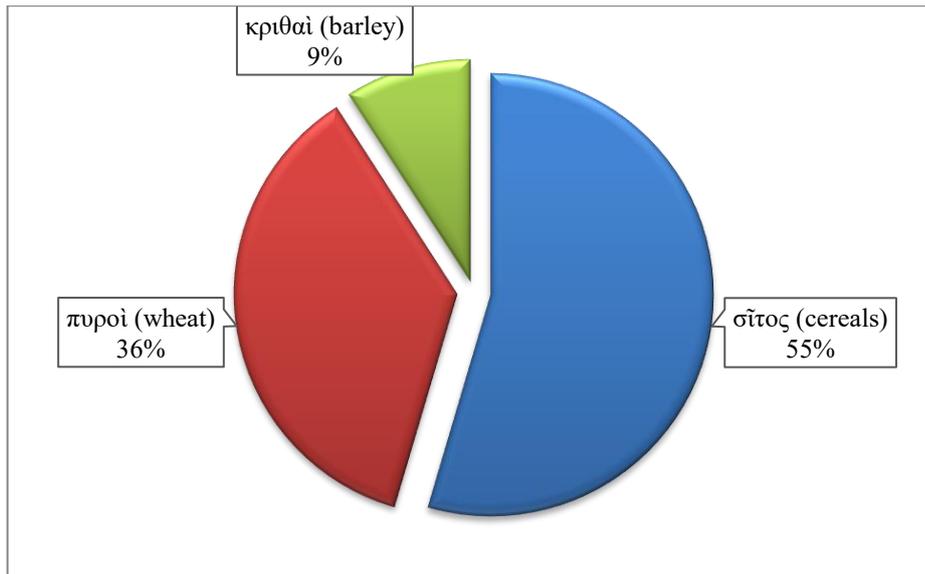


Figure III.14: Percentage of uses of the words ‘cereal’, ‘wheat’ and ‘barley’ in Greek and Roman literary documents (Based on the author literary collected data in App. I. A. 1)

Therefore, the lack of wheat in some non-Cyrenaican cities, the lower price of Cyrenaican wheat in the 4th and 3rd/2nd century BC in contrast to those outside the region, increasing its local cost in the 3rd/2nd centuries BC in comparison to barley, recording wheat before barley in the *demiourgoi* inscriptions of Cyrene in the 3rd/2nd centuries BC as compared with the 4th century BC, representing wheat higher quantities than barley in the *demiourgoi* inscriptions of Cyrene and stressing Cyrene’s wheat value by ancient documentary sources all perhaps support the suggestion that the word ‘σῖτος’ ‘cereal, corn or food’, which was used in the preamble of the Grain decree of Cyrene, represents wheat in particular.

III.3.6 Export of cereals (Wheat and barley) as an indication of the region’s commercial connectivity in the Hellenistic period.

The cereals grown in Cyrenaica dominate the documentary sources relevant to the region’s economic history from the fifth century BC (App. I. A. 1). However, the Grain Decree of Cyrene of 805,000 *medimnoi* (22,057 tonnes) is important evidence of Cyrenaica’s cereal maritime trade at the end of the fourth century BC/beginning of the Hellenistic period (*IGCyr010900*; *SEG* 9. 2). This evidence has been examined above as it relates to annual crops including wheat and barley. Cyrene supplied more than 40 Greek

cities with wheat, most of which were in the Greek mainland and the Peloponnese in addition to Crete and some of the Aegean islands (Bresson 2016: 47; *IGCyr010900*). This decree could provide us with some idea of the cities that Cyrenaica commercially interacted with in this period. It may also represent a general picture of amount of cereals produced and the size of any surplus. Furthermore, the data on this Decree allows us to assume Cyrenaica had stronger trade ties with these areas (Figure III.15).

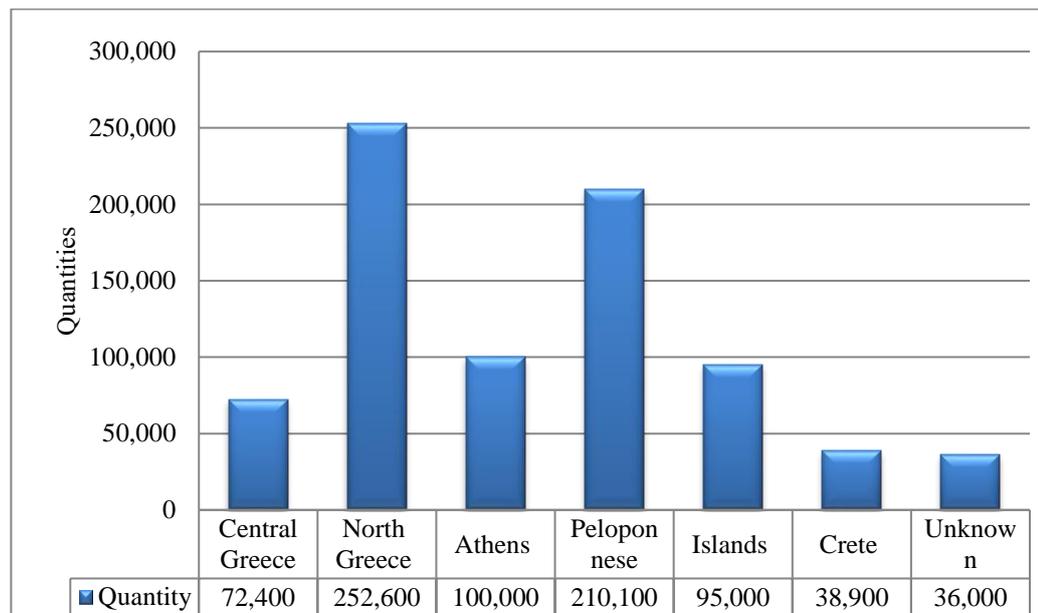


Figure III.15: The recipients of Cyrene’s cereal consignment of 330-326 BC. Quantity in medimnos received by each region (Bresson 2011: 76. Fig. 4. 3; *IGCyr010900*).

Regions of north Greece and Peloponnese received the two largest quantities of cereals, respectively gaining 31% and 26% of the consignment total. Athens alone received the largest amount among all cities (Figure III.16). In addition, as eight of the supplied cities received cereal twice in different volumes, it is reasonable to expect that the ships which carried the lower quantity probably also loaded with it other products such as silphium, olive oil and wine. These cities are Olympias, Meliboea and Ambrakia in North Greece, which gained 31% of the total supplied cereals, and Megara, Aegina and Kythera which who gained 26% (Table III.9).

It is also important to state that Kythera (Κύθηρα) island, which was mentioned by Thucydides (*Pelop. IV. 53*), as a location where the Egyptian and Cyrenaican commercial ships could be encountered, is among the cities which were received cereals twice. This may suggest that the island was one of Cyrenaica’s grain markets from the fifth century

BC, and was perhaps a transshipment point between the region, the Peloponnese and north/central Greece and Attica itself. If this was the case, a cereal exchange probably occurred between Cyrenaica and some of these regions earlier than the Hellenistic period. The question, then, is: what did the Cyrenaican ships bring from these districts in return? The archaic and classical Corinthian fine pottery found at Cyrene and Teucheira (1999: 118-47) and the Attic Black-figure distributed over most of the Cyrenaican archaeological sites (Elrashedy's 1985: 205-17; Schaus 1985: 397) are probably an indication of the size of Cyrenaica's exports of various commodities, including cereals.

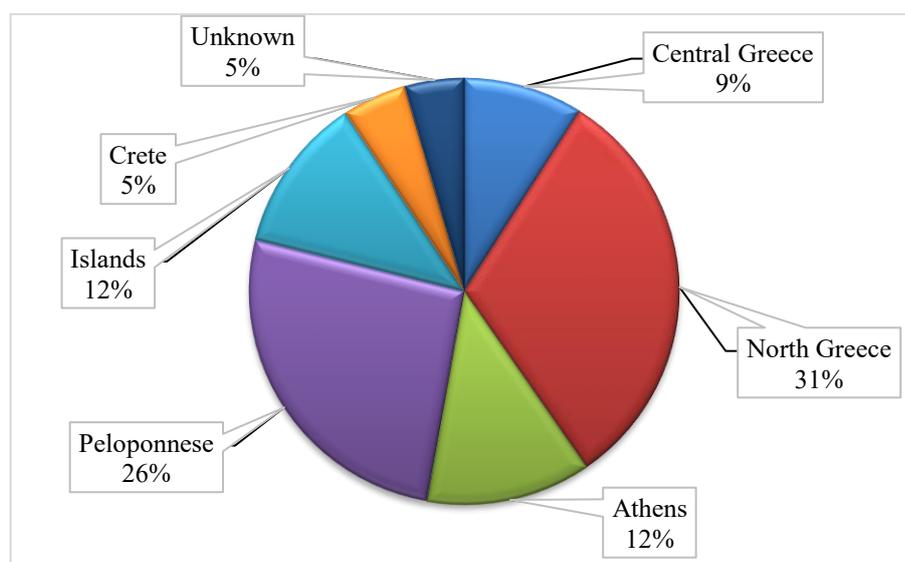


Figure III.16: Percentages of Cyrene's cereal received by each region (Author's data based on Bresson 2011: 76. figs. 4. 3).

Recipients	Qua. in <i>medimnoi</i>	%	N. of cities received cereal twice	Names of cities received cereal twice
Central Greece	72,400	9%	1	Oeta
North Greece	252,600	31%	3	Olympias, Meliboea, Ambrakia
Athens	100,000	12%	0	
Peloponnese	210,100	26%	3	Megara, Aegina, Kythera
Islands	95,000	12%	0	
Crete	38,900	5%	1	Knossos
Unknown	36,000	5%	0	

Table III.9: Cyrene's cereal recipients, quantities, percentages, and the number of cities which received grain twice in each region (*IGCyr010900*).

III.3.7 Cyrenaican cereal during the Roman period

III.3.7.1 Cereal production in Cyrenaica in the period of transition from the Greek to Roman in the 1st century BC

The economic importance of grain in Roman Cyrenaica seems to have continued as can be evidenced from the historiographical and epigraphic data. The cereals of Cyrenaica have been mentioned in the literary documents of the Roman era on different occasions (App. I. A. 1). For example, Caesar (*Civil War*, III. 3), in the first century BC, informs us that Pompey collected huge quantities of grain during his struggle against Caesar in order to support his fighters. Cyrene was one of the few named terrains. Another interesting literary allusion to Cyrenaican grain of the same century comes from Lucan (*Pharsalia*, III. 1). Although Lucan's indication may have been built on Caesar's texts, it should not be ignored. He emphasised the logistical support of Cyrenaica during Caesar's war when he commented on its fertile soil and described it as a granary of Rome. This picture may mirror the different effect of transferring the region to the Rome immediately after the death of Ptolemy Apion in 96 BC. Instability was the general condition of Cyrenaica in the first century and it may have affected the region's economy at least in the first three decades. However, Cyrene was able to survive and may have exported grain as the literary sources highlighted. Furthermore, there is some epigraphic evidence that reflects the good economic condition of this city in the first century BC. The most important example is an honorific decree from Cyrene dated to 31 BC and 16 AD. It indicates that the Athenians honoured officially the Cyrenean Philoxenos son of Philiskos because of his good will. They awarded him a golden crown with a purple stripe and a gilded shield adorned with a portrait of him. The decree recommended that the shield portrait be set up at the most prominent place of the city (*IRCyr.C.952*). According to the decree another statue was erected at Athens as well. Although the Athenians did not explain what the benefaction or deed is that the honoured man had done to them, it is quite likely to relate to wheat, which Athens always lacked. Another interesting piece of evidence of Cyrene's good economic condition is a decree dated to 67 BC (*IRCyr.C.429*; *SEG* 20. 2015). This decree refers to some people whom were doing business in Cyrene. Unquestionably, existing business in the city is an obvious indication of the normal economic trade in this era. The question, then, is what commodities they were trading.

Cyrenaican surpluses were sometimes used to sort out local shortages. Tocra honoured the citizen Aleximachos (Ἀλεξίμαχος) in the end of the second or the beginning of the first century BC (Laronde 1987: 472-79; Reynolds 1976; *SEG* 26. 1817). This decree records that Arsinoe (Tocra) honours him as a benefactor and provides a clear explanation. Aleximachos offered his city a consignment of grain from his own stock of grain while it was suffering from a lack of food supply and was not able to buy it from Lepcis Magna. The value of this epigraphic evidence in this context lies in its clear indication of the main reason that caused a grain shortage at Tocra. The text indicates that the city was at war with the Libyans. This means that the city could not rely on the nearby countryside to produce its need for cereals, as it had become unsafe. It is thus logical to assume that cereal grown in the city's rural area was sufficient to supply this city in peacetime. It can be suggested that Tocra may be exported cereal in normal times due to the fact that Aleximachos owned a considerable volume of grain in his store. The price of this quantity is estimated at 2 *talents* ($2 \times 60 = 120$ minai) and 30 minai (3000 drachmas) by the honourees (about these currency values see App. IV. C). The total equals 15,000 drachmas ($120+30$ minai $\times 100$). It is thus likely that Aleximachos was a grain trader. He was profiteering from the price rise, but in the end was willing to help his fellow citizens. Surely the implication is that if he had been willing to make the grain available sooner there would have been no shortage. This notion is implicit in this part of Aleximachos' decree:

stating that the price of corn was rising, he took on the duty of corn-buyer, so that the corn would be retailed at 2 *talents* and 30 *minai*; that, eager to quickly dispatch the corn, he generously promised that the increase of his own wealth would be chiefly dedicated to public service on behalf of the safe guarding of the masses (*IGCyr066900*).

Therefore, the detailed information in this decree can help us to interpret the probable aims of many other honorific inscriptions elsewhere in Cyrenaica during the early Roman Empire. The inscription of the citizen of Ptolemais Maskika Agameneos who was also honoured by the Arsinoeans (citizens of Tocra) is a case in point (*SEG* 9. 417). Although the latter does not record the aim of charity of this person, this can be regarded as another evidence reflecting on the economic condition of this city.

III.3.7.2 Cyrenaican cereals in the second and third centuries AD

Although the direct evidence of cereal cultivation in Roman Cyrenaica is quite scarce, it is very important. The most important evidence is the literary reference of the Roman jurist Scaevola (App. I. A. 1.24). The Roman *Digesta* tells us that Scaevola, who lived in the second century AD, referred to a small cargo of cereal and olive oil that was traded from Cyrene to the Italian city of Aquileia. The cereal volume was 8,000 *modii* ($6 \text{ modii} = 1 \text{ medimnos} = c.27.4 \text{ kg}$), therefore, $(8,000 \div 6 \times 27.4)$ would be *c.*36 tonnes or 360 quintals if the cargo was barley. But in case the cargo was wheat, the volume would be *c.*40 tonnes or 400 quintals $(8,000 \div 6 \times 30)$. The cargo also included a quantity of olive oil at 3,000 metretai ($1 \text{ mētrēta} = 9 \text{ gallon} = 4.54609 \text{ liters}$). Thus, the olive oil amount would be about $(9 \times 4.54609 \times 3,000 = c. 120,000 \text{ L} = 120 \text{ tonnes})$. These volumes were identified as following:

Navem conduxit, ut de provincia Cyrenensi Aquileiam navigaret olei metretis tribus milibus impositis et frumenti modiis octo milibus certa mercede. (Digest of Justinian: Liber XIX- Library. Dig.19.2.61.1. Scaevola 7 Dig.).

A man leased for a certain sum a vessel to sail from the province of Cyrene to Aquileia, it being loaded with three thousand measures of olive oil and eight thousand bushels of cereal... (Scott 1932: 19.2. 61. *Scaevola, Digest, Book VII*).

The cereal consignment of *c.*40 tonnes that exported to Italy in the second century AD is not comparable to the quantity exported from Cyrene in the Hellenistic period which was estimated by Bresson at *c.*22,057 tonnes (2011:87). However, the total weight of the consignment in a single ship including cereal and oil of about 160 tonnes may help us to approximate the number of small ships that were used to export the 22,057 tonnes in the Hellenistic time. If so, the Hellenistic cargo needed a fleet of about 141 small ships to carry the cereals to the other Greek cities. In fact, this is the normal size of the Greek ships in the Hellenistic period which did not exceed 150 tonnes (Wilford 1993).

In addition, the epigraphic evidence reflects implicitly the importance of the region's corn. This may also be reflected in the Roman concern for Demeter and Kore's cult. The good example of this is the written text on the base of the white marble status

of Kore which was dedicated to Demeter and Kore in the period between the end of the second or early third centuries AD at Cyrene. This text describes Kore as presiding over cereal “... Κόρης ἄγαλμα τὴν ἐπὶ τοῦ σείτου...” (*IRCyr.C.910*; Kane 1985: 455-6; *SEG* 35.1721). Another interesting example of the important position of the cereal goddesses Demeter and Kore is an inscription on a marble block found in the Extramural Sanctuary of Demeter and Kore at Cyrene (Mohamed and Reynolds 1994: 211-218). The block bears three separate inscriptions dated to the late second century AD. One of these refers to a company of collecting tax or a group of *publicani*, revenue collectors. Other evidence relating to the *publicani* is a list of names of *procurators* (financial managers) and *publicani* that have been recorded in the Cyrenaican inscriptions (Goodchild and Reynolds 1962; Gasperini 1957-1966; Robert 1968; Vickers and Reynolds 1971-72). However, tax collecting must have existed in Cyrenaica before Roman times. Applebaum (1979: 207-8) argued that the role of the *publicani* may have negatively affected some cultivated lands and that consequently led to the destruction of the silphium.

The Romans were not much interested in the province of Cyrenaica immediately after the death of Ptolemy Apion in 96 BC. Even after the annexation of the region in 75/4 BC, Roman authorities were only concerned about collecting revenue from the royal lands which had become the public land of the Roman people, *ager publicus populi* (Oliverio 1933a, compiled in *SEG* 9. 165/66, 352, 360; 26. 1819, 1840 and Reynolds 1965; 2000). However, the Roman policy of restoring lands as identified by many boundary stones which are dated to the first century AD, when taken with the appointing of companies for tax collection, is an obvious indication of their interest in realising the province’s agricultural potential from the first century AD onwards. If this was the case, economic growth may be expected in the region during this era as tax collection is one of seven features that may stimulate economic growth according to Hopkins (1980; 1983: xv-xxi; 2002: 190-230).

Returning to the inscription of the *publicani*, the interpretation of its placement in the external sanctuary of the two goddesses may indicate something about the company’s role. The company was probably responsible for collection of revenue relating to cereals. Since silphium in the second century AD had completely disappeared from Cyrenaica, it is logical to assume that the activities of *publicani* in the region related primarily to the productive capacity of cereal.

III.4 Conclusion

The data examined in this chapter suggest that alongside pulses and other annual products, discussed in chapter II, wheat and barley appear to have been the most important cultivated crops for Cyrenaica. They (especially wheat) were probably competing with silphium itself. The suitable ecology and the distinctive agricultural pattern used were probably the main factors of a successful cultivation of these two products.

Since this chapter has provided careful reassessment of the cereal production of Cyrenaica, the quantity exported in the beginning of the Hellenistic period, as mentioned in the Grain Decree, is an important evidence of the region's considerable productive capacity of cereals. Re-examining the value of the Greek Attic unit "*medimnos*" used in the Hellenistic Grain Decree of Cyrene indicates that the exported cereal quantity (805,000 *medimnoi*) was 22,057 tonnes, exported from the one city of Cyrenaica within a year. Comparing this volume with figures of the annual total production of the cities in Attica and of the dependent cities (Lemnos, Skyros and Imbros), as reported by the Eleusis inscription of Attica (329-328 BC), it demonstrates that Cyrenaican exported grain was more than the double of the total cereal production of Attica, and about one-third more than that of the total production of all the other dependent cities.

The plausibility of the region's agricultural potential for growing cereals, as reflected in the 'Grain Decree', has also been investigated by contrasting the mentioned Hellenistic surplus with some modern statistical records dating to 1850 and 1926, when the Cyrenaican lands had not yet undergone reclamation. The record of 1850 indicates that the region exported a volume of grain of 21,270 tonnes to Egypt and that this amount is very close to that of the Hellenistic period (22,057 tonnes). Furthermore, the estimation of the arable lands of Cyrene, which were devoted to cereal cultivation, using previous land estimations and adding my approximation, displays that the Hellenistic consignment was merely 23% (or may less) of the total cereal production of the city of Cyrene alone.

Moreover, this chapter investigates the probable reason for celebrating this shipment and argues that this was due to being entirely from wheat. This led me to consider that wheat was among the essential agricultural products exported from Cyrenaica, and it may have taken the place of silphium from the Hellenistic epoch and after. Therefore, it is reasonable to conclude that Cyrenaica was strongly involved in the

inter-regional cereal market in the Greek world. This active connectivity appeared from the number of cities and communities which received grain from Cyrene according to its Grain Decree [cf. the imported commodities by the region in this period in chapter VI]. The economic significance of cereals, as an essential product exported from Cyrenaica, seems to have started from the Hellenistic period as one can understand from the Grain decree of Cyrene. Despite the lack of the archaeological evidence, some literary texts confirm the continuation of the importance of the Cyrenaican cereals during the Roman period up to the fourth century AD. As the literary sources of medieval Arab travellers, early/modern European travellers and data shown by modern statistics, have also highlighted the economic significance of the Cyrenaican cereals, it is reasonable to expect that this product was also an essential economic resource, even during the period extend between the fifth and eleventh centuries AD. Therefore, one can confidently conclude that what has been mentioned by literary sources and epigraphy about Cyrenaica's overall prolific capacity for producing grain is not surprising.

Chapter IV : Grapes Cultivation and Wine Production: Case Study

IV.1 General Introduction

The last chapter has focused on investigating cereals as an example of an annual agricultural crop. However, grapes (and related products raisins and wine) are examined in more detail, in this chapter, as a case study to assess Cyrenaica's fruit-growing potential and wine production. It is important to mention that a brief investigation of figs, almonds and olives has been made in a section in chapter II. This has provided a general picture of the region's potential for fruit cultivation. Investigating grapes and its by-products alongside these goods which probably were among the most significant traded commodities of the region, will allow me to assess the economic condition of Cyrenaica in both the Greek and Roman periods. The first section addresses the methods used for understanding the importance of cultivating grapes in the region during the Hellenistic period based on epigraphic data. It also explains the methods of quantitative assessments based on data on wine production gained from a second century AD papyrus from Cherronesos (Ras et-Tin, east of Darna), as well as some modern statistical studies related to grape production. The second section discusses a case study regarding Cyrenaica's natural potential for grape cultivation. This includes a brief introduction to the level of annual rainfall and soil types required for this kind of agriculture, along with some examples of how grapes are grown today. In addition, the introduction investigates grape-planting patterns.

IV.2 Methodology

The diversity of the available data representing the grape crop in the Hellenistic and the early/mid-Roman periods suggests implementing different approaches to obtain information about this plant. Epigraphy is the main source of our information on grape types as well as raisin and wine production in the fourth century BC and the Hellenistic period. As has been mentioned in chapter II, Greek and Roman literary references of grapes are another significant resource of information, therefore, they have been collected and classified in Appendix I.A.3. In terms of estimating wine production, a particular quantitative approach has been used based on the account of the papyrus Vaticanus Graecus II. Dissimilarities in the data means wine production has been assessed at three

levels: the minimum, average and maximum. The number of *aroura* per hectare was estimated, and the number of *ceramia* per *aroura* and the equivalent of each in litre was also taken into account. These steps and numerical data from the calculation have been simplified in a table (see Table III. 6 below). The aim of this approach is to approximate the quantity of wine production per hectare.

The quantitative assessment of Cherronesos' wine production per hectare, has been applied to another case study area of the region, but with some modifications (Table III.8). The area was selected due to the presence of considerable evidence of industrial features. It lies to the west and south of Cyrene, the western coastal line of Apollonia and around Balagrae (al-Beida). All the previously published archaeological evidence relevant to wine was collected and classified in a table (App.III. A). New data has also been collected from different resources and prepared in the same way in another table (App.III. B). Some of this new data was derived from Benghazi University's excavation at Teucheira and Omar el-Mokhtar University's excavations at Balagrae and al-Beida. Additionally, some was gathered from a survey which was conducted recently by Ahmed Buzaian (pers. comm.). Both published and [unpublished] sites have been included on a map to determine the area with the most extensive archaeological evidence of wine making. Additionally, the different landscape characteristics (annual rainfall averages and soil quality) have been considered in order to determine to what extent this area could have produced a different quantity of wine to that of Cherronesos (Ras et-Tin).

In this case study area, I have approximated the percentage of the land that was suitable for growing grapes (in hectares) based on modern data representing land classes from I - IV for two locations within the case study area (Table IV.8). The percentage of the land classes I/II of the two examined sites (the most suitable for cultivating grapes) was applied to all case study area. The total production of grapes of only half of this area has been considered to represent that of the ancient periods. Wine production of the other parts of the region has been added to that of the case study area. This has been considered as comprising 50% of the total wine volume estimated from the case study area. Then, I have assessed whether the estimated wine production could meet the region's needs. In this estimation I have considered the approximated population number in the region during the Roman period (see chapter II).

IV.3 Grapes (σταφυλαί): The Cultivated Fruit and its Products, Raisins and Wine (A Case Study)

IV.3.1 General introduction

Cyrenaican grapes were one of the most important agricultural products cultivated by the Greeks and Romans. This related not only to the tasty fruit, but also because of the material for wine production. Since wine was one of the most commonly traded commodities in the Greek and Roman Mediterranean world, an investigation into this trade could reflect the economic condition of Cyrenaica in both proposed periods. The presence of grapes in Cyrenaica can be traced through their representation in different literary and archaeological data. This case study examines the cultivation of the vine and products made from grapes, namely wine and raisins, as an example of Cyrenaica's agriculture. The case study therefore investigates whether the region's natural environment allowed for the successful cultivation of grapes. In addition, the archaeological evidence of wine production in Cyrenaica has been given careful consideration. These include the epigraphic evidence, kilns, amphorae and other elements relevant to making wine such as wine presses and vats.

IV.3.2 The environmental requirements for growing grapes

Cyrenaica's environment seems to be suited for the production of grapes. Bates (1970: 98) stated that grapes seem to have been cultivated in different parts of ancient Cyrenaica, as indeed they are today. Wilson (2004:148) also stated that the Cyrenaican landscape is very suitable for grapes. Cultivating grapes requires an average of annual rainfall of about 550 mm, although they can also be cultivated with an annual rainfall ranging between 400-600 mm (FAO 1965: 32). The deep soil of some parts of the region is suitable for planting grapes, because this type of soil can retain a considerable amount of water. The Cyrenaican plateau is the best area for growing this plant (FAO 1965: 10, 14). According to the FAO report (1965), good-quality grapes can also be grown in some areas around Messa:

The neighbourhood of Messa on the second plateau produces the best wines in Cyrenaica and probably in Libya. Equally suitable areas for vineyard are to be found along the Escarpment and on the terraced slopes north of al Bayda and extending along the slopes towards Cyrene (FAO 1965: 72).

The region's successful cultivation of grapes, in particular for wine production, can be seen in the success of a farm unit at Useta in 1966. The farm covered 50 hectares, 13 hectares of which were devoted to cereals and various pulses while about 4 hectares were devoted to cultivating seven types of fruits. The rest of the farm space was used for breeding various animals. The total income of the farm from its surplus obtained from the three enterprises was £1,291. A total of £391 (30%) came from livestock production including meat, milk, wool and eggs; £300 (23%) came from selling crops (mainly wheat and barley and different kinds of legumes), whereas a considerable part of the farm's income came from fruit production, £600 (47%), though only 4 hectares have been devoted to their cultivation (Figure IV.1 and Table IV.1). The importance question that can be addressed here is to what extent grapes had contributed to this farm's revenue? Grapes and almonds seem to have been the most important fruits grown in this farm. Grapes were cultivated in one hectare, almonds in 0.75 hectares and figs in 0.25 hectare, while the other unidentified four kinds of fruits were grown in 2 hectares (FAO 1969: 85). Grapes were grown in the largest area among the miscellaneous planted fruits in this farm, which may be an indication of the suitability of the soil for grape cultivation and demonstrate its economic value (Figure IV.2). The FAO (1969: 172) indicated that the annual cash income of each farm from selling grapes would range between £200-250 per hectare. If so, the annual profit of grapes comprises about third and sometimes more of the total fruit income of each farm. The importance of growing grapes can be seen in another detailed case study from a Cyrenaican farm at Al Hania. Although this farm was smaller and covered 10.75 hectares, grapes were grown in 50% of the land devoted to cultivating fruit. This comprised 0.5 hectare and it yielded annually about 2.5 tonnes (FAO 1969: 72).

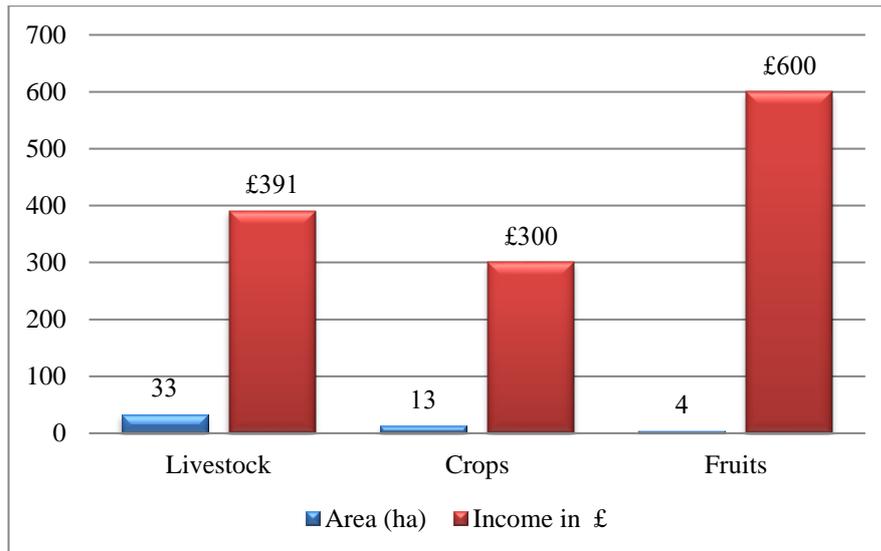


Figure IV.1: The area devoted to each enterprise in a Cyrenaican farm in 1966, and the income from each.

Activity	Area in (ha)	Income in £	Profits percentage
Livestock	33	391	30%
Crops	13	300	23%
Fruits	4	600	47%
Total	90	1291	100%

Table IV.1: The profits percentage of different practised activity in a farm at Cyrenaica in 1966 from total income of £1291.

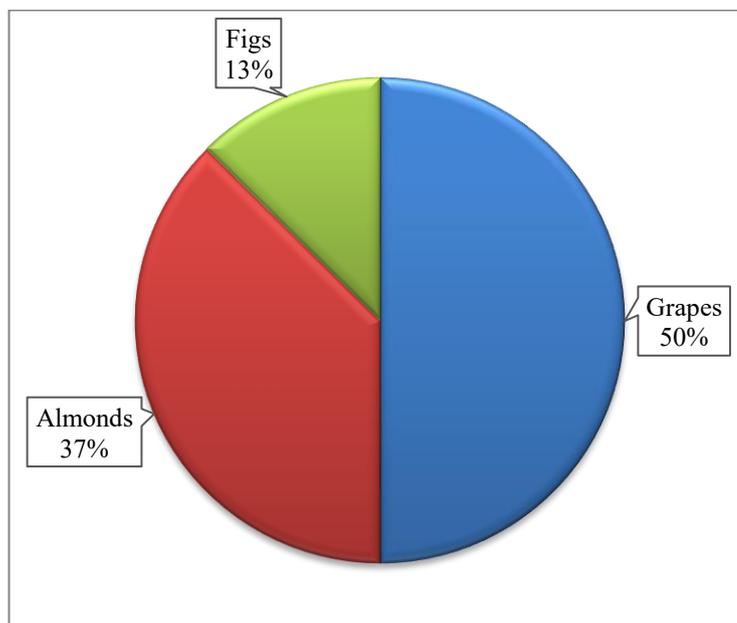


Figure IV.2: Land proportion devoted to cultivation of three kinds of fruits in a Cyrenaican farm of 2 hectares in 1966.

Another interesting example of grape cultivation in Cyrenaica concerns a wine factory which operated in Al-Bayda in the 1960s. In this period, Cyrenaican peasants sold the fruits they harvested on the open market, except for grape production because it was subsidized by the government. Wine making was a fruitful government enterprise. The government ran a wine factory in Al-Bayda and purchased the annual grape yields at fixed prices from about 400 grape growers, in particular those from Messa and Al-Bayda (FAO 1969: 166, 172). This demonstrates the importance of grape cultivation in Cyrenaica and shows that the region possesses a suitable environment for growing grapes. Greek and Roman settlers undoubtedly benefited from viticulture, in particular for making wine.

IV.3.3 Patterns of grape cultivation

From the Greek period until today, grape cultivation in Cyrenaica seems to have occasionally been associated with fig cultivation. As already noted particular days [in summer known as the Akamantia (Ἀκαμάντιων)] were associated with the cult of the wind gods in Cyrenaica. Dobias-Lalou (cited in Robertson 2010: 294; *IGCyr109200*) mentioned that the Akamantia cult was celebrated on the 26th of Heraios (July) and the 12th of Karneios, two days occurred in the beginning and middle of Cyrene's summer (Robertson 2010: 294). Robertson suggested that people probably entreated the wind to mature the figs on the earlier proposed day while asking the gods to ripen grapes by the latter day. The festivals of the Akamantia (Ἀκαμαντιάδες) were also mentioned in another sacred law inscription from Cyrene which has been dated to the first half of the third century BC (*SEG 53.2029*; *SEG 57.2010*; *IGCyr109200*).

Figs also had a place in the middle of the *demiourgoi* list of the fourth century BC, between the types of grapes and raisins (see Figure II.12 above). Furthermore, it generally appeared after wine and before raisins, although it was after raisins in one case in the *demiourgoi* lists of the third/second centuries BC (see Figure II.10 above). This may reflect the strong agricultural relationship between these two plants. Additionally, growing grapes with figs is attested by the papyrus Vaticanus Graecus II (Catani 1985:150). This evidence will be investigated in depth below. Both products were also mentioned in Cyrenaican songs, in which the Gods were still being asked to maintain yield in Synesius' time (*Letter*, 148).

It is reasonable to believe that the grape and fig seeds found at Euesperides indicate the presence of cultivated fruit rather than wild grapes, as Pelling and al Hassy (1997:1-4) suggested. These samples date to the period between the sixth and third centuries BC, and comprised the highest percentage of plant seeds collected from Euesperides. Based on the shape of the grape seeds, Pelling and al Hassy (1997: 1- 4) proposed that the grapes were most likely to be wild, but it is possible the morphology relates to a cultivated variety of unusual dimension. Wilson et al. (2005) mentioned that grapes appear to have been a favoured fruit in Euesperides, though it is not yet clear whether they were cultivated locally or imported into the region. However, as grapes and figs were cultivated together in different parts of the region, as indicated by a variety of data, grapes were more likely to have been cultivated in Euesperides (Benghazi) in the classical era in the same common pattern of cultivation. Pseudo-Skylax's (108) hint in the mid-fourth century BC should be taken into consideration in this regard. He stated that vines (ἄμπελοι) were among the plants in the gardens of Hesperides. This is probably evidence that grapes were cultivated near Euesperides at this time. Although this garden is a mythical place, Pseudo-Skylax associates it with the Libyan coast near Benghazi and his description of vines cultivated there finds support in the sizable samples of grape pips found at Euesperides and spanning in time from the sixth to third centuries BC.

IV.3.4 Epigraphic evidence of grape cultivation and raisin production at Cyrenaica in the fourth century BC

Our main source of information about grape cultivation in the region between the fourth and second centuries BC is the *demiourgoi* inscriptions. This epigraphic evidence is crucial for our understanding of different aspects of grape cultivation, in particular at Cyrene. Four kinds of grapes were cultivated in Cyrene according to the *demiourgoi* inscriptions of the fourth century (App. II. D.6). These varieties were well represented in Cyrene's epigraphic data, as they appeared in 15 out of 17 texts (Figure IV.3). This suggests that they were recorded in all lists. Grapes therefore seem to have been considered one of the city's main agricultural products in this epoch.

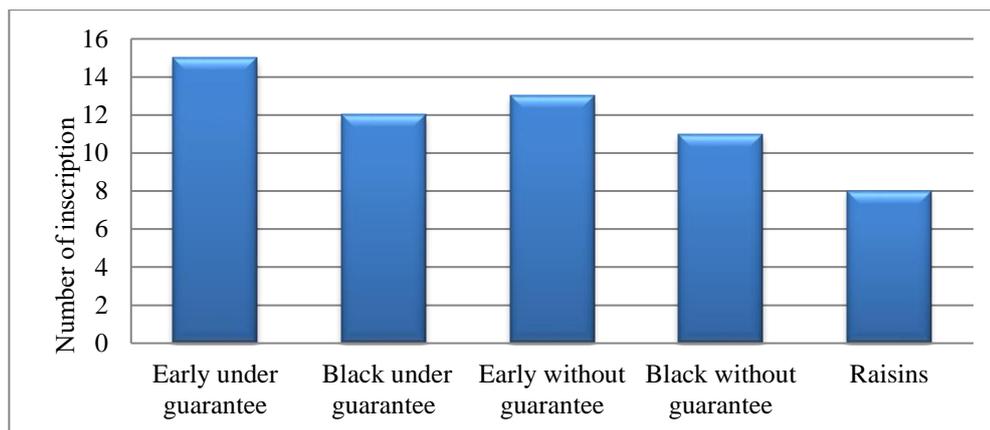


Figure IV.3: The number of the *demiourgoi* inscriptions which indicate different types of grape and raisins in the fourth century BC

Of the two types of early grapes (σταφυλά ψυθία ἔνδος τᾶς προκλησίας, ἔξος), one was under guarantee and the other was not. The early grapes perhaps represent white grapes because the second type was black. Unfortunately, they were sold in unidentified units, although the price of some of these units is clearly indicated. The prices here may have been per basket (τάλαρος), because it was used by Greeks for gathering grapes (Hesiod, *Shield of Heracles* 295). The first type sold for a higher price due to its high quality, between 3 and 8 *drachmas* for which was under-guarantee. Meanwhile, the cost of the second type, which was without guarantee, ranged between 2 *drachmas* and 2.5 *obols* and 4 *drachmas*. The other two kinds of grapes recorded in this period had the same two fold classification as the previous kinds, but were black in colour (μέλαινα). The price of the under-guarantee grapes was between 2 *drachmas* and 2, 5 *obols* and 4 *drachmas*, whereas those without guarantee cost between 3 *drachmas* and 3 *drachmas* 2.5 *obols* (Table IV.2).

Grapes classification	Early (white) grapes prices	Black grapes prices
Under-guarantee	3 - 8 drachmas	2 drachmas and 2. 5 obols - 4 drachmas
Without guarantee	2 drachmas and 2.5 obols - 4 drachmas	3 - 3 drachmas 2.5

Table IV.2: Prices of grapes types based on data collected from *demiourgoi* lists of the fourth century BC.

Grapes were classified into under-guarantee and without guarantee types, and the higher price of guaranteed grapes is probably an indication of their different economic value. Comparing the highest price per *obols* of under-guarantee and without guarantee early (white) and black grapes reveals under-guarantee grapes were more expensive

(Figure IV.4). The word ‘under-guarantee’ (προκλησίας) may be the key to interpreting this matter. It derives linguistically from the word προθεσμία which means ‘day appointed beforehand’, suggesting there was a fixed or limited time within which money was to be paid. Catherine Dobias-Lalou (pers. comm.) mentioned that the word ‘guarantee’ probably refers to a contract made between the cultivator and the buyer a long time before the crop was harvested for a price and/or quantity fixed in advance. It is thus reasonable to suggest that buyers were perhaps guaranteed a fixed quantity of grapes in order to produce raisins for making wine or that they may have traded the grapes locally as a fresh product.

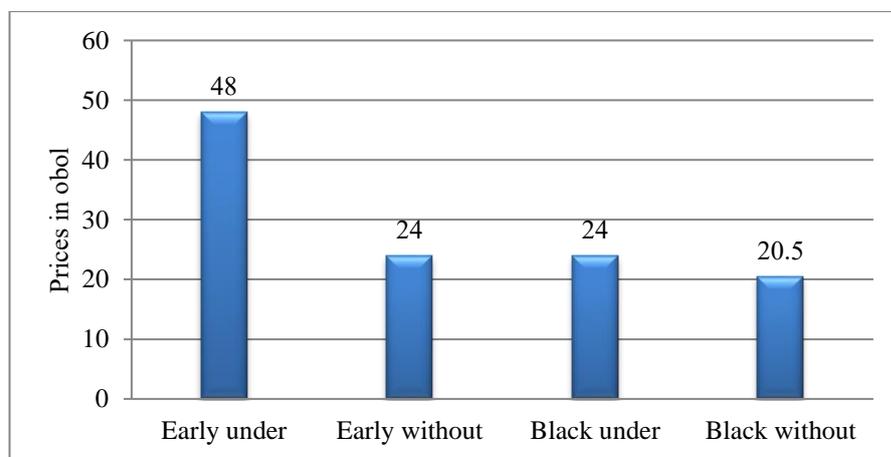


Figure IV.4: The highest prices per obols of the under-guarantee and without guarantee of both early (white) and black grapes.

The grape sequence was eighth in the list of twelve products on most of the *demiourgoi* records of the fourth century BC. However, wine was absent from this epigraphic data. Nevertheless, Herodotus provided an indirect hint about wine production which should not be ignored (IV. 199). He stated that there were three harvest seasons in Cyrenaica in three different landscapes, and the result is that after the first harvest had been eaten and drunk, the following yield became ripe and ready to harvest (...ὥστε ἐκπέπεται τε καὶ καταβέβρωται ὁ πρῶτος καρπὸς καὶ ὁ τελευταῖος συμπαραγίνεται...). The product which is both edible and drinkable after processing (ἐκπέπεται from the verb ἐκπίνω, which means ‘drink out’) is most likely to be grapes. However, in view of the lack of excavations and the use of Greek sites by the Romans, Herodotus’ hint cannot be regarded as solid evidence that wine production took place at Cyrenaica in the classical period.

Raisins are also well presented in the *demiourgoi* lists of the fourth century BC. They were recorded in most texts almost at the end, but before olives and olive oil. Though the measurement unit has not been identified, its price was displayed. Raisins in general were cheaper than grapes of different types, and ranged in price from between 4 *obols* and 3 *drachmas* and 2 *obols*. The higher price occurred only once (App. II. D. 6. DMI 13), and its peak may have been due to a poor grape harvest. The suggestion is more likely, because the best quality grapes of that year sold for 8 *drachmas* according to the same text. However, raisins in this inscription were unusually recorded before the varied grapes types. Raisins appeared after grapes in the other five inscriptions which represented them alongside all the kinds of grapes (see App. II. D. 6. DMI 1, 3, 4, 5, 6). Therefore, the change in position of raisins in the product list and the higher price in inscription DMI 13 may mirror its economic significance as a traded commodity in the regional or inter-regional market.

IV.3.5 Epigraphic evidence of grapes cultivation, raisins, and wine production at Cyrenaica in the Hellenistic period

Grapes and their products appear in more detail in the *demiourgoi* lists of the third/second centuries BC. The same four kinds of grapes and raisins sold in the fourth century BC are found again in the data of this period, alongside wine which appeared from the beginning of the third century BC (App. II. D. 7. DMI 25). Although much of the information about the products indicated by the *demiourgoi* epigraphy is illegible or missing, wine and raisins at least seem to have been present on each list. Wine, for example, appeared in 8 out of 9 inscriptions (Figure IV.5). Wine and raisins were well represented in this epigraphic data, in contrast to the different kinds of grapes (Figure IV.5 and Figure IV.6).

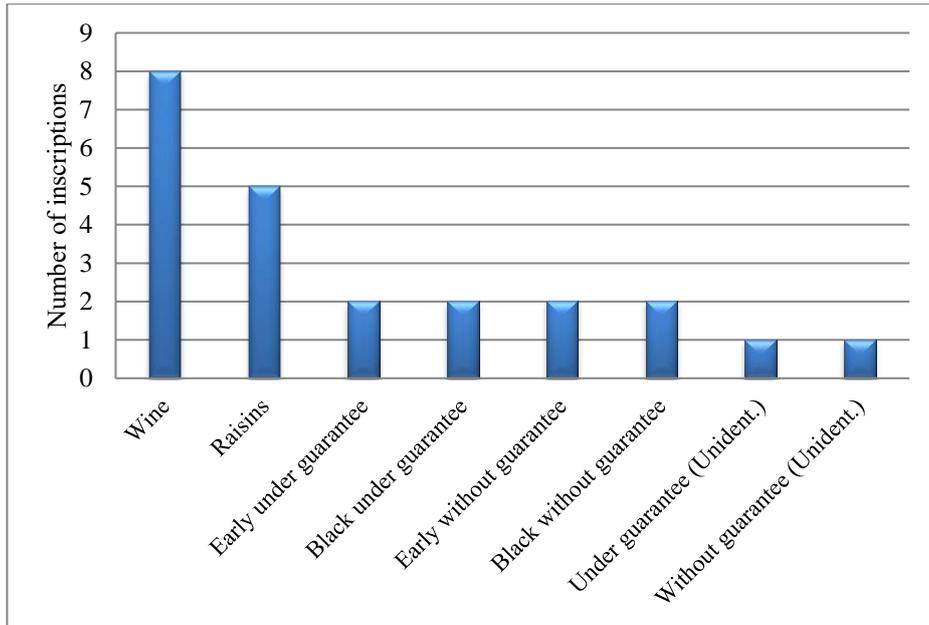


Figure IV.5: The number of the 3rd/2nd centuries BC *demiourgoi* inscriptions mentioning different types of grapes, wine and raisins, arranged according to the general order of citation the crops in these inscriptions.

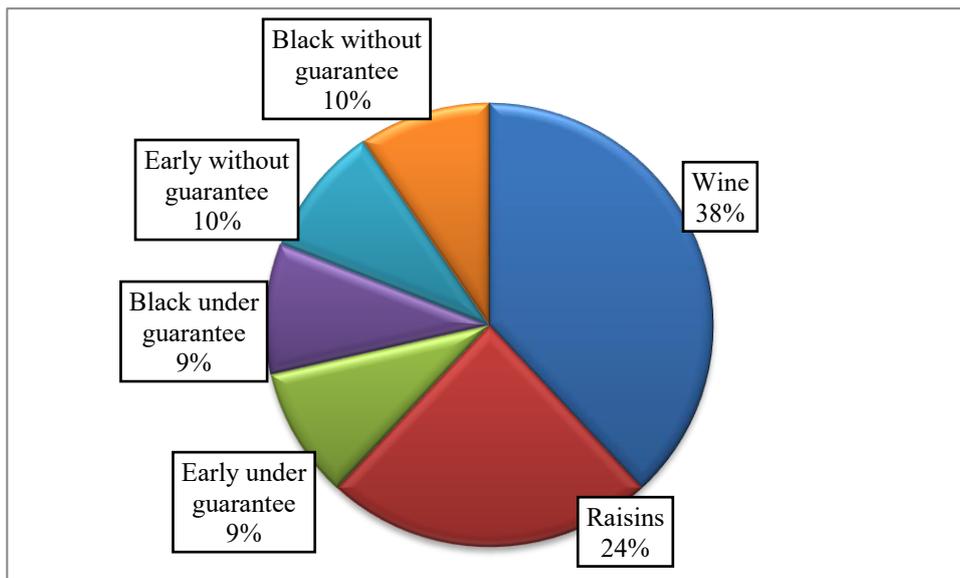


Figure IV.6: The percentages of wine, raisins and the other types of grapes present in nine *demiourgoi* inscriptions of the third/second centuries BC (excluding the unidentified types of grapes).

The products of the Hellenistic period were represented in a quite different way than those of the fourth century BC. The most noticeable change is that wine and raisins were recorded before the various types of grapes, unlike in the previous century when raisins were recorded at the end before the last two crops (see Figures II.10, 12 above).

The products were also reported in both semesters. In addition, the wine and raisin measuring units were now frequently identified. Wine was measured by the *smireus* (σμιρεύς) and raisin by the *talent* (τάλαντον). Similarly, the prices of wine and raisin were mentioned, although unfortunately the grape prices are completely missing. Raisins are represented by two dissimilar costs, according to two different texts. It sold at 20 or 7 *drachmas* per *talent* (App. II. D. 7. DMI 19, 22). The *talent* (τάλαντον) corresponded to c.27.40 kg (Stroud 1998: 54-5). If so, this large quantity was probably sold to traders rather than ordinary citizens. The price of Cyrenean raisins obviously increased to reach as high as 20 drachmas in the Hellenistic period, in contrast to the fourth century BC when it did not exceed 3 drachmas 2 obols per *talent*. The high price of raisins and the change in its position within the *demiorgoi* records of these two centuries can be considered a sign of its importance as a traded commodity.

The *demiorgoi* inscriptions also mention wine, the other important product of grapes. The first mention was in a text dated to 290-280 BC (App. II. D. 7. DMI 25). Wine cost 40 *drachmas* per *smireus* (σμιρεύς) in DMI 19 and DMI 25 inscriptions. However, inscription DMI 22 indicates lower prices of wine at 7 and 8 *drachmas* per *smireus* in both semesters (App. II. D.7; Table IV.3).

Insc.	Wine	Raisin	Cumin	Wheat	Almond	Oil	C. hay	Straw	Peas
DMI 22	7	7	7/8	5	15/6	8	40	10	-
DMI 19	40	20	20	-	-	-	-	-	24
DMI 25	40	-	-	9	-	-	32	-	6

Table IV.3: Prices in drachma for various products in three *demiourgoi* inscriptions (App. II. D.7).

The higher price of wine in the inscription mentioned above (DMI 19 and DMI 25) cannot be compared to the price of wine outside Cyrenaica, because we are still unsure about the size of the local measurement unit (*smireus*). In addition, as the wine prices appear in three inscriptions only and we are not sure about the approximate date of two of them, it is difficult to interpret the high difference between wine costs. While we cannot rule out the impacts of inflation, the fact that in DMI 19 the cost of wine is double that of raisins, unlike their equal costs in DMI 22, this suggests that other factors may be responsible for the price fluctuation. However, some questions can be addressed here. In contrast to DMI 22, if one assumes that a poor grape harvest in inscription DMI 19 made

wine more expensive, why did this not also affect the price of raisins? Was the high price of wine due to high global market demand?

The significance of wine and raisin production can be understood from their considerable presence alongside different kinds of grapes in the epigraphic evidence of the fourth-to-second centuries BC. The lists of the fourth century BC named 15 products including cereals, legumes, some types of fruit, olives, olive oil and two sorts of hay (see Figure II.12 above). Grapes and raisins comprised about a third (5 out of 15) of the total number of the recorded products in the fourth century (Figure IV.7). Alongside wine, they represented more than a quarter of the products listed during Hellenistic era (see Figure II.10 above and Figure IV.8). The decline of the percentage of these products in the *demiourgoi* epigraphic data to a quarter in the Hellenistic era is not an indication of its lower agricultural significance. This change was because nine other new products appeared in late inscriptions, comprising a range of pulses types, which had been recorded together under the term (ὄσπρια) in the fourth century, in addition to almonds, garlic and onion.

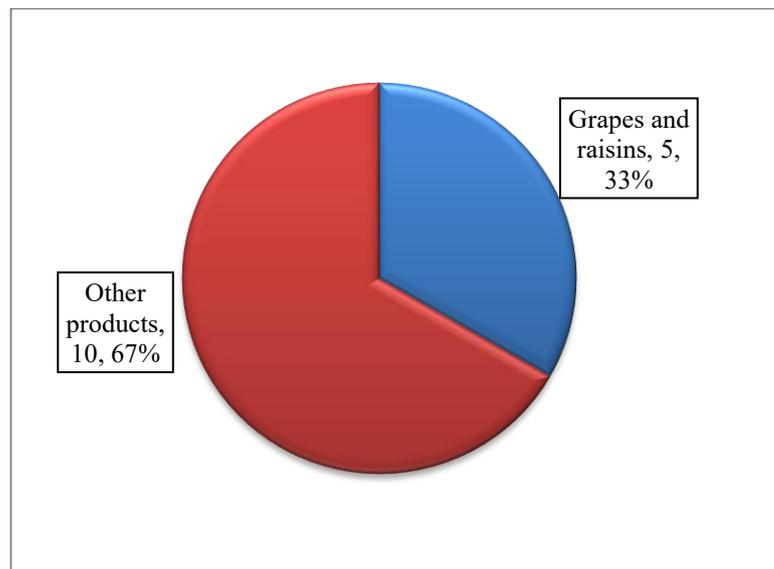


Figure IV.7: The percentage of the recorded grape types with raisins and the percentage of other named products in the fourth century BC (Based on the account of the *demiourgoi*).

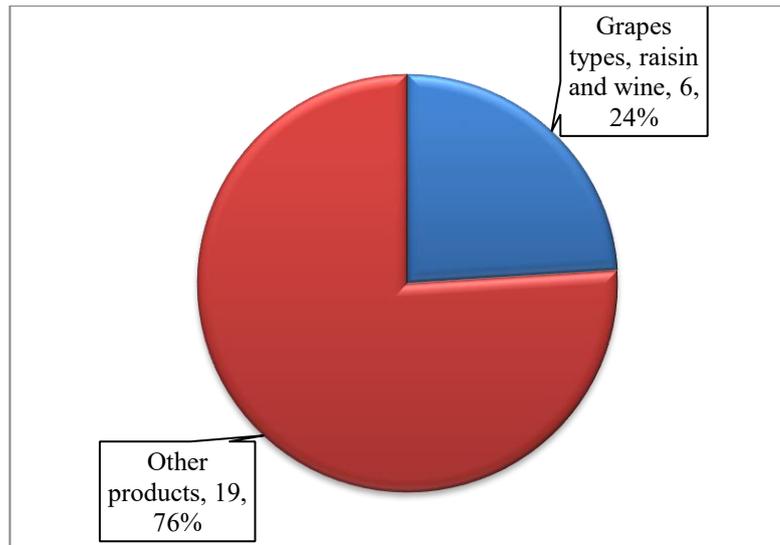


Figure IV.8: The percentage of the recorded types of grape, their products (wine and raisins) and the percentage of other named products in the third/second centuries BC (Based on the account of the *demiourgoi*).

Grapes, raisins and wine have a noticeable presence in both the epigraphy of the *demiourgoi* in the fourth century BC and Hellenistic period comprising 33% and 24% respectively of the commodities named. This can be considered evidence of their important agricultural and economic contributions. Wine and raisins seems to have been exported, at least from the beginning of the third century BC. This can be inferred from their high prices in this era, although the value of the unit used has not been identified yet. The fluctuating prices of these two products in the third and second centuries BC is probably a sign they were following a Mediterranean market (Catani 1985:149). Nevertheless, lower prices could also reflect a glut year, or poor quality vintage.

The local wine amphorae of this period found in Euesperides and Berenice provide further evidence of local commerce of this commodity (Riley 1979:199-21). Furthermore, the abundance of wine in Cyrene in the first half of the third century was noted by Theaetetus of Cyrene. This figure can be implicitly understood from one of his epigrams:

χείματος οἰνωθέντα τὸν Ἀνταγόρῳ μέγαν οἶκον ἐκ νυκτῶν ἔλαθεν πῦρ
 ὑπονειμάμενον ὀγδώκοντα δ' ἀριθμὸν ἐλεύθεροι ἄμμιγα δούλοις τῆς
 ἐχθρῆς ταύτης πυρκαϊῆς ἔτυχον.

The secretly creeping flames, on a winter night, when all were heavy with wine, consumed the great house of Antagoras. Free men and slaves together, eighty in all, perished on this fatal pyre (Anth Gr 7.444).

This text includes some important implications of high-status life in the Cyrenaican countryside in which large quantities of wine were made available, even for slaves. This figure is implicitly reflected in the Theaetetus' description which indicates that all residents, including their slaves, in the big house, or more likely a palace, did not notice the fire and all perished. This was because they had drunk too much wine. This is a supporting idea for the abundance of wine in the rural area around Cyrene.

The presence of grapes and wine of Cyrenaica in the Greek and Roman sources also noticeable (App. I. A. 3). Grapes represent an obvious presence in this data alongside olives and olive oil as the main cultivated fruits (Figure IV.9; App. I. A. 2, 3). It is important to mention that although grapes were not mentioned by Theophrastus, there are clear hints from the mid-fourth century BC. Most of these appeared in the data of the period spanning from the mid-fourth to the first centuries BC. This probably demonstrates the economic importance of these products in this period.

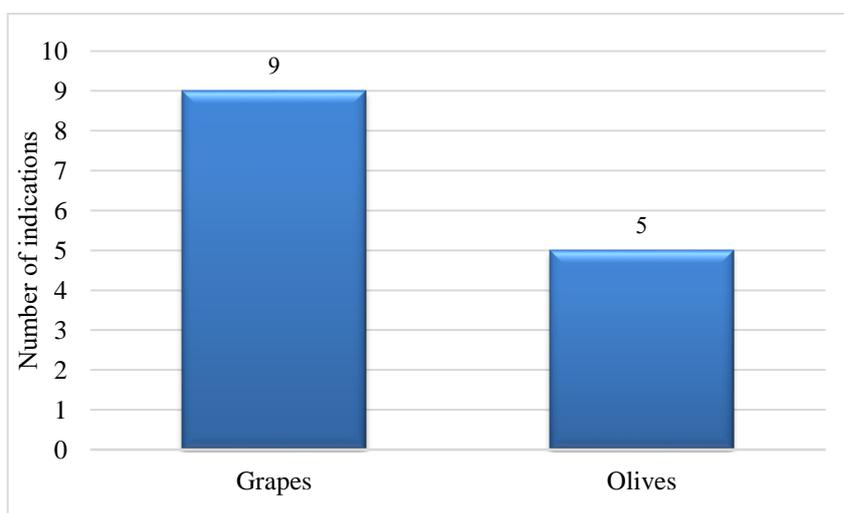


Figure IV.9: The number of references to Cyrenaican grapes and olives in the literary sources in the period between the mid-fourth and the first centuries BC.

Grapes appear to have been one of the most distinctive features of Cyrene's territory. This figure is reflected by the sculptural relief from Cyrene dated to the second century AD (Figure IV.10). A most interesting aspect of this iconography is that the sculptor used vineyards with ripening bunches of grapes to represent Cyrene's territory.

Marshall (1997:179) stated that the presentation of this iconography did not change over time from the Greek to the Roman period. This may indicate that the Cyreneans were proud of this representation. Grapes were probably associated with a local cult of the nymph Cyrene, because she was mentioned together with raisins in a sacred Cyrenean law dated to the mid-fourth/third centuries BC (*IGCyr051900*).

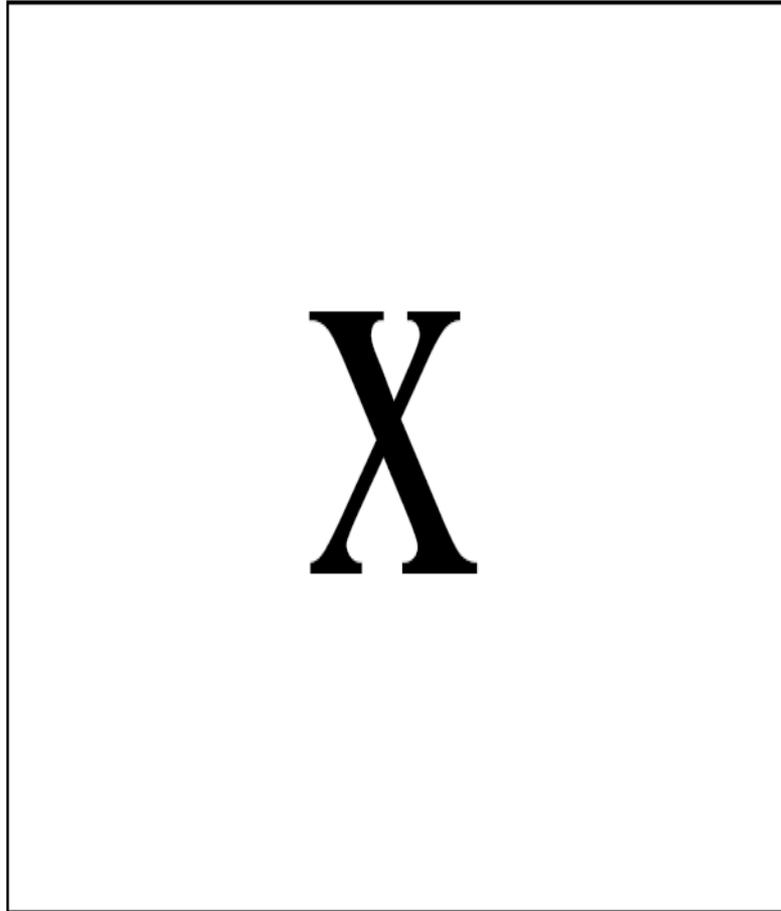


Figure IV.10: A relief representing Libya crowning the nymph Cyrene. Source: British Museum. no.1861, 1127. 30; for the inscribed text see *GVCyr029*.

IV.3.6 Documentary evidence of grape cultivation and wine production at Cherronesos (Ras et-Tin) (east of Darna) in the second century AD

Viticulture seems to have been practised in different parts of Cyrenaica, even in regions less fertile than Cyrene. The papyrus Vaticanus Graecus II of Cherronesos is important evidence of grape and wine production in the district located between the Cyrenaican pentapolis and western Marmarica (Catani 1985:150). The most important

data provided by this papyrus was a record of average wine production between AD 175-190 (Columns IX-XII). It contains a great deal of data about viticulture in this zone. Vines appear in 22 out of 77 (29%) cadastral records of different cultivated products (Figure IV.11). The presence of vines among the other products in about a third of the cadastral reports is probably evidence of its agricultural importance.

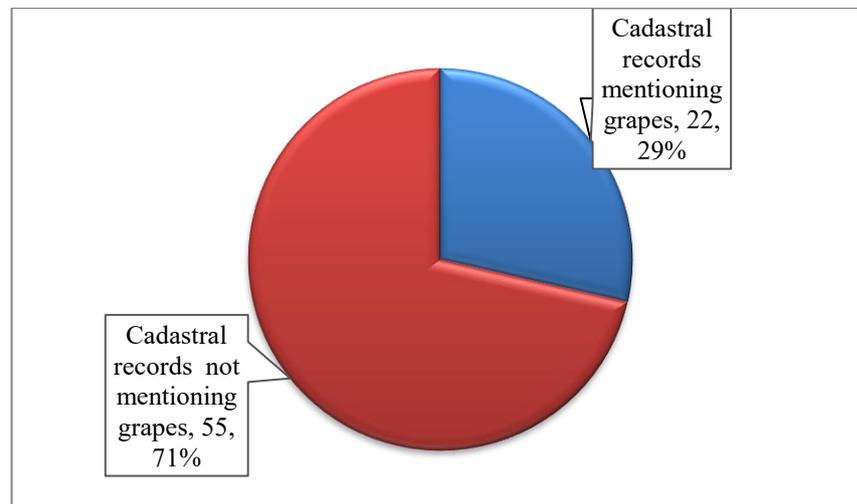


Figure IV.11: The percentage of the cadastral records that indicated grapes among the total records of the papyrus Vaticanus Graecus II.

The papyrus was concerned with the area of plots, the product type, the average wine production of each plot in the years AD 175-180, the income of each plot in *denarii* for AD 190, and the cultivated land types (Table IV.4). The value of these records lies in the distinction between two patterns of cultivated vines. One type of viticulture featured vines alone, while the other cultivated vines along with figs. In addition, the document included the numerical data of wine production in a specific year in each land unit, expressed in multiples of the *aroura* (ἀρουρα), which equals 2,025 square meters. The average of a vineyard was 1-2 *aroura* and produced between 4 and 5 *ceramia* (κεράμιον: an object made of clay and may describe many containers of different shapes and size (Catherine Dobias-Lalou, pers. comm.). Therefore, the exact capacity of the *ceramia* is still questionable. Catani (1985:150) suggests that the *ceramia* seems to correspond to c.34 litres. However, it is reasonable to consider that its capacity was similar to the *doliae* of Lamluda (east of Cyrene), where 20 of them have been recorded and they were associated with wine production (Buzaian 2009: 47, 52). Their average capacity at c.75 litres is used for estimating the capacity of the wine production in Cherronesos (Ahmed Buzaian, pers. Comm.).

Text	Area in <i>aroura</i>	Crop	Average wine production of 5 years AD 175/6- 197/80.	Inc. of each area in AD 190	Type of land
X.37,38	1/8	Vines	1 <i>ceramion</i>	20 <i>denarii</i>	Missing
X.46-XI.1	1/8	Vines	3/4 <i>ceramion</i>	10 <i>denarii</i>	Woodland (πλευρή νάπη)
X.35, 36	4 1/2, 1/32, 1/64	Vines + Figs	2 <i>ceramia</i> of wine; 5 <i>medminoi</i> figs	800 <i>denarii</i>	A walled area (τοιχος)

Table IV.4: Samples of the data provided in the papyrus Vaticanus Graecus II (Catani 1985:153).

Catani (1985:154) interpreted the quantities of wine recorded in the papyrus as an indication of fairly low production levels, possibly due to the type of viticulture practised rather than the size of the plots used. However, the pattern of growing figs with grapes was known in the region, as discussed above. Nevertheless, the majority of the recorded quantities of wine in the papyrus represented areas which cultivated grapes only, so these levels of wine production were probably normal, especially if one considers a higher capacity of the *ceramia* at 75 litres. However, these records indicate that grape cultivation was widespread in the region. One should bear this in mind when discussing the role of viticulture in Cyrenaica's more fertile lands further west.

IV.3.7 Assessing wine production capacity of Cherronesos (Ras et-Tin) based on the second century AD papyrus

Assessing the Cyrenaican capacity for wine production requires a detailed study of the archaeological evidence, such as wine presses, vats, amphorae and other manufacturing facilities, as well as the probable techniques used to make wine. This is beyond the scope of this thesis. However, the data of the papyrus Vaticanus Graecus II can be used to determine the capacity for wine production in semi-arid lands, as it mentions the quantity of wine production per *aroura* (ἄρουρα). As the *aroura* equals about 2025 m², one hectare would include $(10,000 \div 2025) = c. 5$ *arourai*. The *aroura*'s yearly production has been calculated at around 4-5 *ceramia* (Catani 1985: 154). However, it was probably slightly more, as the wine yield of 1/8 *aroura* was described three times at 1/2, 3/4 and 1 *ceramion* (giving a range of 4-8 *ceramia* per *aroura*). This variety in the quantity of wine produced by an eighth of an *aroura* seems to have been due to the nature of the environment in different topographic areas, as the document recorded. It mentioned different types of lands where either only grapes or grapes and figs were cultivated. A land of wheat or corn (γῆ σιτική) is an example of a land type.

However, two of the wine quantities were grown in woodland (πλευρή νόπη), while the land type used to cultivate the third is unknown. Catani (1985: 54) stated that the term πλευρή νόπη is an indication of vineyards in the Cherronesos district; the vine seems to have usually been grown in the fertile wadi beds (fertile valley areas). It is important to mention that these three samples represented the total production of areas which cultivated only grapes. The density of vines in each type of land may also have affected the volume of wine production.

While the data provides different figures for wine production, it does not provide the quantity produced by one *aroura* of grapes. However, as it records different wine quantities gained from an eighth of an *aroura*, it is possible to approximate the minimum, average and maximum yield of a complete *aroura* (Table IV.5). The minimum wine production per $\frac{1}{8}$ of *aroura* was $\frac{1}{2}$ *ceramion*, one *aroura* would yield around 4 *ceramia* ($8 \times \frac{1}{2}$). As the *ceramion* equals c.75 litres, the *aroura* would therefore yield (4×75) 300 litres of wine per annum. As there are approximately 5 *arourai* in one hectare, each producing 300 litres, the minimum total of the annual wine production per hectare at Cherronesos (Ras et-Tin), would be ($5 \text{ arourai} \times 300 \text{ L of wine}$) c.1,500 litres of wine. This mathematical estimation and another two levels (average and maximum) of wine production per hectare are explained in Table VI.5 and Figure IV.12.

Land unit	Equivalent	Number of <i>aroura</i> per hectare	Wine prod. in <i>ceramia</i> per <i>aroura</i>	Total wine prod. per <i>aroura</i>	Wine prod. per (ha)
<i>aroura</i>	2025 m ²	10000 ÷ 2025 = 5 <i>aroura</i>	(8 × $\frac{1}{2}$) = 4 <i>ceramia</i>	4 × (c.75 L) = 300 L	5 <i>arourai</i> × 300 wine L = c. 1,500 L
			(8 × $\frac{3}{4}$) = 6 <i>ceramia</i>	6 × (c.75 L) = 450 L	5 <i>arourai</i> × 450 wine L = c. 2,200 L of wine
			(8 × 1) = 8 <i>ceramia</i>	8 × (c.75 L) = 600 L	5 <i>arourai</i> × 600 wine L = c. 3,000 L of wine

Table IV.5: Estimating wine production per hectare based on determined three different quantities per hectare.

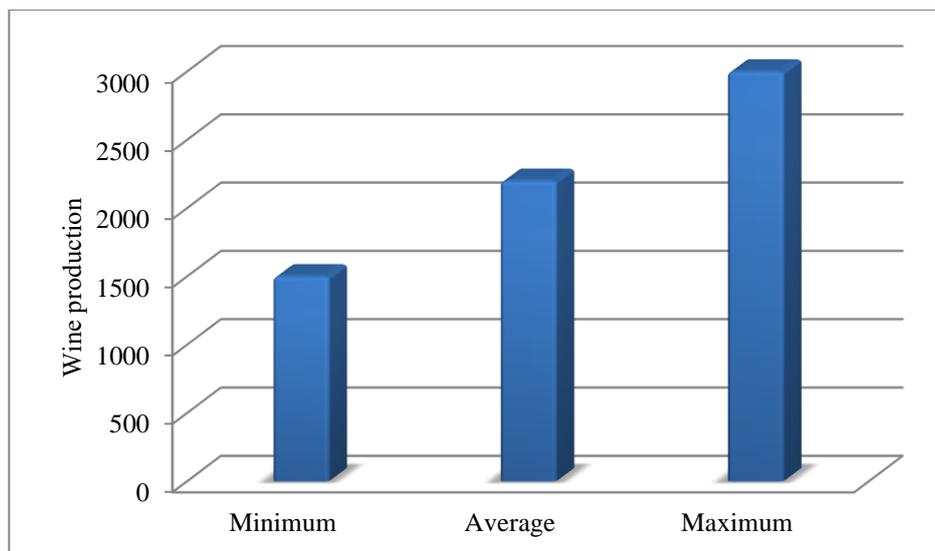


Figure IV.12: Three levels of estimated wine production in litre per hectare.

The average productive capacity of wine per hectare at *c.*2,200 litres in Cherronesos (Ras et-Tin), seems to have been reasonable in an area less fertile and with a lower level of annual rainfall than other parts of the region. This may lead me to suggest that Cherronesos was probably able to cover its local needs for wine as it was a small town, and there was probably a surplus to export as the town had a port. However, this depends on its population density. Whatever the case in Cherronesos (Ras et-Tin), the wine productive capacity of this area can help us to measure the capacity of other parts of the region. A question that can be asked here is: how many kilograms of grapes would produce *c.*2,200 litre of wine? In other words, how many kg of grapes had been yielded per hectare at Cherronesos (Ras et-Tin)?

Modern studies provide close figures of wine quantity in litre that can be gained from 1 kg of grapes. Zeppa (2007) suggested that 100 kg of grapes could produce 60-80 litres of wine. In addition, another study conducted by the FAO (2009: 10) indicated that one kg of grapes could yield, after fermentation, around 0.7 litre of finished wine. Robinson (2015) also stated that the maximum yield of wine is 100 L per 150 kg of grapes in current time. These estimations are about the same ratio given by FAO (2009: 10) at 0.7 per 1 kg. However, it is unrealistic to assume that people in ancient times using simple industrial techniques could produce as much wine as today. The 0.6 litres more likely represents the average wine production from one kilogram of wine grapes in ancient times. If this was the case, then the Cherronesos' average estimated productive capacity per hectare of *c.*2,200 litres of wine would have required a yield of *c.*3,700 kg (two

tonnes) of grapes (see the minimum, average and maximum figures in Table IV.6). In other words, one hectare in this area could produce two tonnes of grapes and c.2,200 litres of wine. This figure can be used to measure wine production via grapes productive capacity per hectare.

Wine in litre	Grapes (kg)	Grapes (tonne)
1,500 L	c.2,500	2.5
2,200 L	c.3,700	3.7
3,000 L	c.5,000	5

Table IV.6: Levels of grapes and wine production of different types of land estimated based on data indicated by the papyrus of Cherronesos.

IV.3.8 A quantitative assessment of wine production capacity per hectare of a selected area based on the modern pattern of grape cultivation

IV.3.8.1 The selected area

The area located to the west and south of Cyrene, the coastal area west of Apollonia and the territory around Balagrae (al-Beida), is rich in archaeological data connected with wine production (Figure IV.13). This represents vital activity relevant to wine-making that was practised in the Hellenistic and early/mid-Roman periods. This section will present all the data found so far in the region, including evidence relating to amphora 1 (Hellenistic and mid-Roman), amphorae kilns, wine presses, treading floors (which were usually mortared), vats, collecting vats and dolia (App. III, A, B and Figure IV.14). It should be noted that amphora kilns and vats could also be related to olive oil production or fish processing. The wine presses, treading floors, collecting vats and dolia are therefore considered more solid evidence of wine production in Cyrenaica in the proposed area. Presses included here are thought to be for wine not oil because they were associated with treading floors.

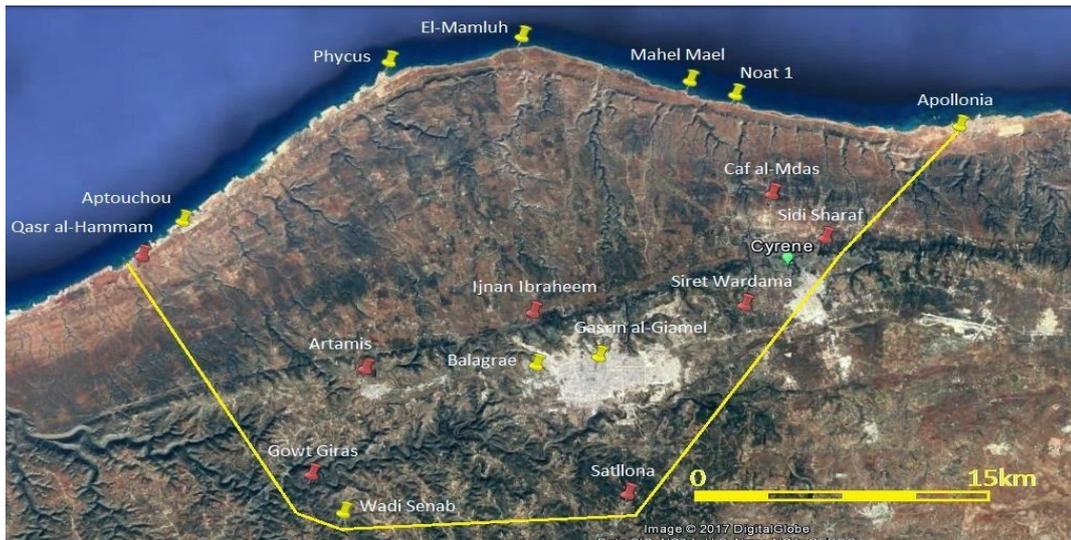


Figure IV.13: Distribution map of wine making sites in the selected case study area. Yellow: previously investigated. Red: newly discovered and not published



1- Berenice 2- Euesperides 3- Hadrianopolis 4- Teucheira 5- Ptolemais 6- Qasr al-Hammam 7- Aptouchou 8- Artamis 9- Phycus 10- El-Mamuh 11- Mahel Meal 12- Noat 1 13- Apollonia 14- Erythron 15- Limnias 16- Zawiet Tert 17- Sidi Sharaf 18- Caf al-Mdas 19- Siret Wardama 20- Ijnanan Ibraheem 21- Balagrae 22- Qasrin el-Giamel 23- Satllona 24- Gowt Giaras 25- Wadi Senab.

Figure IV.14: Distribution map of wine making sites in Cyrenaica. Yellow: previously investigated. Red: newly discovered and not published.

It is important to mention that investigating the spots where the published and new archaeological evidence of wine production has been found demonstrates their density in the area between Sattlona and Goat Giaras south of Balagrae, and Apollonia and Gasr-al Hamam just west of Al Hania on the Cyrenaican coast (Figures. IV. 13 above and 14; App. III. A, B). This shows that this area includes a higher number (65%) of the elements used for wine production (Figure IV.15 and Figure IV.16). Therefore, the agricultural productive capacity of grapes and wine, in this area, is investigated.

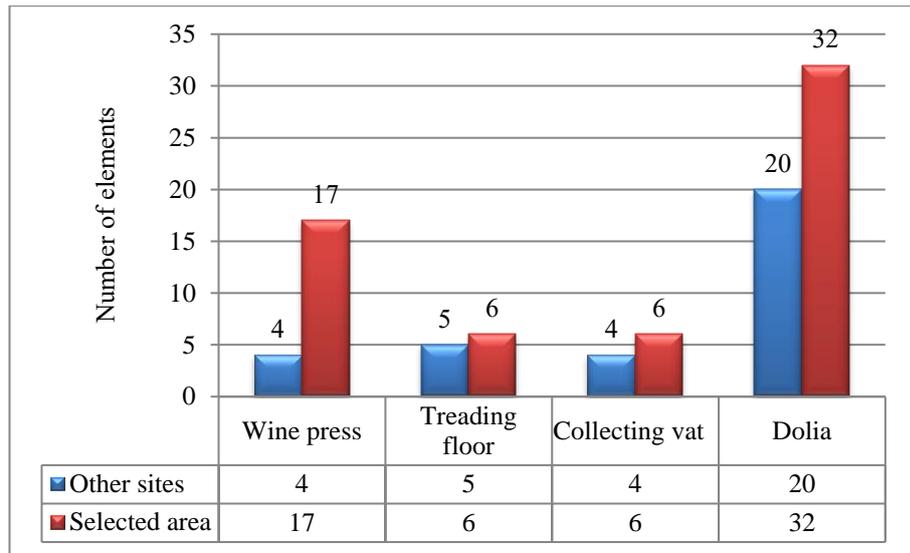


Figure IV.15: Number of each archaeological recorded element representing features of wine production at sites in the case study area and other parts of Cyrenaica (Amphora 1 including Hellenistic and Mid-Roman)

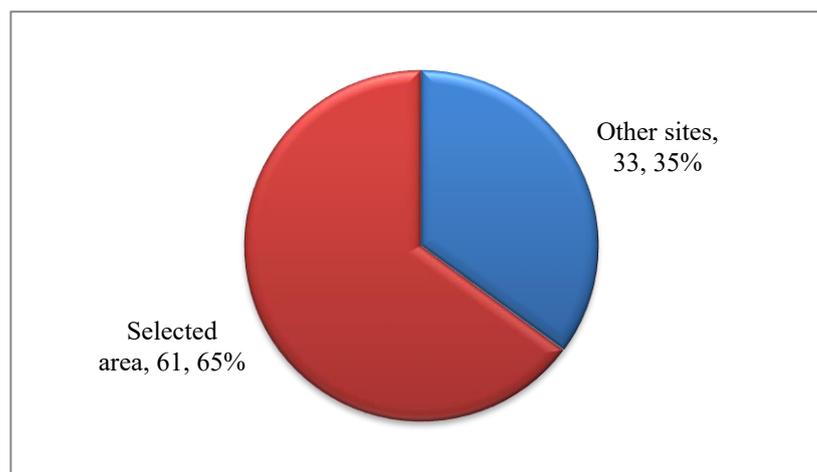


Figure IV.16: The percentages of recorded archaeological elements representing features of wine production in the selected area and the other parts of Cyrenaica.

Another important reason for selecting this area is its soil quality and annual rainfall. This leads one to expect a higher production of grapes and wine in the case study area than that of Cheroneses (Ras et-Tin). Wilson (2004:148) stated that the Cyrenaican landscape is generally very appropriate for growing grapes. In addition, FAO (1969: 61) indicated that the soil of Massah (Airtimes) and al-Beida (Balagrae) is also suitable for growing wine grapes. The proposed area thus seems to be more suitable for this kind of fruit than any other part of the region. This can be also seen from the accounts of ancient sources (App. I. A. 3). The most important intimation is that of Pseudo-Skylax (108), who

mentioned that there was a harbour in the gulf of Phycus called Ampelos (ἄμπελος) (modern Al-Hamama) (Purcaro 1976: 326). An interesting point is that the word (ἄμπελος) means ‘grape-vine’. This may indicate that the harbour was known for exporting wine from the Hellenistic era, or that the fruit was commonly cultivated in the area around this site.

The value of the selected area as a grape producer is also reflected by the presence of a wine factory in Al Bayda during the Italian occupation, as mentioned above (FAO 1969: 166, 172). The factory was supplied by grapes from al Bayda (Balagrae) itself and Messa (Artimis), about 10 km to the west of al Bayda and about 13 km south-west of el-Hanya harbour (Aptouchou). The area located to the west and south of Cyrene and to the west coastal line of Apollonia up to el-Hanya and around Balagrae (al-Beida), thus appears to have been the most fertile area for grapes in the region in both the past and present. I shall next try to estimate its capacity for wine production.

IV.3.8.2 Quantitative evaluation of the wine production capacity of the case study area based on modern patterns of grape cultivation (with comparison to the figures relating to Cherronesos)

This section estimates the proposed area’s capacity for wine production using a similar approach of that used at Cherronesos (Ras et-Tin). Some modifications are needed because of the different available data, as clarified in the Table IV.7. Only one quantitative study of grape production has been conducted by FAO (1965: 32). This has been used in this calculation, because it provides grape quantity production per hectare. The study stated that grape production in the area with good annual rainfall (500-600 mm) was estimated at 3-5 tonnes per hectare from between 1,100-1,600 plants. The average grape production per hectare would thus be 4 tonnes (4,000 kg). If one assumes that producing 0.6 litre of wine by the ancient method requires 1 kg of grapes, 4,000 kg would yield about 2,400 litres of wine ($4,000 \times 0.6$). Wine production capacity per hectare was thus around 2,400 litres. This is a bit higher than the average capacity of Cherronesos (Ras et-Tin), which I have above estimated, based on quantity of wine provided by the papyrus of the second century AD, at *c.*2,200 litres of wine per hectare (Figure IV.17). The question then is how many litres of wine were gained from the case study area during the ancient periods?

Area	Available	Estimated	How
Cherronesos	Wine yield per <i>aroura</i>	Wine in L per hectare	based on wine production of 1/8 ceramion per <i>aroura</i> given by the papyrus of the 2 nd AD
		Grape production per hectare	Estimated based on modern wine-producing methods with some modifications
Case study area	Grape production per hectare (FAO statistics of 1965).	Wine yield per hectare	Estimated based on modern wine-producing methods with some modifications

Table IV.7: Estimating Cherronesos' grape production per hectare based on wine quantity per *aroura* provided by the papyrus and estimating wine production of the selected area based on grape production per hectare.

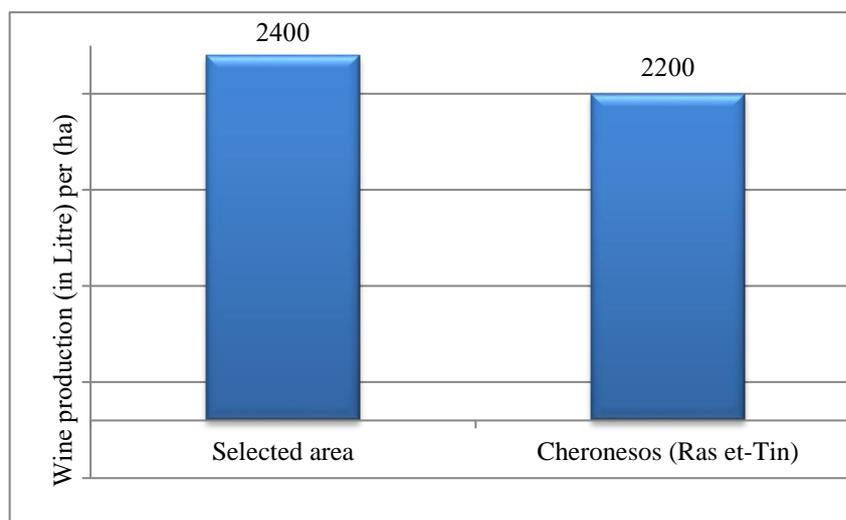


Figure IV.17: The estimated wine production (in litre) per hectare of Cherronesos and the case study area.

IV.3.8.3 Applying modern classifications of land classes within the selected area to all of ancient Cyrenaica (Greek and Roman)

It is implausible that all the land in the case study area was used to produce grapes. However, the potential area can be estimated based on modern classification of the land classes in two parts of the selected area and applied to the total zone. FAO (1969: 70) classified the land of Al Hania (Aptouchou) into classes I, II, III and IV, the first two of which were suitable for growing vines. They also estimated the number of hectares for each class. FAO (1969: 70) argued 20% (c. 500 hectares) of the available land at Al Hania (Aptouchou) fell within classes I and II, while classes III and IV made up the remaining 80% (c. 2,000 hectares). However, the other example of Al Useta represents a hilly area

situated on the first escarpment (FAO 1969: 83). This indicated a higher percentage of land in classes I and II than that of Al Hania, comprising (46%) 2,500 hectares, whereas (54%) 3,000 hectares represented that of class III.

As there are no statistical approximations of land classes I and II of the whole area under question, the total figure of Al Hania (Aptouchou) and Al Useta has to be applied here. The total arable lands fall into classes I and II at Al Hania and Al Useta, made up 35% (3,000 out of 8,500) of the total lands of both sites (Table IV.8 and Figure IV.18). Therefore, this figure has been used. The overall case study area represents about 1,000 km², and includes *c.*100,000 hectares (1,000 km² × 100). However, in light of modern reclamation works, it is reasonable to suggest that only half of this area (50,000 hectares) was probably cultivated by the Greeks and Romans. Thus, based on Al Hania and Al Useta's land classification, it is suggested that 35% of the case study area of 50,000 hectares represent classes I and II. This would be about 17,500 hectares.

Site	Class I, II per ha	%	Class III, IV per ha	%
Al Hania	500	20%	2,500	80%
Al Useta	2,500	46%	3,000	54%
Total	3,000	35%	5,500	65%

Table IV.8: Land classes per hectares and their percentages at Al Hania and Al Useta (Based on data provided by FAO 1969: 70, 83). (nos. corresponding to the data shown in figure IV.18).

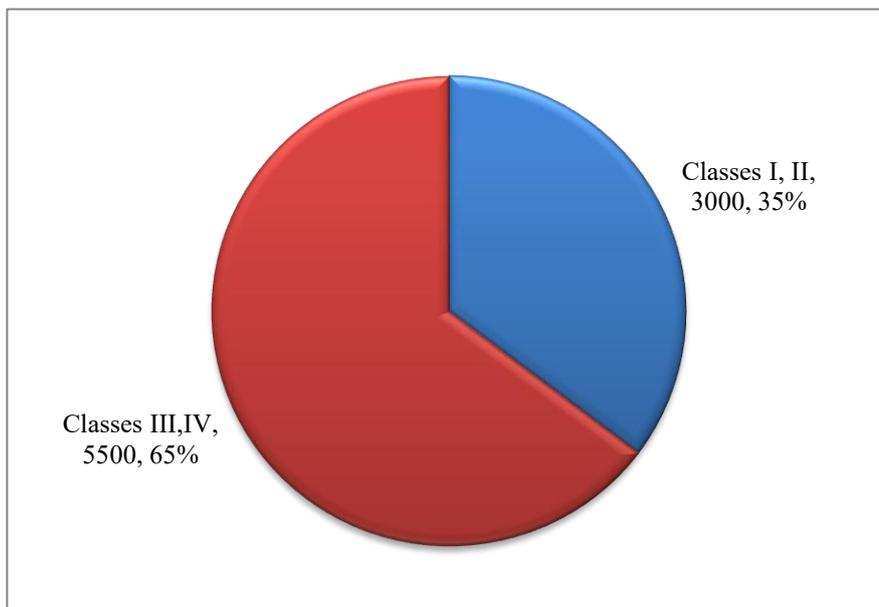


Figure IV.18: Percentages of land classes per hectares at Al Hania and Al Useta (Based on data provided by FAO 1969: 70, 83). (nos. corresponding to the data shown in table III. 9).

If so, as the average grape production of one hectare in the case study area has been estimated at 4,000 kg, the 17,500 hectares could produce 70,000,000 kg (17,500 ha × 4000 kg). About 42,000,000 litres of wine could thus be produced from the case study area (70,000,000 kg × 0.6) if all class I and II land was planted with grapes only. However, assuming only a quarter of the 17,500 hectares were devoted to vines and the rest were for other crops, they would yield 17,000,000 kg (17,500 ha ÷ 4 = 4,250 ha × 4,000 kg). This quantity of grapes would produce 10,200,000 litres of wine (17,000,000 × 0.6) (Table IV.9). The case study area average annual production of wine, thus, would be about 26,100,000 litres (10,200,000 + 42,000,000 × 100) (Figure IV.19).

Cultivated plant	Class I, II (ha)	Grapes prod. (kg)	Wine prod. (litre)	Tonnes
Grapes only	17,500 ha	70, 000,000 kg	42, 000,000 L	42,000
Grapes + other fruits	4,250 ha	17,000,000 kg	10,200,000 L	10,200

Table IV.9: An estimation of grape production in kg and wine in litres within the case study area (considering 35% of the investigated area represents class I and II land).

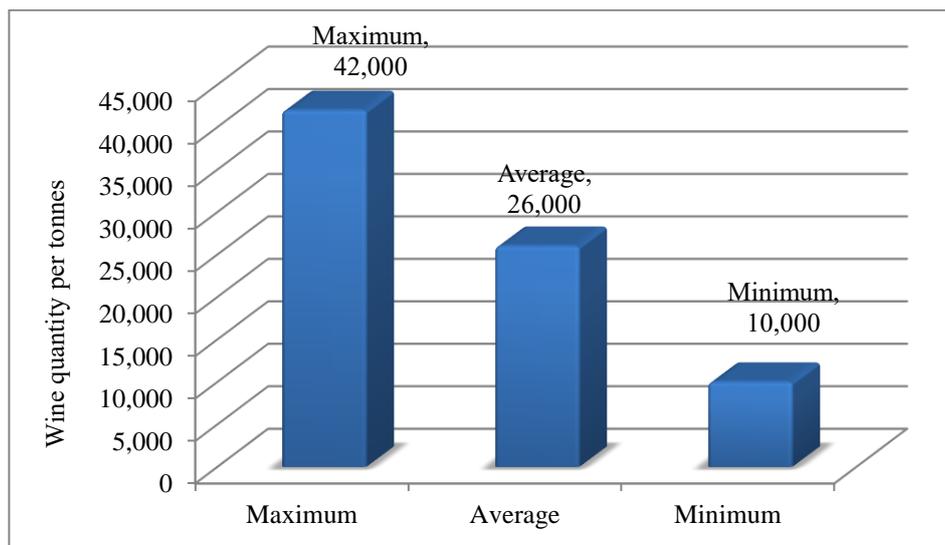


Figure IV.19: The maximum, average and minimum estimated wine production per tonnes of the case study area.

According to the *demiourgoi* inscriptions, grapes were consumed as fresh fruit or processed into raisins and wine. It is thus reasonable to assume that only half of all grape production was associated with wine-making. If so, the study area could have produced half of the three approximated figures of wine per year. This would be a maximum of 21,000 tonnes (42,000 ÷ 2), an average of 13,000 (26,000 kg ÷ 2) tonnes and a minimum of 5,000 (10,000 ÷ 2) tonnes of wine (17,000,000 ÷ 2) (Figure IV.20)

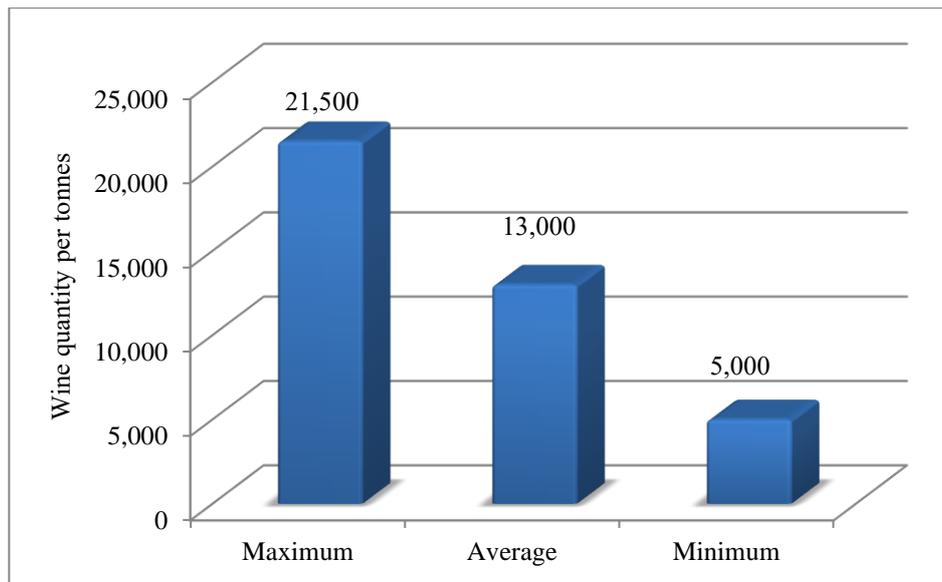


Figure IV.20: The maximum, average and minimum estimated wine production per tonnes of the case study area in case only half of its grapes production used for wine making.

It can be concluded that the average figure of 13,000 tonnes represents a good order of magnitude figure for the quantity of wine produced within the examined area during the Hellenistic and early/mid-Roman periods. This is because the case study area possesses the most suitable type of soil for growing grapes, which is classified as types I and II, while other fruits can be cultivated in soil of classes II and IV. The area also possessed a high number of industrial installations related to wine production, such as wine presses, treading floors and others (see figure IV.13 and above). Furthermore, the *demiourgoi* evidence listed only four types of fruit, including olives, two varieties of almonds, figs and four varieties of grapes that seem to have been planted around Cyrene. Moreover, the inscriptions identified grape by-products raisins and wine - and classified grapes into 'guaranteed' (sold based on a contract between farmers and buyers) and 'unguaranteed'. As the guaranteed types demanded the highest prices, they would be needed for wine and raisin production (see Table IV.3 and Figure IV.4 above). Nevertheless, wine production of the other parts of the region should be taken into account. This can be assumed to represent at least 6,500 tonnes 50% of the total wine production of the selected area at 13,000. In this case, the average figure of the region's annual wine production would have been *c.*20,000 (13,000+6,500) tonnes. If so, the important question would be the extent to which this volume (20,000 tonnes) of wine production could cover all or part of the region's wine needs.

IV.3.8.4 Wine production from the case study area and its consumption

As the total of Cyrenaica's population in the Roman period was probably estimated at 255,000 (see chapter II), it is possible to assess whether the quantity of 20,000 tonnes could cover or exceed the demand of the region's inhabitants. In other words, how many litres of wine the 255,000 persons living in Roman Cyrenaica would have required?

In terms of the annual wine consumption per head Tchernia's model will be adopted (cited in Kingsley 2001: 46). Kingsley (2001: 46) suggested annual consumption ranged from 146 to 182 litres per head, taking into account that women would have consumed half as much as men. However, children should also be excluded from the population, while slaves also probably consumed less wine. It is thus fair to consider that Cyrenaica had a total population of *c.* 127,000 wine-drinkers (half of its total population at 255,000). If so, the *c.* 20,000,000 litres of wine, the estimated annual production of the region including the selected area, could meet the demands of *c.* 133,000 inhabitants (20,000,000÷150).

However, the Cyrenaican population is possibly double the figure estimated in this thesis, especially those who inhabited the countryside. This can be expected if one bears in mind the considerable number and different sizes of settlements in the region at least in Roman period. In addition, it is important to mention that the estimated wine production figures are based on modern patterns which involve planting between 1,100 and 1,600 vine trees per hectare. Wine production could actually have been more. The ancient pattern of vine cultivation involved planting around 4,100-7,000 plants per hectare, as attested by Hellenistic leases from Amos in the Rhodian Peraia (Bresson 2016: 123; *SEG* 28. 833; 52. 1030). Furthermore, the absence of any imported wine amphora and the presence of locally produced amphorae in the area under discussion may indicate the case study area's population was self-sufficient in wine and sometimes there was a surplus for regional export. Four kinds of grapes were represented in the *demiourgoi* inscriptions of Cyrene in the fourth- second BC centuries, which perhaps supports the argument that grapes and grape by-products were among the commercial commodities from this area. The Local MRA1 founded in Berenice is probably proof of local trade in wine during the Hellenistic period. Additionally, the varied evidence of activity related to the production of wine in areas around Cyrene, in contrast to the rest of the region, is an important indication of its productive potential for wine over centuries. The most

valuable archaeological evidence of wine-making in this area is a workshop recorded at the site of Noat 1, to the west of Apollonia. A number of different industrial installations related to wine production have been found in this site dating to the mid-Roman era. These include 23 dolia and 15 rock-cut vats, as well as architectural elements of wine presses and treading floors (Hesein 2014: 218). The location of these industrial wine-production features on the coast may suggest wine was exported in the mid-Roman period. The next section introduces selected archaeological evidence which indicate the region's involvement in wine production.

IV.3.9 Selected archaeological and industrial evidence of wine production from Cyrenaica in the Hellenistic and early/mid-Roman epochs

Varied archaeological evidence dated to the Hellenistic and early/mid-Roman periods suggest that considerable wine manufacturing took place in Cyrenaica. This evidence includes amphora kilns, locally produced amphorae and other elements of architectural installations relating to the manufacturing of wine, such as wine presses and vats. General background has been provided about most of them in chapter II and they have been classified in App III.A and B. Since investigating all this data was beyond the scope of this thesis, only a sample of the data is presented here. The kilns and amphorae types that were probably associated with wine production are presented as examples of the archaeological artefacts and installations related to wine production.

IV.3.9.1 Amphora Kilns as archaeological evidence of wine production

The manufacture of amphorae provides evidence of local production of wine, olive oil and other products. Examples of local pottery kilns have been identified in a number of different Cyrenaican sites, most of them dating to the Hellenistic and early/mid-Roman periods. Around 14 kilns have been discovered at Euesperides, Teucheira, Berenice, Ptolemais and Hadrianopolis, in addition to eight kilns at Kambut and Marsa Lukk (Buzaian 2000; Hulin 2008, Hulin et al. 2009; Jones and Little 1971; Lloyd 1977; Mazou and Capelli 2011; Riley 1976, 1979; Wright 1963). Furthermore, Hesein (2014: 172-187) has recently discovered another 10 kilns at three coastal sites to the east of Apollonia. Hesein (2014:173) also mentioned remains of another two possible kilns in the same area. In view of the lack of excavations, the minimum number of 32 kilns is promising, and not out of line with the number of kilns discovered in some regions dated to the Hellenistic

and Roman periods (Figure IV.21). They are closer to that of Tripolitania and higher than those from Attica and Western Greece.

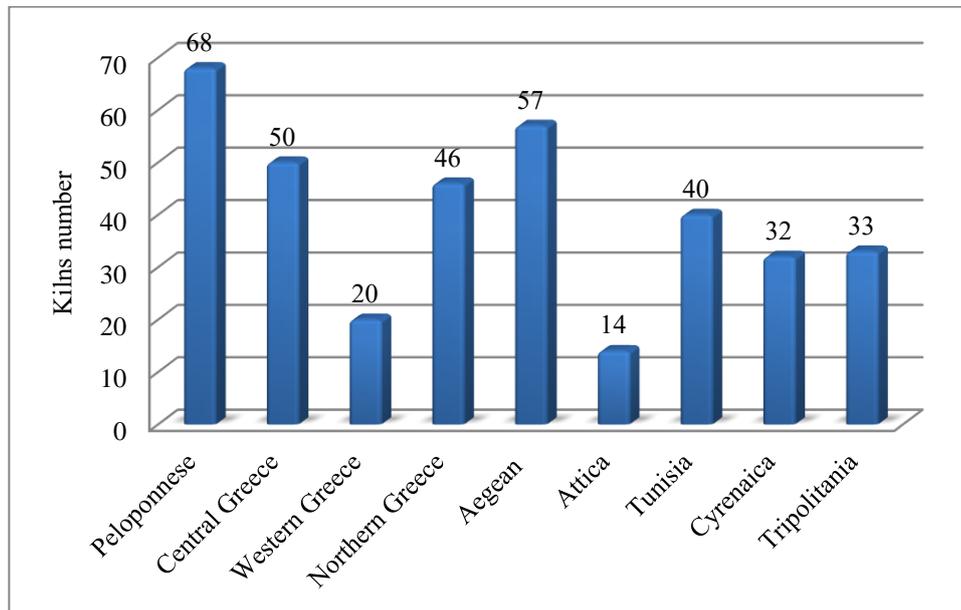


Figure IV.21: Numbers of Hellenistic and Roman kilns found in Cyrenaica and other regions (Hesein 2014: 191-3)

However, not all of the Cyrenaican kilns were producers of amphorae; some produced elements such as coarse ware, *dolia*, lamps and others, as classified by Hesein (2014: 170, 171), while the products of others have yet to be identified. Nevertheless, the percentage of identified amphora kilns seems to be considerable. It comprises 43% (12 out of 28) of the total number of identified kilns (Figure IV.22). In addition, two of the other identified kilns are *dolia* kilns, which can be added to the number of amphora kilns as *dolia* were usually used for wine rather than olive oil production. As Brun (2004: 6) argued, in southern Europe *dolia* were particularly associated with wine production. In Cyrenaica *dolia* also seems to have had the same usage, as can be seen in one example found at the site of Lamluda (east of Cyrene), which indicates wine pressing rooms were associated with a group of *doliae* (Buzaian 2009: 47, 52). If this was the case with the *dolia*, the kilns that probably fired wine and olive oil amphorae will represent 50% of the total identified kilns at Cyrenaica. It is also important to note that five of the eight kilns of Kambut and Marsa Lukk at Marmarica were amphora kilns (Hesein 2014: 170).

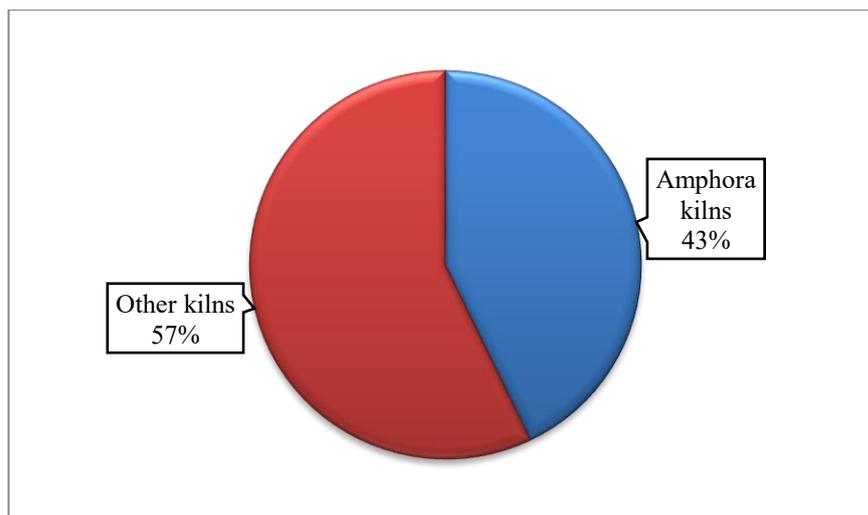


Figure IV.22: Percentage of the amphora kilns and others in Cyrenaica

It is worth mentioning that the recent discovery of 10 kilns provides important evidence about local amphora production. Its value lies in the fact that the three sites with kilns are close to each other in the coastal area east of Apollonia. Aptouchou (el-Hanya) is about 5 km east of the ancient port of Phycus, while the Cape of Phycus is 5 km from Mahel Mael (Hesein 2014:173). This may suggest the presence of considerable amphora production in the mid-Roman period, the proposed date of the kilns. If so, abundant local agricultural production of wine and olive oil was probably expected in the region, at least in this era. Undoubtedly, the number of kilns in Cyrenaica is good evidence that these two products were probably exported.

IV.3.9.2 Wine amphorae: Mid-Roman Amphora 1 (MRA 1) and Mid-Roman Amphora 8 (MRA 8)

The recent survey conducted in the coastal strip between Apollonia and Uglia indicated that two main types of local amphora were produced by the 10 recorded amphora kilns (Hesein 2014: 178, 180). These are Mid-Roman Amphora 1 (MRA 1) and Mid-Roman Amphora 8 (MRA 8). These amphorae have been found in different sites at Cyrenaica, Apollonia, Berenice, Teucheira (Figure IV.23) and Erythron (modern Latrun), 25 km east of Apollonia as examples (Mazou and Capelli 2011; Riley 1979: 402). The predominant type discovered in the region is MRA 1 dated to the end of third century AD, comprising 75% of the amphorae found at Erythron (Mazou and Capelli 2011; Hesein 2014: 166, 167). So far, only Amphora MRA 8 has been found abroad, at Veneto and Ostia in Italy (Ferrarini 1993).

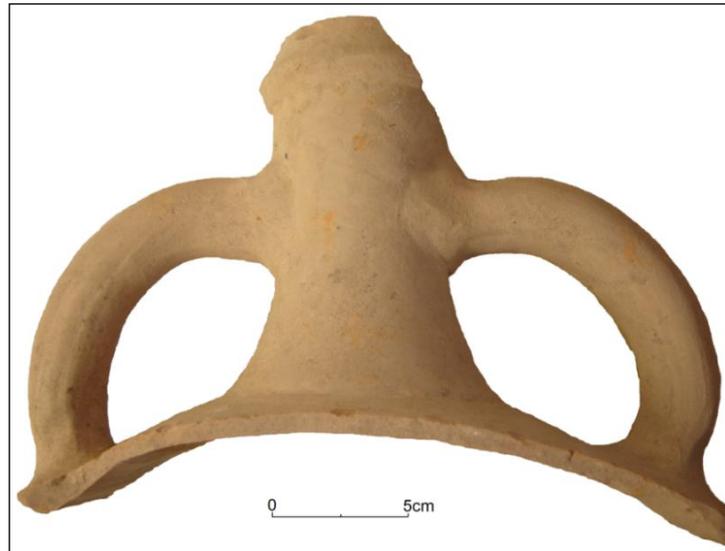


Figure IV.23: Mid-Roman Amphora 1. Benghazi University, excavations at Teucheira (Photo by Muna, season 1994).

The contents of these two types of amphora are still uncertain, and they may have contained wine, olive oil or something else. Wilson (2004: 140. N. 15) suggested that MRA 8 was used for olive oil or salted fish, while Hesein (2014: 180, 344, 349) argued that this amphora was probably used to transport fish sauce. Hesein (2014:179, 180, 344, 349) argues that the MRA 1 was used for wine, and that it was produced in the new kilns he found. The agricultural potential of the area where these kilns and amphorae were found may help us to identify the purpose of these industrial activities. In fact, they were located in an area of low temperature and heavy rainfall. For example, the land of Aptouchou (Al-Hanya) has been classified to represent land classes I and II in agricultural Zone II. Land in this zone received 500-600 mm annual rainfall (FAO 1965: 32, 33), which is more suitable for grapes than olives. Olives grow in Zone III, which has an annual rainfall between 400-500 mm.

Furthermore, several pieces of evidence of industrial installations related to wine production have been reported in proximity to the discovered kiln sites, such as presses (Personal communication with Ahmed Buzaian). The most interesting example relate to different industrial elements of wine production found at Noat, 16 km west of Apollonia and about 9 km east of Aptouchou (el-Hanya). The most important part of these installations is the 38 vats dated to the mid-Roman period (Hesein 2014: 122, 218). This archaeological evidence and the environmental circumstances of the area may suggest that the recently-discovered kilns were used to produce wine amphorae. The aim of

producing this type of amphorae was probably to cover the requirements of an enterprise exporting wine in the mid-Roman period. This figure can be also applied to the Hellenistic epoch and probably the early Roman era. The Greek interest in growing different types of grapes at Cyrene in this period (as seen in the lists of the *demiourgoi*) supports this view.

IV.4 Conclusion

This chapter examined the most important epigraphic evidence and ancient documentary sources that relate to grapes, raisins and wine in the Hellenistic and early/mid-Roman periods. Growing grapes was subject to careful consideration, and was considered as an example of the region's agricultural potential for fruit cultivation. The plant investigation included a brief section related to the suitable environment of growing grapes. It then tested the presence of grapes in the Hellenistic era as represented by the epigraphy of Cyrene. Grapes have been examined during the Roman period via one piece of papyrus and other varied archaeological evidence. The papyrus reflects that practising viticulture in the region was common because it represents the Roman concern about recording a detail about viticulture cultivation and production gained from less fertile lands in Cyrenaica. The average estimated productive capacity per hectare in Cherronesos is c.2,200 litres. This volume is quite reasonable if one considers that this area is less fertile and usually had a lower level of annual rainfall than other parts of the region.

Grape and wine production capacities in the most fertile lands in Cyrenaica have been estimated in this chapter. This was based on a selected area which possessed a good representation of various archaeological installations associated with wine production. The estimation indicates an average figure of annual wine production, from the case study area and all other parts of the region, at c.20,000 tonnes. This result raises a question about whether this volume (20,000 tonnes) of wine production could meet the region's demand. The assessment of c.20,000 tonnes against the number of the Roman Cyrenaica's population of 255,000, which was estimated in chapter II, indicates that the estimated annual wine production could meet the region's consumption at least in some years during the Mid-Roman period. This is because most of the local amphora kilns and amphorae associated with wine production are dated to this time.

The data presented in this chapter suggests that grapes were one of the most important fruits cultivated at Cyrenaica in both the Hellenistic and early/mid-Roman periods. The production of wine and raisins also perhaps played a significant part in the intra-regional and inter-regional markets. Nevertheless, the economic contribution of grapes and its by-products to the region seems to have been less significant than that of cereals. This can be understood from the literary sources the epigraphy indications relevant to both products, grapes and grain alongside their by-products.

Chapter V Horses: Case Study of Cyrenaica's Animal husbandry

V.1 General Introduction

This chapter examines, in detail, horse rearing in Cyrenaica as a case study, to assess the region's economic significance for breeding animals during the Hellenistic and early/mid-Roman periods. This is because horses were expensive to breed and associated with the nobility. These are important key points which probably allow us to draw a picture of the animal's economic contribution to the regional economy during the proposed period. Therefore, the chapter aims to assess whether Cyrene was the right place for producing a good quality of horse which could be used in contests, as literary documents highlight. It also intends to investigate the data related to the horses of Cyrenaica, which reflects its use by cavalries. In addition, the epigraphic evidence, that highlighted the equestrian significance as a part of the region's ephebate, is also examined in this chapter. This is because the existence of the ephebate itself can be considered an economic measurement, as membership of the ephebate was expensive.

Furthermore, the use of the word 'horse' in the structure of personal names in Cyrenaica as indicated by epigraphic evidence is significant matter discussed to assess breeding the horse culture in the region in the Hellenistic and early/mid-Roman periods.

V.2 Methodology

The economic roles of the horse in any region during the Greek and Roman periods are hard to evaluate solely from using direct archaeological evidence. This can be performed to a greater extent in the case of studying the consumption of animals such as sheep and it could be sufficient for demonstrating the importance of some agricultural products, olives and olives oil being an illustration. Additionally, the lack of excavations in Cyrenaica prevents us from obtaining more epigraphic or architectural evidence that reflects how the horse was used. Hippodromes for racing horses and chariots are a case in point. Thus, other approaches have been used in which indirect and direct indications of the horse allows us to examine the importance of their breeding and their probable economic role in the region.

As the literary documents directly and indirectly represented the horse in different contexts, the data has been collected and addressed in Table D. 3 in Appendix I. The data

has been classified into different themes according to the context of the horse vocabulary employed. In addition, the use of horses in the Cyrenaica army has been attested by some epigraphic data. The relevant historiographical intimations have been also used to identify the horse's status via its use in warfare.

Since equestrian activities took place in the ephebrates of some Greek and Roman cities, whether the Cyrenaican ephebate included this type of sport has been examined. This involved testing the direct epigraphic linguistic evidence used by the Greeks and Romans, and the probable local synonyms referring to horsemanship. The ephebic inscriptions that included linguistic indications are collected from the *IGCyr* and *IRCyr* projects, and is addressed in the App. II. E.3. This tabulates the word form, the number of cavalry and the number of available teaching staff and students, the inscription's location and date, and the main reference.

Patterns in the use of the word 'horse' as part of a personal name are another significant indication of the horse's status in Greek and Roman societies. Therefore, a section is devoted to discuss this matter. The remarkable work of Fraser and Matthews (1987) in *Greek Personal Names* makes it possible to compile a preliminary list of names of people in Cyrenaica whose suffixes or prefixes refer to horses. The presence of three names has been examined across seven centuries, from the fifth century BC to second century AD, to identify the period in which these names were most popular. Fraser and Matthews (1987) included data from Crete and Cyprus, so it was possible to compare some of the structures of the personal names used in Cyrenaica with those used in Crete and Cyprus. A similar comparison of these kinds of names from Cyrenaica has been made with those from the Peloponnese. This approach enabled a picture to be built on the horse's probable value in Cyrenaica over several centuries.

V.3 Horse Breeding: A Case Study

V.3.1 Cyrene famous in literature as a place for horses, especially those used in contests

Ancient Greek and Roman writers were interested in Cyrenaican horses and used them to explore a number of different themes. One theme emphasized the importance of

Cyrenaican chariots in warfare, as will be discussed in the next section. Another theme highlighted the distinctive performance of Cyrenaican horses in the Greek games. These achievements were in the most cases associated with the name of Cyrene. Moreover, the ancient sources provided direct and indirect reference to the Cyrenaican horse breeding and the horse's contribution to the regional economy. Several ancient writers stated on a number of different occasions that Cyrenaica produced the best kinds of horses (App. I. D. 3). Pindar (*Pyth*, IV. 1-3), emphasizes the quality of the horse when he was describing the king of Cyrene and his noble horse ‘...εὐππου βασιλῆι Κυράνας...’ which means ‘King of well-horsed Cyrene’. Pindar (*Pyth*, IV. 6-8), linked the good horse with Cyrenaica when he explained how Battus, the colonizer of the fruit-bearing Libya, left his island Thera in order to find the city of fine chariots [Cyrene] on one of the nutritive places of the earth ‘...Βάττον καρποφόρου Λιβύας, ἱερὰν νᾶσον ὡς ἤδη λιπῶν κτίσσειεν εὐάρματον πόλιν ἐν ἀργεννόεντι μαστῶ...’. Also Strabo (XVII. 21) reported that Callimachus was proud of his city Cyrene and described it as the mother of the good horses (μήτηρ εὐππου). These are significant indications of nurturing the region's good breeds of horses to the extent that they were one of its best-known features. Therefore, the horse seems to have played an important role in the ephebate activities, and was probably a significant resource of the region's economic prosperity (Figure V.1).

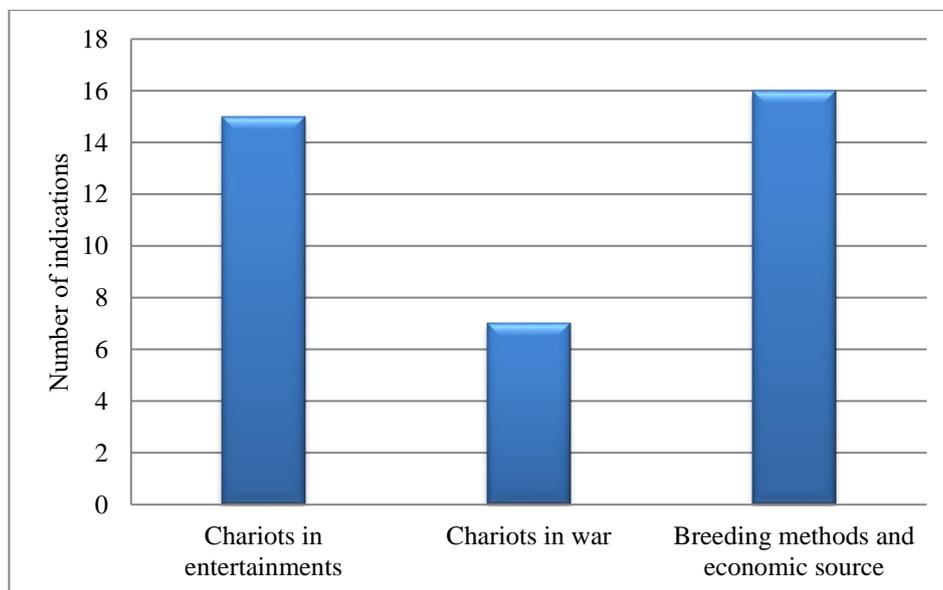


Figure V.1: Different references to Cyrenaican horses and chariots as represented in ancient Greek and Roman sources (based on the collected data in App. I. D. 3).

The appearance of Cyrenaican horses in Classical Greek games, in particular in chariot races, was highlighted by many literary references. The earliest indications can be seen in the account of Pindar. He (*Pyth.* IV. 1-3, 59- 76; V. 40-53; IX. 1-4) reported on several occasions the remarkable contribution of Cyrenaican horses in the *Pythian* and Olympic Games in the mid-fifth century BC. He gave the names of some of Cyrene's horsemen and their horses who won these famous games. Well-known examples of this can be seen in three of Pindar's *Pythians*, which were delivered as a reward for the athlete's victory in chariot-race. He devoted his fourth *Pythian* to celebrate the victory of Arcesilas of Cyrene, and the fifth *Pythian* to honouring the brother of Arcesilas, who won the chariot-race in the year 462 BC (Pindar, *Pyth.* IV. 1-3; V. 40-53.). He also devoted his ninth *Pythian* to praising Telesicrates (Τελεσικράτης), the Cyrenian chariot winner of the year 474 BC (Pindar, *Pyth.* IX. 1- 4). It is important to mention that Pindar highlighted that Cyrenian athletes were famous for their achievements in the Greek games:

πολύχρυσος Λιβύας· ἵνα καλλίσταν πόλιν. ἀμφέπει κλεινάν τ' ἀέθλοις
(Pindar, *Pyth.* IX. 69, 70).

Libya, the rich in gold, where she possesses a most beautiful city
which is outstanding for the prize in the completions.

There can be no doubt that the city alluded to here is Cyrene, but describing Cyrenaica in this context to be 'rich in gold' requires some discussions. The word 'gold' was probably meant to imply that the city had abundant economic resources, such as agricultural products and animal husbandry. However, there are number of reasons to believe that 'gold' may also have been a metaphorical expression for Cyrene's equine wealth. One of these reasons is that Pindar (*Pyth.* IX. 7) used another term in the same poem to represent the region's potential for cultivation and breeding animals when he described Cyrene's plentiful sheep (πολυμήλου) and its high agricultural capacity (πολυκαρποτάτας). The poet also called this *Pythian* to honour a Cyrenean chariot champion, and at the beginning of his poem he described the chariot of Apollo, which carried his girl to Cyrene, as golden (... χρυσεῶ ... δίφρῳ...). Gold in this context is thus an implicit indication of Cyrene's wealth, in particular horses. This suggestion makes more sense if one bears in mind that three of Pindar's twelve *Pythians* were composed to praise the achievements of the chariots and horses of Cyrene.

The literary documents mention of Cyrenaican horses in relation to the Greek games was also by the Greek writer Sophocles, (*Electra*, 701-708) and appeared in the fifth century BC. The value of this testimony lies in its interesting description of one of the four-horse chariot races. Sophocles indicated that there were 10 competitors, two of who were from Cyrenaica while the remaining eight each represented a different Greek city, including Athens:

εἷς ἦν Ἀχαιός, εἷς ἀπὸ Σπάρτης, δύο
Λίβυες ζυγωτῶν ἀρμάτων ἐπιστάται·
κάκεϊνος ἐν τούτοισι, Θεσσαλὰς ἔχων
ἵππους, ὁ πέμπτος· ἕκτος ἐξ Αἰτωλίας
ξανθαῖσι πάλοις· ἕβδομος Μάγνης ἀνὴρ·
ὁ δ' ὄγδοος λεύκιππος, Αἰνιὰν γένος·
ἔνατος Ἀθηνῶν τῶν θεοδμήτων ἄπο·
Βοιωτὸς ἄλλος, δέκατον ἐκπληρῶν ὄχον (Sophocles, *Electra* 701-8).

One was an Achaean, one from Sparta; two masters of yoked cars were Libyans; Orestes, driving Thessalian mares, came fifth among them; the sixth was from Aetolia with chestnut colts; a Magnesian was the seventh; the eighth, with white horses, was of Aenian stock; the ninth hailed from Athens, built of gods; there was a Boeotian too, manning the tenth chariot.

Sophocles' description, derived from the tragic story of Electra and her brother Orestes, reflects the importance of the Cyrenaican chariots in the Greek world. The account also suggests that Cyrene was not the only Cyrenaican city to produce skilled horses, as many ancient sources suggest, and that other Cyrenaican cities may also have bred horses. Sophocles (*Electra*, 727) stated that one of the Cyrenaicans was from Barce, calling to mind Aeneas Tacticus' (XVI, 14-16) observation that Barce and Cyrene were examples of Cyrenaican cities known for their use of large number of chariots in warfare. Similarly the tomb of *Alslaiia* near Barce almost certainly related to victory in the games, because of the Panathenaic amphora and olives wreath found there (Vickers and Bazama 1971:69-84). The early tomb, dated to the end of the sixth and beginning of fifth centuries BC, suggests the involvement of the city in the Panathenic games at least from this period.

Additionally, much attention seems to have been paid to equestrians at Cyrenaica in the Hellenistic period, as can be understood from the contribution made by the region's women in the Panathenaic games. The most interesting example of this is the probable first poem *The Victory of Berenice*, written by Callimachus in honour of Berenice II (267 or 266 BC – 221 BC), the daughter of Magas of Cyrene (Fantham 1995: 146). Callimachus celebrated the victory of her *quadriga* at the Nemean games. The poet seems to have been proud of her achievement, and frequently stated that his ode was devoted to the victory of her horses:

ἡμ[ε]τερο[.....].εων ἐπινίκιον ἵππων ἀρμοῖ.

our epinician for your horses' victory (Callim. *Aetia*, III. Fr. 54. 3, 4)

Despite the fact that Berenice II was a queen, behaving as a ruler, her honour reflects the importance of the horse in Cyrenaican culture to the extent that even women were concerned with the region's horse-riding events.

V.3.2 The horse's economic importance and methods of breeding based on literary sources

The literary documents demonstrated another important aspect of horse breeding in Cyrenaica through their representations of the animal's role in the Greek games. They mentioned the horse's economic significance in addition to addressing some distinctive breeding techniques used in Cyrenaica. However, horses were domesticated by the indigenous people of Cyrenaica long before the Greek occupation, which explains their skill in breeding horses. An engraving of a horse and a man has been found at a prehistoric rock art site called *Kaf Tahr*, located in the Green Mountain (al-Jabal al-Akhdar). Marini et al. (2010: 275) suggested that the engraved horse probably dated to the protohistoric period (the transition period between the prehistoric and historic eras), which is known in south-west Libya as the *libyco-berberian* period or 'horse phase' (Le Quellec 2012: 22, 23). Libyans may therefore have had their own tradition of breeding horses and using four-horse chariots, and the Greeks were influenced by their methods. Herodotus (IV. 189) described the customs and traditions of the Libyan tribes, and mentioned that Greeks learned to drive the *quadriga* from the Libyans:

Καὶ τέσσερας ἵππους συζευγνῶναι παρὰ Λιβύων οἱ Ἕλληνας
μεμαθήκασι (Herodotus IV. 189).

The Greeks have learned from Libyans to yoke the four horses together [using
four- horse chariots] (Author's translation).

Pindar (*Pyth*, IV. 1-3) also emphasized the quality of Cyrenaican horses when he was describing the king of Cyrene and his noble horse, ‘...εὐἵππου βασιλῆι Κυράνας...’, which means ‘King of well-horsed Cyrene’. Furthermore, Strabo (XVII. 21), in the late first century BC, described the reasons for Cyrene’s prosperity and highlights the fact that Cyrene was the best at keeping horses alongside good crops: ‘...καὶ γὰρ ἵπποτρόφος ἐστὶν ἀρίστη καὶ καλλίκαρπος...’. As has been mentioned before the reported speech of Callimachus by Strabo (XVII. 19) indicated the monopolising by the Ptolemaic kings of breeding horses and highlighted that the colts proliferated yearly by a hundred thousand. If Cyrenaica was included, these animals would graze in the Libyan areas as well. If so, Libyans and Greeks perhaps shared together this economic resource as was the case with silphium, because this considerable number of horses required a larger area to graze and much care. Libyan experience in breeding horses has been described by Pausanias (VI, 12. 7) and Aelian (*Charact.*, III. 2 cf. XIV. 10) as explained below. The large number of horses is clearly a strong indication that the horse was an essential economic resource, although it is worth mentioning that Strabo’s account seems to be based on earlier information from Callimachus (XVII. 21), who lived in the early Hellenistic period. However, Athenaeus (*Deipnosophists*, I, 100f) may support Strabo’s point when he reported the speech of Lynceus of Samos (the end of the fourth and beginning of third centuries BC), who mentioned that any discussion of Cyrene during Ptolemy’s regime was dominated by two words, silphium and horses.

In addition, Hyginus (*Astronomia*, II. 24) acknowledged this by providing important information reflecting the high quality of Cyrenaican horses and their economic significance during the Hellenistic period. He stated that some authors, including Callimachus, reported that Berenice II was interested in raising horses, and used to send them to Olympia.

Synesius (*Letter*, 130) pointed out that the source of wealth of most of Cyrenaica was due to their cattle, herds of camels and horses. He wrote this while he was

complaining about the barbarian attacks and the neglect of security by the rulers. Specifically, he (*Epist.*, 130) mentioned bitterly that Cyrenaica had become deprived of horses. However, this seems to have been the case of the region in the unsettled years only. The anonymous geographical work *Expositio Totius Mundi et Gentium* (LXII), written in the mid-fourth century AD, stated that horses and grain were essential Cyrenaican products

The ancient literary sources also indicated the horse's significance in Roman Cyrenaica and the Libyan role in breeding and training this animal. Pausanias (VI, 12. 7) in the second century AD, for instance, provided a memorable description of the achievements of Theochrestus (Θεόχρηστος) of Cyrene and his family when he won the Olympic and Isthmian games with four-horse chariots. This account contains another interesting point that suggests that the Libyans were renowned experts in horse husbandry, because he and maybe his family bred their horses in the Libyan way:

Θεόχρηστον δὲ Κυρηναῖον ἵπποτροφήσαντα κατὰ τὸ ἐπιχώριον τοῖς Λίβυσι καὶ αὐτόν τε ἐν Ὀλυμπίᾳ καὶ ἔτι πρότερον τὸν ὁμώνυμόν τε αὐτῷ καὶ τοῦ πατρὸς πατέρα, τούτους μὲν ἐνταῦθα ἵππων νίκας, ἐν δὲ Ἰσθμῷ τοῦ Θεοχρήστου λαβεῖν τὸν πατέρα, τὸ ἐπίγραμμα δηλοῖ τὸ ἐπὶ τῷ ἄρματι (Pausanias VI, 12. 7).

Theochrestus of Cyrene bred horses after the traditional Libyan manner; he himself and before him his paternal grandfather of the same name won victories at Olympia with the four-horse chariot, while the father of Theochrestus won a victory at the Isthmus. So declares the inscription on the chariot.

Theochrestus' grandfather won the Olympia chariot race in 360 BC and his father achieved that of the Isthmian in 300 BC. If they also bred their horses in the Libyan's way, it is probably an indication of distinctive Libyan skills in this field.

The distinctive characteristics of the Libyan horse can also be seen in the work of Aelian (AD 175-235), which provides important data about the different kinds of animals bred during the Roman period. In the section on horses, Aelian (*Charact.*, III. 2 cf. XIV. 10) addresses firstly the characteristics of the Libyan horse, and compared them with Persia horses. Aelian emphasizes that Libyan horses were fast even if they were neglected

by their owners. They were also thin and obedient, to the degree that after each journey the horses could be set loose to graze.

Additionally, the literary documents suggest that Cyrenaican horses had other advantages (App. I. D. 3). For example, Synesius of Cyrene (c. AD 370-413) provides us with additional details about Cyrenaican horses in a letter to his friend at Nesaea (Persian city) (*Letter*, 40). He discussed the versatility of the horse, which can be used for racing, hunting, chariot racing and war. Synesius makes an important point relating to a Libyan tradition of using the horse to celebrate victories. He states that ‘the horse can be used to lead ceremonial processions in honour of the Libyan victory...’ This is probably an indication that Libyans raced horses as the Romans did. Synesius describes Cyrenaican horses and compares their appearance with horses from Nesaea, stating that Cyrenaican horses were less beautiful because of their big heads. They were also thinner and heavier than Nesaeian horses, which were heavier in flesh. Additionally, Synesius emphasized in this letter the good quality of Cyrenaican horses. Sending Synesius a horse as a gift from Cyrenaica to Nesaea, the country of the most beautiful horses, shows the importance of there being other distinctive characteristics found in Cyrenaican horses that were not found in those of Nesaeian.

V.3.2 Cyrenaican cavalry

V.3.2.1 The socio-economic position of the horse and equestrians

In the wider socio-economic sense, the horse was a key marker of social status in both the Greek and Roman periods. They classified those who owned horses among the higher social classes. This is because the horses, more than other animals, had a high purchase cost and were expensive to breed and care for. In Athens, for example, according to Solon's constitution the cavalry (ἰππίας) was the second highest of the four social classes (Bugh 1988: 22). The cavalry comprised Athenian citizens who could produce three hundred *medimnoi* of different kinds of agricultural products (ἰππίαδα δὲ τὸς τριακόσια ποιῶντας) or who were able to breed a horse and could cover his cost (ὡς δ’ ἔνιοί φασι τὸς ἵπποτροφεῖν δυναμένους) (Aristotle, *Ath. Pol.*, 7. 4). Additionally, the Romans considered the equestrian class (knights) to be the second of the aristocratic classes for economic reasons (Dunstan 2010: 102). These classes comprised an important part of the military structure in both epochs. The number of mounted horsemen in the

army or the scales of use of horses in entertainments were signs of a city's or region's wealth. In other words, the quantity of horses bred at any place during the Greek and Roman eras could be used to measure its economic condition.

V.3.2.2 Literary evidence of the Cyrenaican cavalry in Classical and Hellenistic armies

The cavalry or horsemen were an essential part of Greek and Roman armies, and contributed significantly to the army's strength. The Cyrenaican horse played an important function in warfare, as clearly pointed out by the literary documents (App. I. D. 3). This was indicated by Xenophon (*Cyr.* VI, 1. 27-28) in the fourth century BC. The writer mentioned the use of war chariots in Cyrenaica, and specified the number of horses needed:

ἄρματα γὰρ τριακόσια τοὺς μὲν μαχομένους παρέχεται τριακοσίους,
ἵπποις δ' οὗτοι χρῶνται διακοσίους καὶ χιλίους (Xenophon *Cyr.* VI, 1.
27-28).

There were three hundred chariots, which required twelve hundred horses to be at the army's disposal and ready for use in the battles.

Although Xenophon did not mention the use of four-horse chariots by name τέθριπποι, it is clearly implied: if 1,200 horses drew 300 chariots, 4 horses would have been used to draw each chariot.

In addition, Aeneas Tacticus (XVI, 14- 16), who lived in the mid-fourth century BC, emphasized the significance of the horses in Cyrene, Barce and other Cyrenaican cities. He discussed how large numbers of chariots were used in the battles, which were helpful for quickly deploying combatants and their equipment to the field of the battle, transferring the wounded to the city, and many other purposes. He also reported that the chariots were used for protecting the heavy-armed troops when they attacked the enemy.

Cyrenaica had the potential to breed large number of horses and train them for warfare, which can be seen from the account of Polybius. He indicated the importance of the Cyrenaican cavalry through their contribution of an elite troop at the Battle of Raphia, the large conflict between Ptolemaic Egypt and the Seleucid Empire in 217 BC.

Ptolemy IV's army contained a total of 5,000 horsemen (Fischer-Bovet 2014: 132), 2,000 of which were hired from various Greek cities. The Libyan cavalrymen were among the other three thousand cavalries. According to Polybius:

τοὺς δ' ἰππεῖς τοὺς μὲν περὶ τὴν αὐλήν, ὄντας εἰς ἑπτακοσίους, Πολυκράτης παρεσκεύαζε καὶ τοὺς ἀπὸ Λιβύης, ἔτι δὲ καὶ τοὺς ἐγχωρίους· καὶ τούτων αὐτὸς ἡγεῖτο πάντων, περὶ τρισχιλίους ὄντων τὸν ἀριθμὸν (Polybius V.65. 5, 6).

The cavalry, again, attached to the court, amounting to seven hundred, as well as that which was obtained from Libya or enlisted in the country, were being trained by Polycrates, and were under his personal command: amounting in all to about three thousand men.

This text highlights the significance of the Cyrenaican horsemen at a number of points. They were among the elite troops trained by the commander Polycrates of Argos (Fischer-Bovet 2014: 148; Polybius V, 65.5). This implies that those citizens who owned horses and were able to train them well were wealthy. Although Polybius did not give the exact size of the Libyan cavalry, it is possible to approximate. If we excluded 700 horsemen, who constituted the guard or the court (αὐλήν), from the total of 3,000 cavalry, the other 2,300 were mixed cavalry made up of Libyans and Egyptians (Table V.1).

Libyans in this context are more likely to be Cyrenaicans, because Polybius mentioned them also when he listed the number of the infantry (Polybius V, 65). The leader of the Libyans infantry was from Barce, as is evident from his name *Ammonius of Barce* (Ἀμμώνιος ὁ Βαρκαῖος). *Ammonius* was a common Greek name especially in Egypt, Nubia and Cyrenaica (Fraser and Matthews 1987: 32).

Cavalry classifications	Number	%
Hired from other Greek cities	2,000	40%
Cavalry of the guard	700	14%
Libyans and Egyptians	2,300	46%
Cavalry total	5,000	100%

Table V.1: Place, number and percentage of cavalry participated in the army of Ptolemy IV in 217 BC (after Polybius).

It is important to note that the writer mentioned the Libyans before those who came from Egypt itself. This is probably a hint that the Libyan horseman made up the majority of the cavalry. As this cannot be considered reliable evidence, my suggestion here is that the Libyans probably made up at least half of the cavalry with 1,150 horsemen ($2,300 \div 2$). On this basis, the proposed numbers of Cyrenaican horsemen, probably a mixture of Greco-Libyan will have made up about a quarter of the Ptolemaic cavalry in the Battle of Rhabia. Even if we assume only equal numbers of cavalry from Egypt and Libya (Figure V.2), the scale of Cyrenaicans horses is highlighted. This can be understood for a few reasons. One is that Libya (Cyrenaica) is the only named place that contributed cavalry in the battle, and the rest were from Egypt the centre of the Ptolemies or hired from different unspecified places. The other one is that other place-names such as Gallia and Thracia were mentioned among those that provided numbers of infantry, but they were not among those that supplied cavalry (see Fischer-Bovet 2014: table 3.7). Another reason is that Cyrenaica was not as highly populated as Egypt was at that time, nevertheless its cavalry involvement in the battle was essential for the ruler Ptolemy IV. Therefore, whatever the exact number of Libyan cavalry contributing to the Battle of Rhabia, their presence should still be considered highly significant and indicative of a regional specialisation in breeding horses.

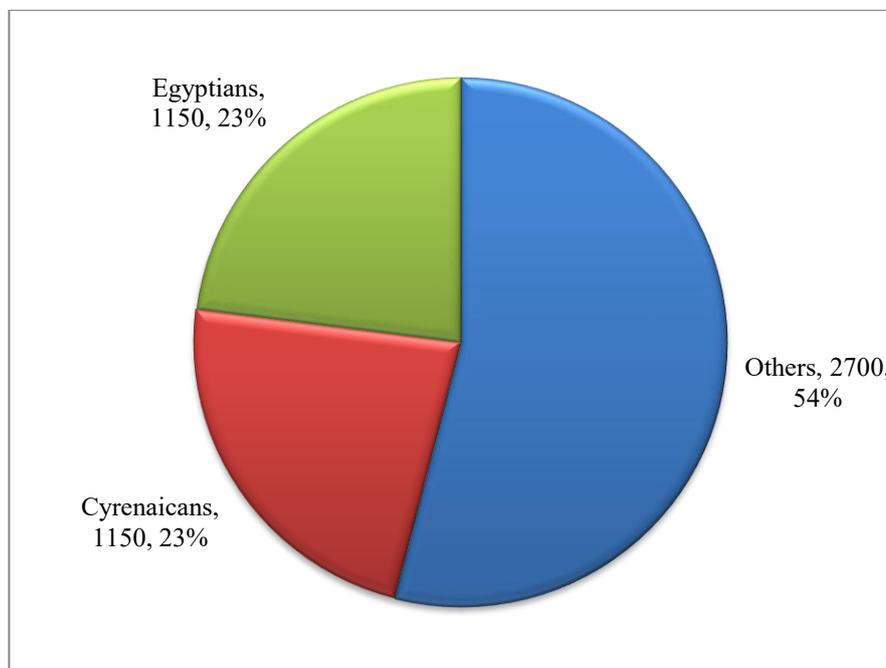


Figure V.2: The numbers and percentages of the Cyrenaican and other cavalries in the army of Ptolemy IV in 217 BC (see also Table IV. 2).

In addition, Cyrenaica's potential to supply considerable numbers of horsemen may be seen in the number of cavalry it supplied in this battle compared to the number of infantry from the region (Table V.2). A total of 70,000 infantrymen fought in this battle, of which only 3,000 were from Cyrenaica.

καθώπλισαν δὲ καὶ Λίβυας τρισχιλίους εἰς τὸν Μακεδονικὸν τρόπον,
ἐφ' ὧν ἦν Ἀμμώνιος ὁ Βαρκαῖος (Polybius V, 85. 8, 9).

They also armed three thousand Libyans in the Macedonian fashion, who were commanded by Ammonius of Barce.

Units	Total	Cyrenaica	Percentage
Infantry	70,000	3,000	3%
Cavalry	5,000	1150	23%

Table V.2: The percentages of the infantry and cavalry of Cyrenaica in the Battle of Rhapsia in 217 BC.

The Cyrenaican infantrymen comprised about 3% of infantry, while the proposed number of Cyrenaican horsemen represented around 23% of the total cavalry in the Battle of Rhapsia. Moreover, the distinctiveness of Cyrenaica's horses and chariots led them to be presented as gifts. Diodorus Siculus (XVII. 49. (3) informs us that Cyrene sent a delegation to Egypt to meet Alexander and present him with gifts of horses and four-horse chariots:

ἐν οἷς ἦγον ἵππους τε πολεμιστὰς τριακοσίους καὶ πέντε τέθριππα τὰ
κράτιστα.

Three hundred warrior horses and five of the most excellent four-horse chariots.

These literary manifestations and other archaeological evidence can be considered as important indication of Cyrenaica's capacity to raise horses in the Hellenistic period.

V.3.2.3 Epigraphic evidence for the Cyrenaican cavalry in Classical and Hellenistic armies

Epigraphic evidence also indicates that the cavalry with their four-horse chariots were an important part of the region's armies from the fourth century BC. One of the most

important military inscriptions, dated to 345 BC, listed the named of about 89 officers in different military units (*IGCyr084000*). This evidence is the most complete list of military officers found in the region so far. It included the names of six commanders of four-horse chariots teams (Λοχαγοὶ τέθριπποι) and five names of leaders of single horse riders, or horseman bands (Λοχαγοὶ μόνιπποι). The inscription also contained the names of eleven leaders of mixed units, structured around those who bore light shields and four horse chariots (Λοχαγοὶ πελταστᾶν συμμερῖται τοῖς τεθριππων). There are also the names of another five officers who oversaw the bands which fought beside the chariots (Λοχαγοὶ παραιβατᾶν). The horse seems to have played a part in the structure of about 27 bands from different units, if one assumes each one of the 89 officers was leader of a band. In other words, the horse units may have comprised a third of the total units in the Cyrenean military (Figure V.3). It is important to mention that 17 names of ephebic commanders (τριακατίαρχαι) have been also recorded in this list. As these were auxiliary units and comprised from the elite citizens, they are more likely to have used horses as well.

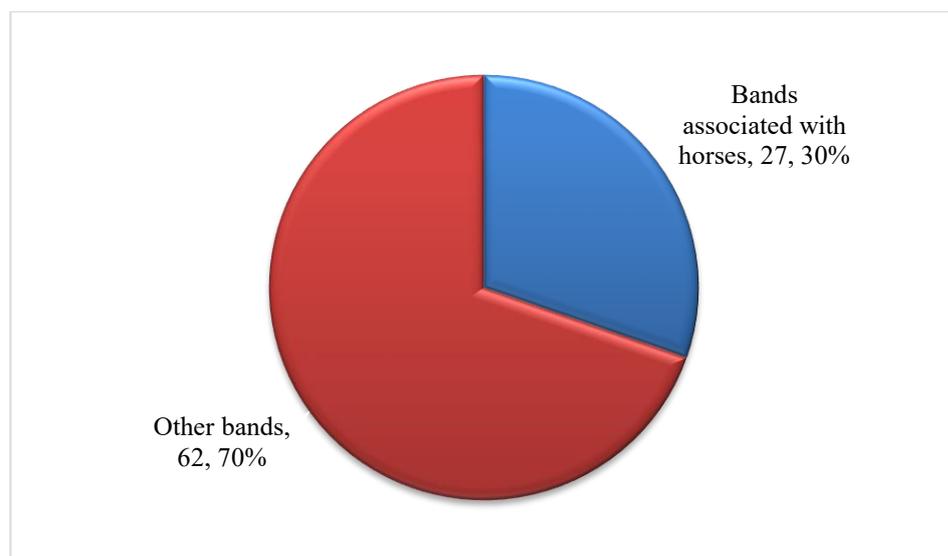


Figure V.3: The probable band numbers which represent the use of horses. Based on data from the inscription *IGCyr084000*.

Further evidence of the widespread use of horses in the Cyrenaican army can be seen in another inscription dated to 330 BC which records the names of commanders of four-horse chariot teams (*IGCyr014800*). It listed the names of nine generals and five four-horse chariot commanders along with a further 108 names. Dobias-Lalou mentioned that these names with 39 missing names may represent men forming one band (λόχος). Dobias-Lalou also stated that the list probably included names of other officers in the

missing lines. Although we are unsure whether the list represents soldiers, commanders of four-horse chariots or even other officers, the inclusive of at least five names of commanders of four-horse chariot teams is significant evidence of the importance of horses.

Our knowledge of the Cyrenaican cavalry during the Roman period is quite limited. However, Cuff (2010:251) listed some cohorts (consisting of Roman auxiliary mixed infantry and cavalry) which were assigned to garrison Germania. The cohort *II Augusta Cyrenaica equitata* (horsed) was among those placed in Germania Superior. He also mentioned that the presence of eastern units was rare in Roman Germany (Cuff 2010: 251, 252), though it is possible Cyrenaican cavalry units served elsewhere.

V.3.3 Equestrianism in the ephebate

V.3.3.1 An introduction to the ephebate

The ephebate was initially obligatory military training for elite citizens, it emerged in Athens during the fifth century BC (Recaldin 2011: 2, 3). The training period ran for two years and was publicly funded up to the end of the fourth century BC, when it changed to a voluntary and privately funded system (Recaldin 2011: 4, 12, 19). Consequently, ephebes became an auxiliary part of the army in some regions. According to the law of Demetrius 317-312 BC, young citizens could not be enrolled in the ephebate unless their fathers possessed property worth over 1,000 drachmas (Chaniotis 2005: 48-9 cited in Recaldin 2011: 12). This law seems to have been an indication that the ephebate changed from a public to a private activity, and may suggest that there was a financial reason behind this change. If so, the ephebate can be regarded an indication that individuals had sufficient wealth and leisure to enrol their sons in the ephebic institutions

The Cyrenaican ephebate seems to have been established from the fifth century BC, if one takes into consideration the number of Panathenaic amphorae found in the excavated tombs of Tocra, and other different places at the region such as *Alslaia* near Barce (El-Marj), Cyrene and Euesperides (Dennis 1970: 177-9; Elrashedy 1985: 406, 407; Finley and Pleket 1976: 123; Laronde 1987:143, 145-48; Vickers and Bazama 1971: 69-84). The earliest Cyrenaican Panathenaic amphora is that of *Alslaia*, which shows a view

of athletic completion (Figure V.4). It has been dated to the end of the sixth and beginning of the fifth centuries BC. However, the most interesting example of these is a Panathenaic prize amphora found at Tocra and dated to the end of the fifth century BC (Figure V.5). This seems to have been given to a winner of the chariot race in the ancient Panathenaia games held at Athens. The competitors in those games were ephebes who represented cities from different places in the Greek world.

Additionally, the substantial number of ephebic inscriptions found in Cyrene, Ptolemais and Tocra are important evidence that an active ephebate existed in the region from at least the fourth century BC (Reynolds 1996: 37-44; 1998: 475-84). Directors of the ephebes themselves appeared in the list of officers' names of the fourth century BC, as part of the military (*IGCyr084000*). Among the 89 officers were the names of 17 ephebic leaders (τριακατίαρχαι) and the names of 20 mixed units, which included ephebes and troops who bore a light shield (Λοχαγοὶ πελταστῶν συμμερῖται τοῖς τριακατίοις) (App. II. E. 1). It is possible to suppose that half of the 20 leaders were appointed to supervise the ephebes alongside the other 17, they would be 27 (10+17) names. If this was the case, the ephebes appear to have comprised a considerable number of the army members. The ephebic group in Cyrene (τριακάτιοι) have been regarded as auxiliary units formed from elite individuals which were used to fight beside troops who used light shields as πελτασταί (Gauthier cited in Prage's 2007: 88). Based on this, it is reasonable to regard that the large number of ephebes involved in the military as significant evidence of the sizeable privileged class in the society of Cyrene in the fourth century BC.

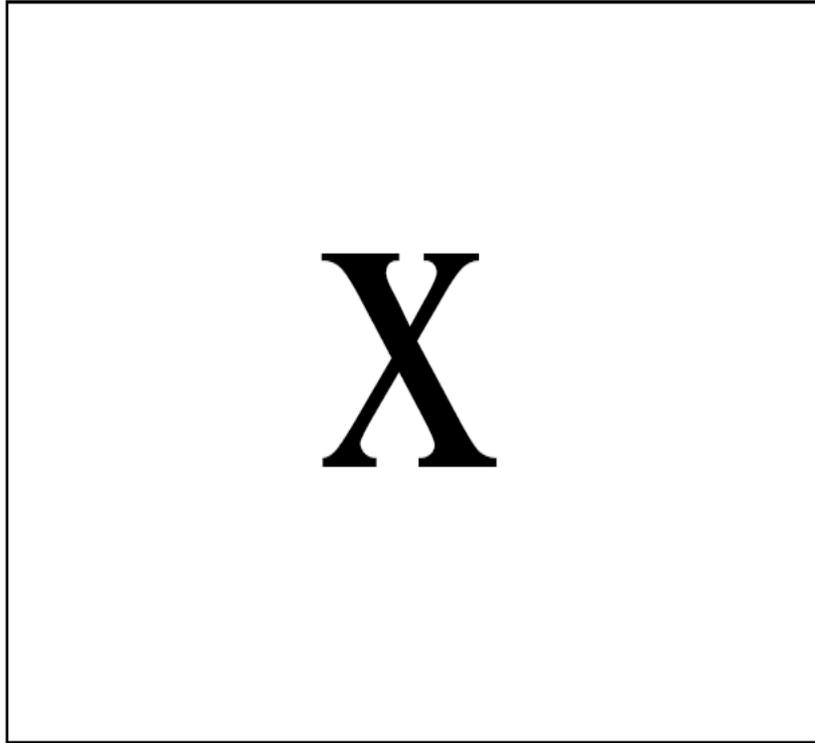


Figure V.4: A Panathenaic amphora from Alslaiia near Barce (El-Marj) dated to 510-470 BC (Laronde 1987:143. Fig. 38)

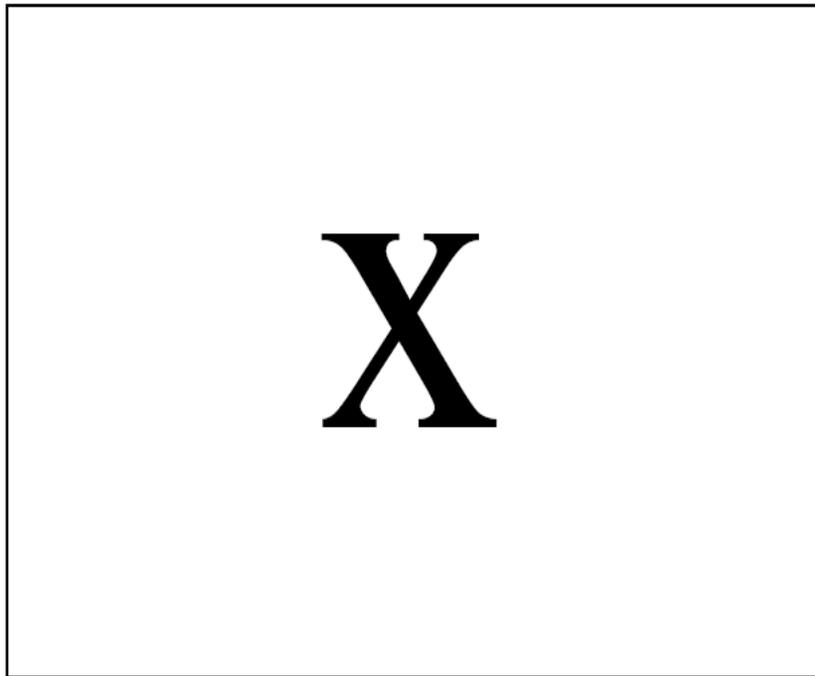


Figure V.5: View of a four-horse chariot race represented on a Panathenaic prize amphora found in Tocra and dated to 410-400 BC. Source: The British Museum. N. 1866,0415.249.

V.3.3.2 Linguistic and iconographic representations of horsemanship on ephebic inscriptions from Cyrene:

V.3.3.2.1 Linguistic indications:

The Greeks and Romans used some common linguistic terms to represent horsemanship for both entertainment and war. These words and others are important keys to test whether the ephebate of Cyrenaica included horse-riding. The word horse-riding (ἡ ἵππασία, ας) was the Greek term representing equitation itself. A man who practised this activity was called a horseman or cavalryman (ὁ ἵππεύς, έως). It refers to both those who rode on horseback and those who used a chariot. Additionally, the word commander of cavalry (ὁ ἱπάρχης, ου) was widely used in different places throughout the Greek world, including Thessaly, Caria and Egyptian Thebes, as can be seen in the following examples: *IG IX 2*, 1103; *SEG 35*. 1085; *SEG 18*. 705 (Tylor 2009: 288). However, so far neither the term equitation (ἵππασία) nor the word ἱπάρχης has been attested in Cyrenaica. Nevertheless, the word ἵππεύς appears in two inscriptions. One from Zawiyat Msus (about 100 km southeast of Berenice) is dated to the first century AD (*SEG 26*.1852; Reynolds 1971: 41, 10). It is also attested in another inscription from Esc-Shceleidima (about 70 km southeast of Berenice). While this evidence has not been published yet, Reynolds has initially dated it to the early/mid-Roman era (*IRCry.B.56*). The word horseman (ἵππεύς) in these two inscriptions probably relates to cavalrymen in the army.

In Cyrenaica, the cavalry's instructor who was appointed to train the ephebes in equestrianism had the local name ἀπορτυιάζων. This regional word was represented by a number of the ephebic inscriptions of Cyrene (Kennell 2009: 232; Lüderitz 1983: 7; Recaldin 2011:18; *IGCyr*; *IRCyr*). The earliest testimony indicated by an ephebic dedicated inscription is dated to the beginning of the second century BC (*IGCyr015200*). It stated that Apollonidas son of Damatrios (Ἀπολλωνίδαυ Δαματριώ) was a commander of the cavalry (ἀπορτυιάζων) and the son of the gymnasiarch Praxiadas Eukles (Πραξιάδαυ Εὐκλεῦς). He seems to have been a member of the teaching staff, which included four τριακατιάρχει (leaders of ephebes) and four γυμνασίαρχοι (trainers of the professional athletes). Two of these ephebic instructors were appointed to train the older ephebes (πρεσβυτέροι) (App. II. E. 1-3). The inscription also listed about nine names of the dedicators as ephebes, but there were probably more (*IGCyr015200*). The cavalry instructor appears to have had a high social position, as his father was a gymnasiarch. The

value of this evidence lies in its indication that horsemanship was an important part of the training programs at ephebic institutions in the second century BC, and was probably separate from military training. It is important to mention that ephebes trained as part of the military in Athens during the fifth century BC (Recaldin 2011: 2, 3). In Cyrene, the inscription *IGCyr084000* demonstrates that they also had their training with the military of the region in the fourth century BC. This evidence lists names of ephebes, and military officers (see App. II. E. 2). However, the second century BC ephebic inscriptions of Cyrene, indicate that ephebic instructor then acted alone. This is perhaps important evidence for establishing ephebic institutions that were separate from military ones in the region during the Hellenistic period (App. II. E. 1-3). Different activities seem to have been practiced there, including horsemanship.

The term ἀπορτυιάζων (cavalry) is also attested in other dedicated ephebic inscriptions from Cyrene. They respectively date to the second and end of the second century BC and the beginning of the first century BC (*IGCyr103900*, 104000, C. 447; App, II. E. 3). These three inscriptions similarly represented the word ἀπορτυιάζων alongside a close number of staff appointed for training ephebes. They indicated respectively about five and four names of gymnasiarchs for supervising younger and elder ephebes (*IGCyr103900*, 104000; *IRCyr.C. 447*). They also used the local terms of the ephebes (τρικάτιοι). This may reflect continuation of equestrianism as an essential part of the Cyrenaican ephebic training program over time.

The ephebic inscriptions of Cyrene only included the word ἀπορτυιάζων in the period between the second century BC and the first century AD. However, it seems to be a synonym of the Athenian so-called ἱπάρχης, ου or ἵππαρχος, ος (commander of cavalry) because in some cases the inscription was embellished with a relief sculpture of horse. The most interesting example of this is an ephebic inscription dated to the beginning of the first century AD (*IRCyr.C.114*). This represented the term ἀπορτυιάζων among the trainer's staff and a list of about 78 ephebic names on a marble panel. On the reverse face of this panel appears a relief of a horse's head. This is a clear indication of the active role of the horseman, at least in Cyrene. Although the names listed date to different years, it seems to provide further proof that equestrianism was practised in the ephebate of Cyrene and the list suggest an ephebic activity rather than military training, as suggested by researchers such as Kennell (2009: 332) and Recaldin (2011: 18). The

most important evidence of this is that the inscription under question, like all other inscriptions, represented the term ἀπορτυάζων alongside the leaders of the ephebes (τριακατιάρχαι) or those who supervised the gymnasia itself (γυμνασίαρχοι), or both in some cases (App. I. E. 3). In addition, the list was a dedication to Hermes and Heracles, the gods of the gymnasia. It is worth mentioning that the strong relationship between the ephebic institutions of Cyrenaica and these gods has been epigraphically attested from the Hellenistic period. For example, an ephebic inscription from Cyrene dated to the second century BC indicated that a gymnasiarch dedicated 80 sacred strigils to Hermes and Heracles (*IGCyr*100700; *SEG* 37.1674). This tight relationship also appeared during the Roman period in some evidence from Ptolemais and Cyrene dated to the first century BC (*IRCyr*.P.251; *IRCyr*.C.753; *SEG* 20.740; *SEG* 26:1839).

Therefore, it is reasonable to suggest that equestrianism was one of the most important skills that the ephebes of Cyrenaica were trained in as part of the ephebic institutions.

V.3.3.2.2 Iconographic representations of horsemanship on the ephebic inscriptions

Although the available ephebic inscriptions contained limited direct linguistic evidence of horse-riding in the Cyrenaican ephebate, they include some iconographic features related to horse-riding, especially at Cyrene. The Roman ephebic epigraphy of Cyrene collected from the *IRCyr* project comprises about 35 inscriptions. Around 16 of them have been associated with different features of the horse. Nevertheless, one should take into consideration that some of the latter were incomplete, and in some cases lacked the preamble which is the most important part of the text, because it usually includes the names and roles of the directors of the ephebes. It is therefore reasonable to expect that more of them originally indicated horse-riding activity. Nevertheless, 16 out of 35 (46%) inscriptions represent evidence reflecting the value of the horse in the city's society (Figure V.6).

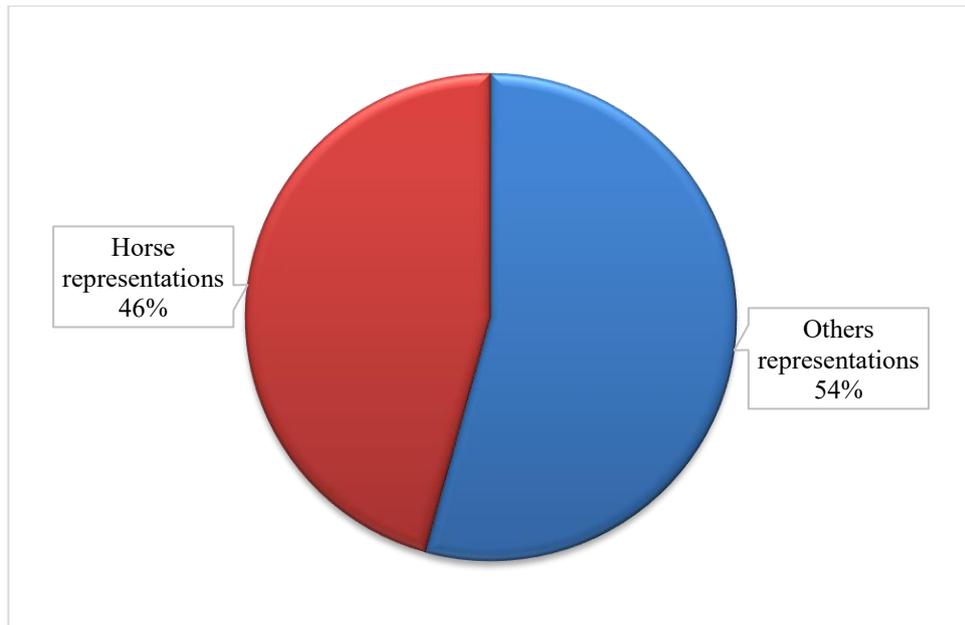


Figure V.6: The percentages of Cyrene's ephobic inscriptions containing direct or indirect clues related to horse-riding.

Two inscriptions contained linguistic evidence referring to the word cavalry instructor, (*ἀπορτυτάζων*) (*IRCyr. C.447, C.114*), dated to the first centuries BC and AD. The other 14 inscriptions were embellished with a variety of iconographic features related to horses. Horse and *quadrigae* were associated with most of these ephobic inscriptions. Eight ephobic inscriptions, dated to different times between the first century BC and second century AD, were inscribed on multiple sides of one free-standing monumental base. This monument was also decorated with two different views that included horses. On the front face, a relief sculpture of a four-horse chariot with a driver was found (Figure V.7). On the left face of the same block, a figure of a boy leading a horse is depicted (*IRCyr.C.698,699,700-705*).

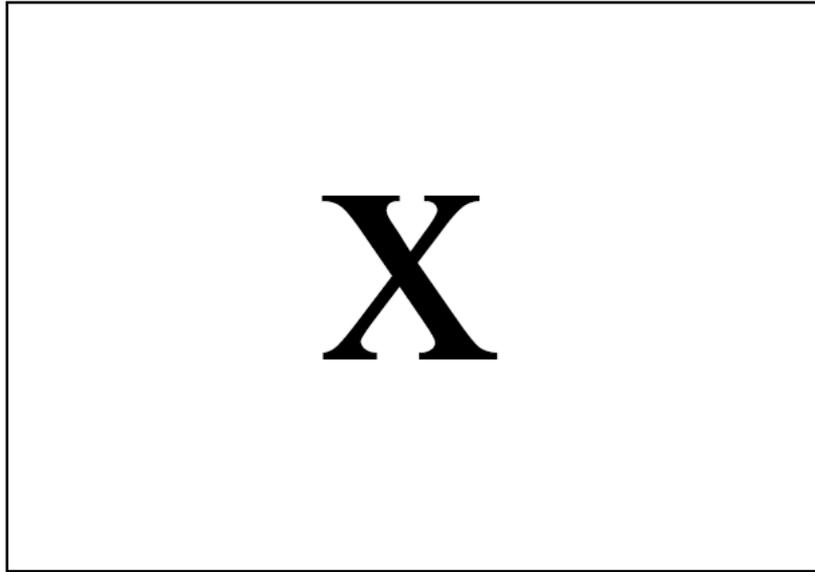


Figure V.7: A relief of a four-horse chariot with a driver depicted on a face of an epebic inscriptions. Sources: *IRCyr.C.698, 699,700-705*.

An interesting pair of inscribed marble bases was embellished with reliefs on all faces of four-horse chariots and a driver (*IRCyr.C.710, 711*). The text was written on two faces: above the relief and on the necks of the horses. In addition, another four inscriptions were probably relevant to the cult of hero. Three of them represented a man on horseback, while the fourth represented only the word hero, but it probably was for a horseman hero (*IRCyr.C.956, 907, 908, 909*; Kane 2003). Thus, the *quadriga* is well represented in the iconographic data relevant to horses depicted on the epebic inscriptions of Cyrene. This image associated with 71% (10 out of 14) of the relevant epigraphic evidence (Figure V.8). It is therefore no surprise to notice that there were a considerable number of four-horse chariots in the epebic inscriptions, because the literary evidence also emphasized the use of Cyrenaican horses and chariots for entertainment in the Hellenistic and Roman worlds and their outstanding achievements (see App. I. D.3).

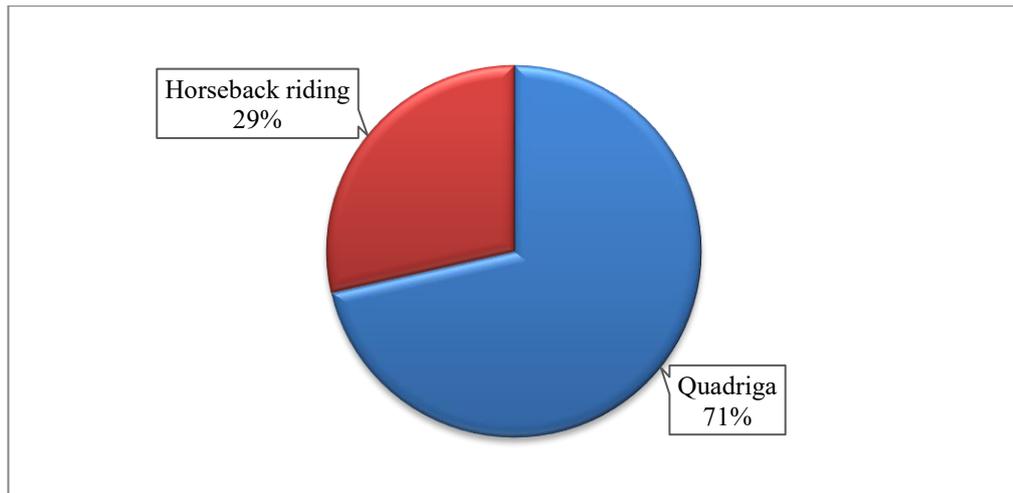


Figure V.8: The percentages of ephobic inscriptions associated with figures of quadriga and horseback riding. Based on data collected from *IRCyr*

V.3.4 Metrical indications of horsemanship on ephobic inscriptions from Cyrene:

The metrical epigraphic data is important evidence of the practice of equestrianism under the ephobic institutions of Cyrenaica. A poem dated to the second/third centuries AD was written to celebrate the victory of citizen Markos and his horses (*GVCyr036*). However, the most important indication of the region's high-quality horsemanship can be seen in two honorific poems written to celebrate the winners of horse chariot races (*GVCyr034*). The epigraphic evidence probably dates from the end of the second or the beginning of the first century BC. The textual verse provides significant information relevant to Cyrene's advanced horse training program. The first poem highlighted an athlete's victory, and stated that he won because of the highly-skilled trainers at the gymnasium school which was under the care of Heracles:

πάντεσι δ' ἄρ' ὀνύχεσσιν δῶκεν (granted) οἱ ὠκέσιν (quick) ἵππος
 στεψαμένωι (crowning) τελέαν ἄρματι (chariot) καμμονίαν·
 οὐδέ μιν Ἑρμεία ὁ σόφων ἀδαήμονα μύθων
 πατρὶς ἐνὶ λιπαροῖς ἔτρεφε γυμνασίοις,
 εὖ δὲ καὶ Ἡρακλῆϊ μεμηλότα... (GVCyr034).

For by means of all their quick hooves, his horses gave him with his chariot the perfect victory with which he crowned himself; Hermes' wise discourses were not failing in the education given by his home-

city in its luxurious gymnasiums, neither was he deprived of Heracles' concern (*GVCyr034*).

The second poem named a competitor who won two chariot races. The text's value lies in its description of the charioteer sailing over the sea, which means that he contributed in games outside his home city of Cyrene. However, the most important phrase that highlights Cyrene as the place where those great contestants were graduated from:

στεψάμενον διδύμας κλῶνα διφρηλασίας
καὶ διὰ κυανέας στέλλεται αὐθις ἄλός·
οὔσε πάλαιμέγα θάμβος ὄρωρεν' δῖα Κυράνα,
ἀθλητᾶν τοίους παῖδας ἀεξομέναν. (*GVCyr034*).

He crowned himself with the palm of a double chariot race... And on the spot he fits himself out for sailing through the dark blue sea. That is why a great amazement has long since arisen towards you, divine Cyrene, who brings up such sons of athletes (*GVCyr034*).

These poems clearly show that equitation was practised by Cyrenaican ephebes, along with other sporting activities, at the ephebic gymnasia during the Hellenistic period. The poems emphasized the region's great reputation in the four-horse chariot race. The importance of these metrical texts lies in their addition of three names of winners in the *quadriga* from the region. Laronde (1987: 146) listed 15 names of known Cyrenaican athletes who had won a variety of games. The list indicated that, 4 of them represented a chariot race victory. Adding to them those two new names (Markos and Neon son of Theuchrestos) and that of Berenice II (267 or 266 BC - 221 BC), the daughter of Magas of Cyrene mentioned by Callimachus (Fantham 1995: 146), there would be 7 names in total. These 7 names in addition to other names mentioned by the literary sources, excluding Neon son of Dionysios who had won a local contest, they make up 56% (10 out of 18) of the total number of Cyrenaican winners of the Greek and Roman games (Table V.3). This is a significant indication of the Cyrenaican interest in breeding horses in the Hellenistic and early/mid-Roman periods.

N.	Name	Date	Festival or location	Reference
1	Cratisthenes	464 BC	Olympian	Laronde 1987: 146
2	Arcesilas IV	462 BC	Pythian	Laronde 1987: 146
3	Theochrestus I	360 BC?	Olympian	Laronde 1987: 146
4	Theochrestus II	300 BC	Isthmian	Laronde 1987: 146
5	Markos	2 nd /3 rd centuries AD	Delphi	GVCyr036
6	Neon son of Theuchrestos	End 2 nd / beginning 1 st centuries BC	He won two competitions somewhere in Greece	GVCyr034
?	Neon son of Dionysios	End 2 nd / beginning 1 st centuries BC	He probably won a local competition at Cyrene.	GVCyr034
7	Berenice II	c. 266- 221 BC	Nemean	Callimachus, Aetia, <i>The victory of Berenice</i> , III. Fr. 54. 3, 4.
8	Eubotas	408 BC	Olympian	Pausanias, VI, 8. 3.
9	Brother of Arcesilas	462 BC	Pythian	Pindar, <i>Pyth</i> , V. 40- 53.
10	Telesicrates	474 BC	Pythian	Pindar, <i>Pyth</i> , V. 40- 53.
11	Theochrestus	Second/First century BC	Olympian	Pausanias, VI, 12. 7.

Table V.3: Cyrenaican charioteer winners, historical dates and the names of the festivals or their locations (For the literary sources accounts see App. I. D. 3).

V.3.5 Epigraphic evidence of the use of the word ‘horse’ in the structure of personal names

Personal names offer a picture of the ancient Greek society, reflecting as they do languages, landscape, population movement and mixture, family tradition and relations, the highest professions and humblest trades, historical events, local mythology and cult, politics, cultural values and... (Christidis 2007:687)

The word ‘horse’ was widely used in the personal names of the Greeks and Romans. This probably reflects their concern with this animal in particular. It is important to point out that some of these personal names were composed of two parts, and consisted of a changeable adjective as a prefix followed by fixed noun (horse). *Κάλλιππος* (beautiful-horse) and *Μελάνιππος* (Black-horse) are examples of this. Other personal names were composed from a fixed noun (horse) followed by a changeable noun as a suffix. For example, *Ἰππόνικος* (Who has winning horses) or *Ἰπόλυτος* (Who lets horses loose).

The use of these types of names, which Dubois (2000: 43, 50) referred to as ‘possessive compounds’, in Cyrenaica can be considered as an important sign of the status of the horse in the Greek and Roman societies of the region. Although these names are linguistically Greek, their wide usage in Cyrenaica could indicate the translation of existing Libyan patterns of nomenclature linked to successful horses breeding. The fertile land and the Libyan indigenous tradition of horses breeding are probably the most important factors.

The epigraphic data indicates that these compound personal names seem to have been used in Cyrenaica from the fifth century BC up to the second century AD (Fraser and Matthews 1987). However, investigating a number of these names, such as Ἀρίστιππος (Best-horse), Κάλλιππος (Beautiful-horse) and Μελάνιππος (Black-horse), shows that they were particularly common between the fourth century BC and the first century AD (Figure V.9).

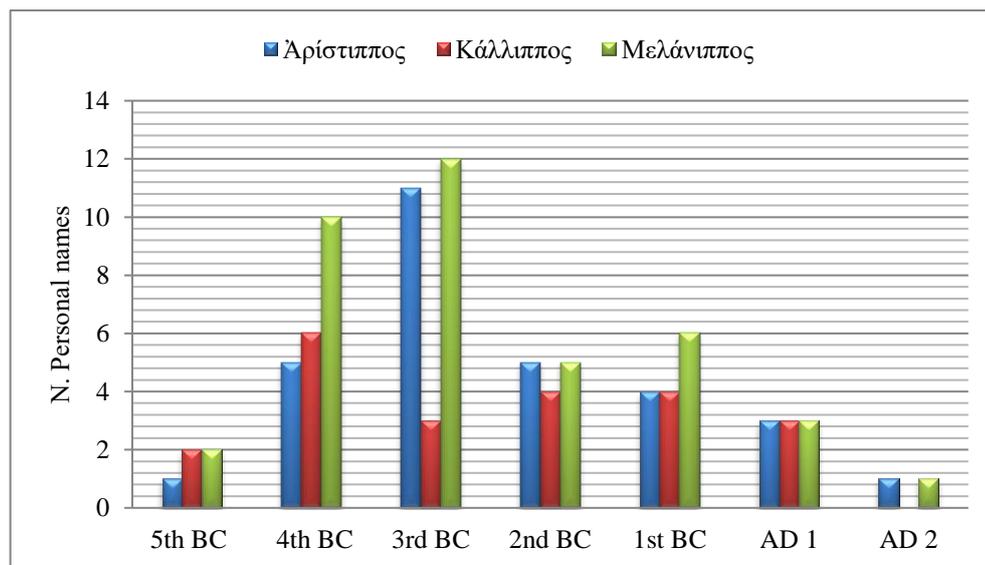


Figure V.9: Cyrenaican personal names consisting of horse compound names and adjectives in use from the fifth century to the second century AD. Ἀρίστιππος (Best-horse) Κάλλιππος (Beautiful-horse) and Μελάνιππος (Black-horse) (based on data collected from Fraser and Matthews 1987).

These three examined names and other horse related names from Cyrenaica can be compared to Crete and Cyprus (Table V.4 and Figure V.10). It is interesting to note that the overwhelming majority of horse related names from the three areas were from Cyrenaica. The clear presence of horse-related names in Cyrenaica can be also considered as evidence of an unusual pattern in local Greek nomenclature. This can be seen in the vast number of these names in the epigraphic evidence of the region. A list of names from

Cyrene dated to the fourth century BC is a case in point (SEG 20.735). An interesting name constructed from the word ‘horse’ recorded in this evidence is Ἀρίστιππος Μελάνιππω (Aristippus son of Melanippus). This incorporated the word ‘horse’ in the names of both the son and his father. The sizable use of word ‘horse’ for forming the names is perhaps evidence that many Greeks in Cyrenaica were horse-owners and horse-breeders.

Personal Names	Crete	Cyprus	Cyrenaica
Ἀρίστιππος (Best-horse)	1	0	22
Εὔιππος (Well-horsed or delighting in horses)	0	0	4
Ἰππίας (From ἵππεύς: horseman, rider)	2	0	6
Ἰππόδαμος (Who has tamed horses)	0	0	4
Ἰπποκράτης (Who has powerful horses)	0	1	3
Ἰππόνικος (Who has winning horses)	0	1	4
Κάλλιππος (Beautiful-horses)	1	3	22
Μελάνιππος (Black-horse)	0	0	31
Φίλιππος (He who loves/is fond of horses or riding horses)	5	4	28
Total	9	9	124

Table V.4: A comparison of Greek personal names formed from two words (one of which is the word horse) in Crete, Cyprus and Cyrenaica from the fifth century BC to the first century AD (based on data collected from Fraser and Matthews 1987).

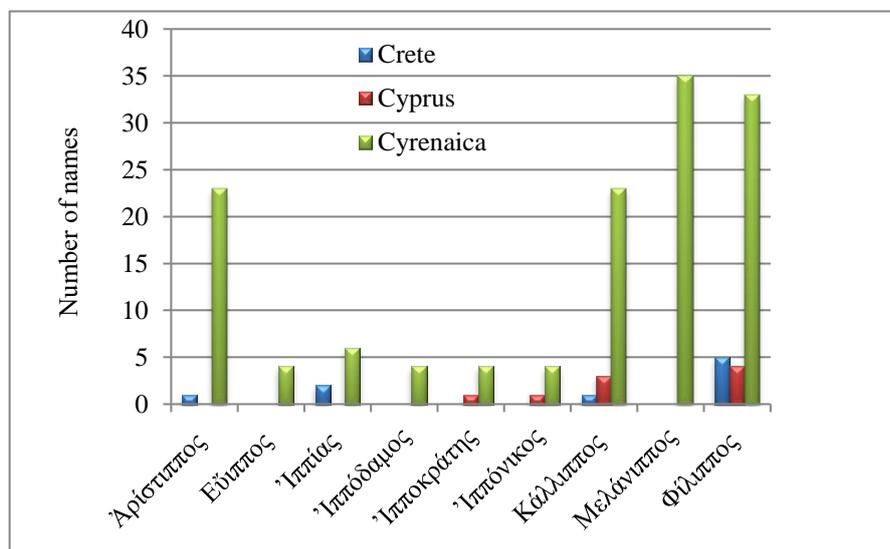


Figure V.10: A comparison of the occurrences of horse-related Greek personal names in Crete, Cyprus and Cyrenaica from the fifth century BC to the first century AD (nos. correspond to the names shown in Table V. 4). (Based on data collected from Fraser and Matthews 1987).

Nevertheless, it is perhaps more instructive to contrast this nomenclature in Cyrenaica with that of a Greek mainland area, such as the Peloponnese (Fraser and Matthews 1997). This includes also the personal names formed from two words (one of which is the word horse) in the Peloponnese during the period spanning from the fifth century BC to the first century AD (see Table V.5 and Figure V.11). However, it is important to note there is a gap of a decade between Fraser and Matthews' collections relating to the two regions. They published the volume which includes Greek personal names from Cyrenaica in 1987 and the one that includes names from the Peloponnese in 1997. Also, the lack of recent excavations at Cyrenaica is another matter which should be taken into account in this comparison and the larger number of Greek cities in the Peloponnese. Nevertheless, Cyrenaica has yielded a higher number from these compound personal names. These are 124 names against 107 from Peloponnese. *Κάλλιππος* (Beautiful-horses) and *Αρίστιππος* (Best-horse) seem to have been common names in both regions, though the latter indicates a higher number in Cyrenaica.

However, the most interesting point is the clear indication of the name *Μελάνιππος* (Black-horse) in Cyrenaica (Figure V. 11). The number of names collected from Cyrenaica is 31, while one name only has been recorded from the Peloponnese. This may reflect that the black horse was widely bred in Cyrenaica, or it may indicate something relating to the good quality of these horses, especially in the Greek and Roman games. This view can be supported by the modest presence of this name in the other regions. For example, there are three names come from Central Greece, four from Thessaly and only five names from Attica itself (see Fraser et al. 1994; Fraser and Matthews 2000). Overall, the evidence strongly suggests that the use of the name *Μελάνιππος* (Black-horse) had special importance in Cyrenaica's nomenclature.

Personal Names	Peloponnese (data collected in 1997)	Cyrenaica (data collected in 1987)
Ἀρίστιππος (Best-horse)	14	22
Εὔιππος (Well-horsed or delighting in horses)	1	4
Ἰππίας (From ἵππεύς: horseman, rider)	14	6
Ἰππόδαμος (Who has tamed horses)	5	4
Ἰπποκράτης (Who has powerful horses)	6	3
Ἰππόνικος (Who has winning horses)	4	4
Κάλλιππος (Beautiful-horses)	22	22
Μελάνιππος (Black-horse)	1	31
Φίλιππος (He who loves/is fond of horses or riding horses)	40	28
Total	107	124

Table V.5 A comparison of Greek personal names formed from two words (one of which is the word horse) in the Peloponnese and Cyrenaica from the fifth century BC to the first century AD (based on data collected from Fraser and Matthews 1987 and 1997).

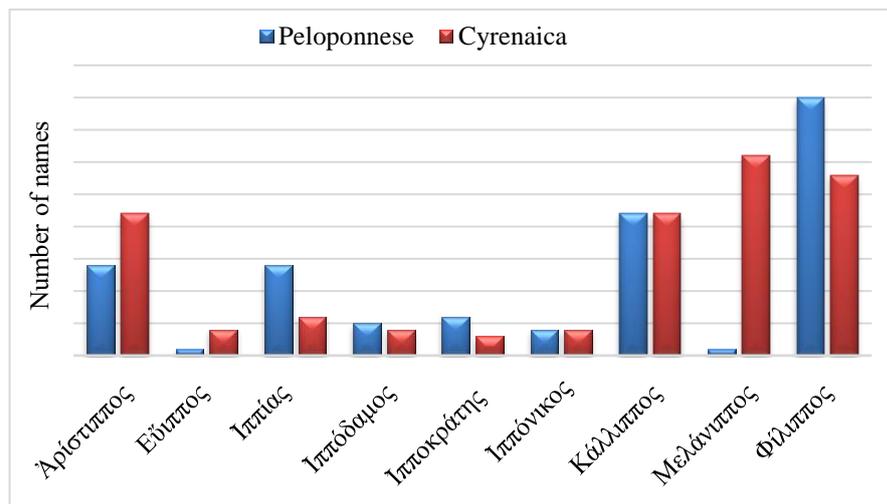


Figure V.11: A comparison of the occurrences of horse-related Greek personal names in Peloponnese and Cyrenaica from the fifth century BC to the first century AD (nos. correspond to the names shown in Table V. 5). (Based on data collected from Fraser and Matthews 1987 and 1997).

Comparing the total number of the Greek personal names, formed from the word horse in the Peloponnese and in Cyrenaica, is quite difficult. This is because there is no list of names in Volume I (Fraser and Matthews 1987) which includes Cyrenaica, Cyprus and the Aegean Islands and Volume IIIA (Fraser and Matthews 1997) includes a list of names from the Peloponnese alongside other regions. Therefore, I have selected the name Κάλλιππος (Beautiful-horses) to indicate their percentages among the names started with kappa ‘κ’ in both regions. I selected this name as there is an equal number (22) of

occurrences from the two regions as has been seen in table V.5 above (Fraser and Matthews 1987, 1997). The total number of the names starting with kappa (κ) in the Peloponnese is 1489, however 22, that include the word horse, comprises *c.*1.5% of the total names. Meanwhile, those from Cyrenaica number 353 names and 22 names associated with the word horse represents *c.*6.2% names relate to the word horse. Obviously, these percentages can provide only an approximate indication of the overall trend, but the results suggest that horse nomenclature may have been four times as common in Cyrenaica as in the Peloponnese.

The changing economic value of the horse in Cyrenaica over time can presumably be seen in the slightly decline in the use of the word horse in personal names. This is apparent in the total number of the three personal names which appear in each century, which reflect a higher use of the word horse from the fourth to the first centuries BC in contrast to that of the centuries AD (Figure V.12 and Table V.6). Although this decline was probably also due to naming fashion change for other reasons, it is worth mention that a similar trend is perhaps also seen in the ephebate. This picture is reflected in the total number of the ephebic directors who were appointed to cover different subjects in each century. There are about 7 and 8 ephebic inscriptions, dated to the fourth century and the second centuries BC respectively, each demonstrating 27 directors' names. Based on this, it is possible to assume that similar numbers of ephebic supervisors existed in the third century BC, even though only one poor ephebic inscription represents this century. The names of 24 instructors are known from 120 inscriptions dated to the first century BC, 19 names taken from 162 inscriptions dated to the first century AD, 18 names from 76 inscriptions of the second century AD and 8 names taken from 6 the third century AD's inscriptions. The total number of these directors began falling in the first century BC as can see in figure V.12 and table V.6. Despite the recovery which seems to have happened in the number of staff in the second and third centuries AD, it is still much lower than that of the fourth and second centuries BC. This is given extra emphasis when we recognise that the names of fourth-second centuries BC date come from a much lower number of inscriptions (see Figure V.13). Thus about 81 (57%) names of ephebes directors have been represented by 16 (4%) inscriptions dating from the fourth to the first centuries BC, while 61 (43%) names appeared in 364 (96%) inscriptions dated to the first three centuries AD. This change, in the use of the word horse in personal names and in the number of ephebes's instructors which appeared during the Roman period, may be

down to economic reasons. The Romans also had their own styles of nomenclature which had a local impact through the acquisition of Roman citizenship by the elite.

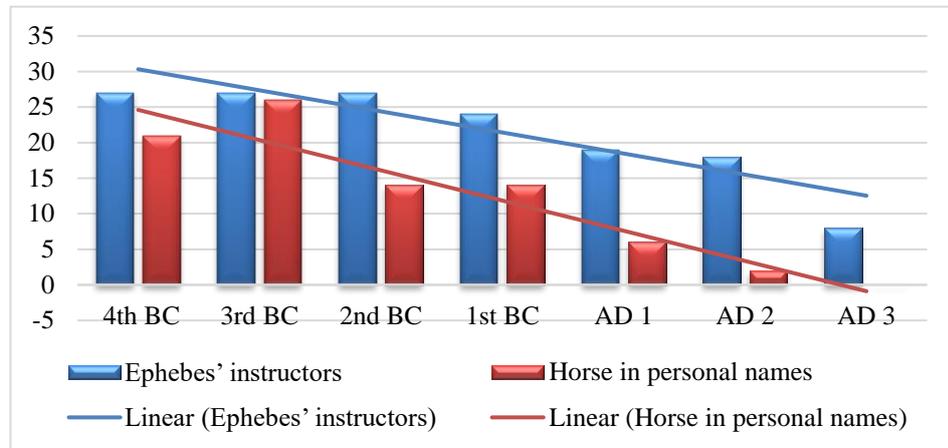


Figure V.12: The total number of three personal names Ἀρίστιππος (Best-horse), Κάλλιππος (Beautiful-horse) and (Μελάνιππος) and the total number of epebes' instructors in each century from the 4th century BC to the 3rd century AD.

Date	The word 'Horse' used in personal names	Epebic instructors	
		N. staff	N. inscriptions
4 th BC	21	27 (18%)	7
3 rd BC	26	27? (18%)	1
2 nd BC	14	27 (18%)	8
1 st BC	14	24 (16%)	120
AD 1	6	19 (13%)	162
AD 2	2	18 (12%)	76
AD 3	0	8 (5%)	6

Table V.6: The total number of three personal names Ἀρίστιππος (Best-horse), Κάλλιππος (Beautiful-horse) and (Μελάνιππος) and the total number of epebes' instructors in each century from the 4th century BC to the 3rd century AD.

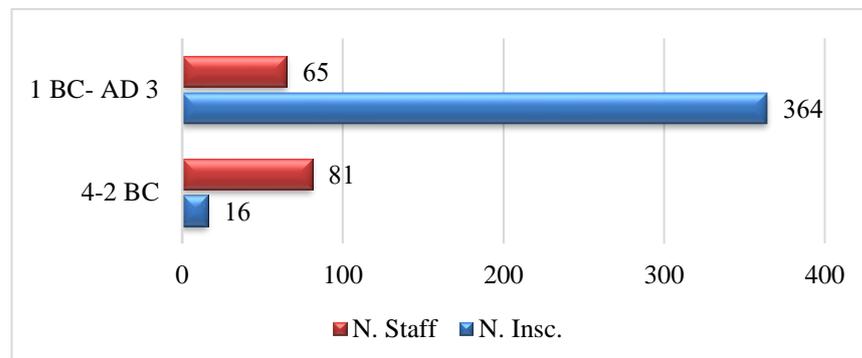


Figure V.13: Number of the epebic inscriptions dated to the period from fourth to second centuries BC and that dated to the period from 1 BC to the third century AD and the number of epebes' instructors gained from each group (based on data from *IGCyr*, *GVCyr* and *IRCyr* projects).

V.3.6 Cyrenaican horses in different cultural materials

The various representations of the hero cult, in particular Heracles (who was associated with athletic affairs) and the horse on some cultural materials, are important evidence of the region's concern with entertainment and the status of the horse. This is probably a sign of Cyrenaica's strong economy, which allowed the public to take part in many sports and allowed some of them to own horses for pleasure. Brandt (2012: 169,170) examined seven visual themes represented on pottery discovered in three different sanctuaries in Athens, Samos and Cyrene dated to the period between the 7th and 5th centuries BC. The investigation focused on the Attic black-figure, in particular the vases relevant to ritual usage. The heroes, especially Heracles, and horse scenes such as hunting, racing and cavalry fighting, were among these different subjects. The heroes and horse themes are well indicated by the data from Cyrene. Heroic figures appeared on 6 out of 104 vases at Athens (6%), 3 out of 10 at Samos (30%) and 9 out of 23 at Cyrene (39%). Additionally, horse themes were represented on 23 vases out of 420 at Athens (5%), 20 out of 63 at Samos (32%) and 25 out of 60 vases at Cyrene (42%) (Brandt 2012: 170). Both themes were thus more frequent in Cyrene (Figure V.14). This probably also demonstrates that horses were important for Cyreneans and may have been associated with luxury.

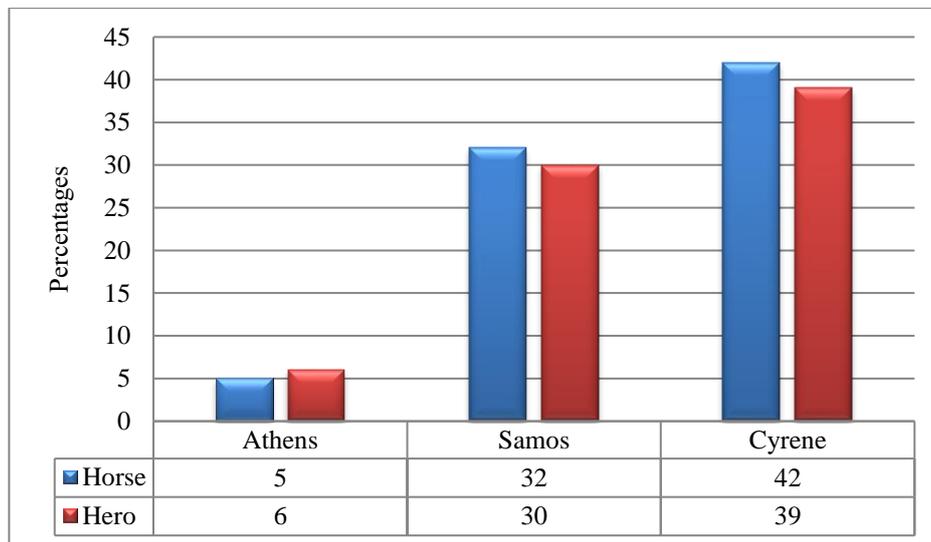


Figure V.14: An illustration of the percentages which represented heroes and horses on Attic black figure vases collected from Athens, Samos and Cyrene.

Furthermore, the horse is frequently represented in free and relief sculptures and on terracotta figurines (Bonanno 1979: 65-90). A good example is a relief portraying a four-

horse chariot found at Cyrene and dated to the fourth century BC (Hyslop and Applebaum 1945: 88). Another very remarkable relief sculpture (Figure V.15), depicting a Hellenistic equestrian type, has recently been discovered by the Polish mission at Ptolemais (Muszyńska 2012: 294, 308-11). In addition, the horse image was a favoured theme on Cyrene's golden coins in the Greek and Hellenistic periods (Buttrey 1997; Caltabiano 1998: 97-112; Robinson 1927: Pl. XIII, XIV, XIX, XX). The *quadriga* is well-represented on coins of the period 375-308 BC (Robinson 1927: 25-33). It was depicted on the obverse of golden *Staters*, while Ammon appeared on the reverse (Figure V.16) *Horseman/silphium* also appeared on the golden *drachmas*. However, horses were not illustrated on less valuable coins, such as the Attic *hemidrachmas* and *tenths*. According to Robinson, 61 Cyrenean golden coins of this period have been recorded. A horse figure appeared on 22 *Staters* and 10 *drachmas*. These comprised 52% (32 out of 61) of the total coins of this period.

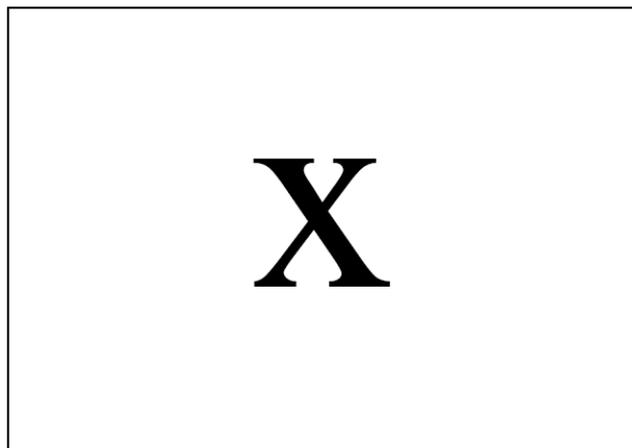


Figure V.15: Relief sculpture from Ptolemais showing a Hero equitans type (Muszyńska 2012: 294, fig. 2).

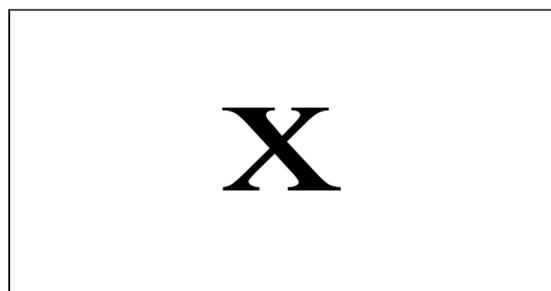


Figure V.16: Golden Stater. Obv. Quadriga driven by Nike. Rev. Ammon. Late 4th century BC
Source: Cyrenaica - Coin Archives; see also Robinson Pl.XIV. 1-10.

Architectural evidence relating to horses is slight. Cyrenaican cities probably all had their own buildings devoted to entertainment, specifically horse racing, which was a popular sport and practised in a special building called a hippodrome. There has been much debate on how to accurately interpret these buildings, and their function is still not settled. Nevertheless, a few structures in Cyrenaica have been tentatively accepted as probably having served as horseracing courses. Wright (1963) refers to a hippodrome at Tobra, though its existence is not yet proven. Similar buildings were also reported at Cyrene (Figure V.17), Apollonia and Ptolemais (Humphrey 1986: 520-23; Kraeling 1962: 95; Stucchi 1975: 137, 295-96; Wright 1963). Since classical literary records state that many horse-racing winners came from Cyrenaica, they would presumably have had intensive practise. One question that needs to be asked, however, is whether each city had its own race track. Additionally, Synesius (*Letter*, 40) mentioned the good quality of the horse that he sent to his friend, and emphasized its benefits if used in hunting or competitions in the hippodrome. If the substantial numbers of ephebic inscriptions are taken into consideration, one might expect that future excavations will provide us with better evidence from the remains of hippodromes in the region.

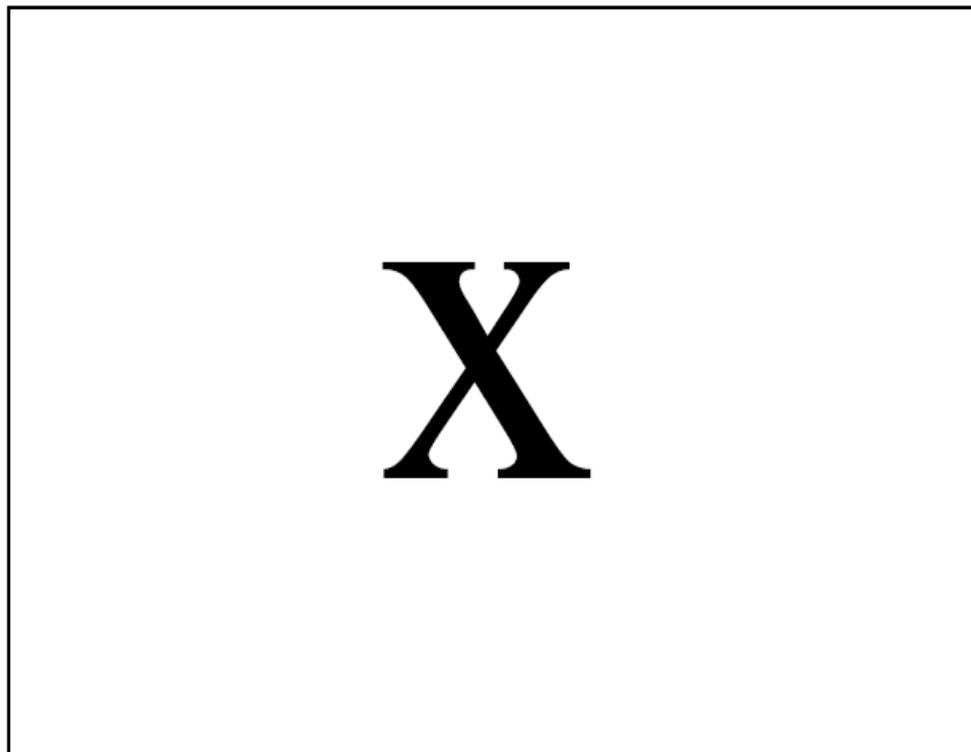


Figure V.17: Plan of hippodrome at Cyrene (Humphrey 1986: fig. 256).

Some modern studies have unambiguously stated that the horse was one of the economic pillars of Cyrenaica. Rostovtzeff (1941: 385, 293, 396) notes that Cyrenaican's horses were sent to Egypt in large numbers. Additionally, Coster (1968:118, n.61) emphasizes this point, and detailed the different breeds of Cyrenaican horse in the Classical and Hellenistic period. After examining the horse in both the ancient literary sources and archaeological evidence, I am confident that together they tell us a vivid story about the importance of Cyrenaican horses across ancient times, particularly during the Greek and Hellenistic periods.

V.4 Conclusion

The horse was used in this chapter as a case study, and was subject to detailed examination based on literary documents and epigraphic evidence. The data indicate that breeding horses, alongside other animals, was a significant activity practised in Cyrenaica in the Hellenistic and early/mid-Roman periods. The socio-cultural significance of horses, as indicated by the examined evidence, has been considered an indirect sign for their economic importance. They mention the Libyans' excellent experience in breeding horses and the Greek influence on their methods in this field. In general, both textual kinds of evidence represented the horse within two main themes: the horse's contribution to entertainment making Cyrene famous in literature as a place associated with horses, especially in contests. The ancient writers from the fifth century BC onwards highlighted that Cyrenian athletes were famous for their achievements in the Greek games. Investigating ephebic inscriptions represent linguistic proof that equestrian activities took place in Cyrenaica from the Hellenistic period. Involvement in this equestrian activity in the ephebic Cyrenaican institutions was reflected through some iconography relevant to the horse in the early and mid-Roman period. The most interesting point is symbolizing the *quadriga* and horseback riding on some of the Cyrenaican ephebic inscriptions. In other words, the importance of the Cyrenaican horses in the entertainment activity mentioned by the literary sources of Classical and the Hellenistic periods, alongside regional epigraphic evidence, is also reflected by the local inscriptions dating to the early/mid-Roman periods.

The other theme, which is reflected by the literary sources and the epigraphic evidence, is the significant status of Cyrenaica's horses as part of the military. This important status is illustrated by the horse's presence in fields such as local and external

warfare. Some inscriptions from the region reported names of leaders of different units from the army structure. These indicate the sizable use of the horses in the Cyrenaican army. The value of the horses of the region appeared also from participating in the Cyrenaican cavalry in wars outside the region, as in the case of the battle of Rhapsia dating to 217 BC.

In addition, an examination of patterns in the use of the word 'horse' as part of the personal Cyrenaican names, and comparing their numbers to others collected from different places, demonstrates that horse nomenclature was more common in Cyrenaica than in other comparative places. The most intriguing point about horse nomenclature is the Cyrenaican frequent use of the name Μελάνιππος (Black-horse) among all regions, including Attica itself.

To sum, the data analysed and discussed in this chapter suggest that the horses were native animals to Cyrenaica and they may have a vital contribution to the region's socio-economic life from early times for the indigenous people. This seems to have also continued across the Hellenistic and early/mid-Roman periods.

Chapter VI : Cyrenaica's Commercial Interactions During the Hellenistic and Early/Mid-Roman Periods

VI.1 General Introduction

As Cyrenaica was part of the Greek and Roman world it had commercial connections with other regions, especially those in the Mediterranean basin. Generally, this chapter aims to discuss the probable exchanged commodities to indicate the region's mercantile relationships. The chapter includes three parts. The first part aims to reassess Cyrenaica's commercial communications by approximating the probable number of harbours along the region's coastline, as indicated by the geographical literary documents. The descriptions provided by Pseudo-Skylax are the most important evidence used in this section, because the writer distinguished between two types of maritime locations, harbours and anchorages, which were situated on the Cyrenaican coast during the fourth century BC. The recent first full English version of the Greek text by Shipley (2011) is also used in this section. This enables a fair calculation of the Cyrenaican ports used in the Hellenistic period. The geographical accounts of other writers about the coastline sites of Roman Cyrenaica have been considered, especially Strabo and the *Stadiasmus*. Furthermore, another separate section in the first part discusses some epigraphic and literary evidence of internal or external honours given to Cyrenaican citizens. These may represent the region's merchants who had intra- and inter-regional economic interest.

The second part of this chapter re-examines the main imported commodities as evidence of regional trade and its orientations, including coarse and fine pottery. The different types of imported marble have been also investigated. The purpose of this is to demonstrate the size and use of imports into the region over time. The final part of the chapter investigates evidence for some of the region's principal exports. Although silphium has been broadly considered the main product exported from the region, this chapter argues that Cyrenaica seems to have exported various agricultural products, alongside animal and animal by-products which perhaps made a significant contribution to the region's economy from the Hellenistic period onwards. These include cumin, almonds, different types of legumes, wine and olive oil, in addition to trans-Saharan products such as ivory, dates and slaves. Furthermore, animal and manufactured products include sheep, cattle and horses and their products such as textiles, leather, skins, fish

processing and others. It also emphasizes the significance of wheat among the probable exported products at least from the Hellenistic period and after.

VI.2.1 Harbours as Evidence of Inter-regional and Intra-Regional Trade:

VI.2.1.1 Cyrenaican harbours dated to the fifth century BC

Cyrenaica seems to have been connected and interacted with the other Greek regions from an early date. This can be inferred from the number of varied ports in the region, some of which date to the 5th century BC. These were directly and indirectly mentioned by some of the ancient literary sources on different occasions. The first mention of the Cyrenaican harbours was made by Herodotus in the fifth century BC. He referred to *Aziris* (Ἀζιρίς), currently called Marsa al-Chabda in Wadi Al Khaleej (about 15 km east of Darna) (Herodotus IV. 157, 169; Carter 1963: 26; De Graauw 2016: 360; James 2005: 4). Herodotus also mentioned *Platea* (Πλατέα) many times, describing it as an island off the Cyrenaican coast (IV, 151,152,156; Peter 2005: 4). This island certainly possessed a port, because the Theraians landed and settled there for about two years.

Furthermore, Herodotus (IV. 169) referred to another port called the harbour of *Menelaus* (Μενέλαος λιμὴν) while describing the area inhabited by the Giligamae (Γιλιγάμααι) tribe (Herodotus IV. 169). The location of this harbour is still a matter of debate. According to Herodotus it was located on the coast-line lies between *Platea* and *Aziris* to the east of Darna, or probably near to *Platea* (Πλατέα) itself. However, most of the ancient historians and geographers who came after Herodotus placed the port of *Menelaus* near to the end of the eastern border of Cyrenaica (Pseudo-Skylax, 108. 1) and Strabo XII, 22). Pseudo-Skylax also did not mention it as a harbour, despite listing a number of these facilities. However, Malkin (1994:50-54) stated that this port probably lay in the area around *Platea*, and may date much earlier than the fifth century BC. He argued that the harbour probably dated to Homer time if we consider the relationship between the name (Menelaos) and Homer's hints that the hero Menelaos visited Libya. In Homer (Homer, *Od*, IV. 84-89), the narrative of Menelaos indicated that during his maritime return he sailed in his ship and landed on a number of coastal spots, including Libya.

Αἰθίοπας θ' ἰκόμην καὶ Σιδονίους καὶ Ἐρεμβοὺς
καὶ Λιβύην, ἵνα τ' ἄρνες ἄφαρ κεραοὶ τελέθουσι.
τρὶς γὰρ τίκτει μῆλα τελεσφόρον εἰς ἐνιαυτόν.
ἔνθα μὲν οὔτε ἄναξ ἐπιδευῆς οὔτε τι ποιμὴν
τυροῦ καὶ κρειῶν οὐδὲ γλυκεροῖο γάλακτος,
ἀλλ' αἰεὶ παρέχουσιν ἐπηετανὸν γάλα θῆσθαι (Homer, *Od.*, IV. 84-89).

I went also to the Ethiopians, the Sidonians, and the Erembians, and to Libya where the lambs have horns as soon as they are born, and the sheep bear lambs three times a year. Everyone in that country, whether master or man, has plenty of cheese, meat, and good milk, for the ewes yield all the year round (*P. D. L. T.*).

Although the work of Homer is considered to be to some extent full of mythical stories, this figure which describes an abundant area of sheep can be used as a key to identify where the *Menelaos* port was located within Libya. From the examination of the Cyrenaican cereals and sheep in two separate chapters of this project, it can be said that there are no fertile areas that can provide good pasture to the east of *Aziris* (Ἀζιρίς). The land between *Aziris* and the Nile delta was a pastoral zone, but it was arid and unsuitable for producing the considerable quantities of animal products mentioned by Homer. One tends therefore to support Malkin's view (1994:50-4), who suggested that the location of the *Menelaos* port is apparently much closer to Cyrene and it lay on the mainland opposite to *Platea* contrary to what ancient writers indicated and modern scholars have argued (Laronde 1987:221).

In addition, Herodotus indirectly mentioned other ports on the Cyrenaican coast when he identified the areas rendered inhabitable by Libyan tribes. According to him the Auschisae lived in Barce, near the coast at *Euhesperides* (Εὐεσπερίδες), while the small Bacales tribe 'reached the sea' at *Taucheira* (Ταύχειρα) (IV. 172). Herodotus did not use the term 'port', but his phrase 'reaching the sea' may imply the existence of anchorages for those two cities. However, as *Taucheira* was not among the listed ports of Pseudo-Skylax in the fourth century BC, there is some doubt that the city established its harbour in the fifth century BC. The city at this time probably used the port of *Ptolemais*, which

was located a short distance to the east. Additionally, the port of *Apollonia* was perhaps established during the Battiad regime, as can be inferred from the account of Herodotus. Herodotus (IV. 159; Applebaum 1979) mentioned that the Delphic oracle told all Greeks to sail (πλέειν) to Libya, otherwise they would miss the Cyrenaeans' invitation which included giving them pieces of lands. This may be an implicit indication that the port *Apollonia* was part of a direct maritime route between Cyrene and the island of Thera in the era of Battus III in the sixth century BC. This port was also indirectly mentioned by Pseudo-Skylax in the fourth century BC.

VI.2.1.2 Cyrenaican harbours dated to the fourth century BC

In the fourth century BC, Pseudo-Skylax (108), without further specification, listed at least eleven ports and anchorages on the Cyrenaican coast. He started his description from the east, where the Libyan *Marmaridai* tribe lived. These included *Plynos* (πλύνος) (port of Sallum), *Petras* (the small Petras is a port while the great Petras is a village) its modern name is Marsa Tarfaia, *Antipyrgos* (Tobrouk), *Aziris* (Marsa al-Chabda in Wadi Al Khaleej), and an unidentified number of minor anchorages (ῥορμοί) at the island of *Aedonia* (Jeziret el-Marakeb) and *Platea* (South of Bombah), *Aphrodisias* (Chersa 15 km North West of Derna), *Naustathmos* (Ras al Hilal), and *Euesperides* (Benghazi).

The geographer also referred indirectly to another two significant ports. One of these was the harbour of Cyrene: ‘...ἀπὸ δὲ Ναυστάθμου εἰς λιμένα τὸν Κυρήνης στάδια ρ...’ ‘...and from Naustathmos to the harbour of Cyrene: 100 stades...’, and that of Barce ‘...ἐκ δὲ λιμένος τοῦ κατὰ Βάρκην ἐφ’ Ἑσπερίδας στάδια χκ’ ...’ ‘... and out of the harbour by Barce up to Hesperides, 620 stades...’ (Pseudo-Skylax 108. 3; see also Shipley 2011: 47, 80, 81). The writer here is certainly referring to the ports of Ptolemais and Apollonia, as he indirectly mentioned each one twice. In each case, he provided the distance between the ports and the cities on one hand and between the ports themselves on the other hand. However, he refers to Taucheira as the village of the Bacalos ‘...Βάκαλοῦ κόμη...’, the Libyan tribe which Herodotus had previously mentioned. He also did not mention a harbour to be linked with *Taucheira*, whereas *Hesperides* (Euesperides) was described as a city with a port ‘...Ἑσπερίδες πόλις καὶ λιμὴν...’.

It is important to mention that Pseudo-Skylax provides us with significant geographical information about the coastal sites and makes distinctions between the

different types, which include villages, cities, harbours and anchorages. He also frequently highlighted that Cyrenaican harbours were always fit for landing in (λιμένες πάνορμοι) or, according to Shipley’s translation, were harbours suitable for all types of weather (Shipley 2011: 81). This work is valuable because Pseudo-Skylax was a geographer and took care to distinguish between a harbour (λιμήν) and an anchorage (ὑφορμος) (Table VI.1). The precise description allows us to fairly classify the types of harbours, and based on this their number can be estimated. This enables us also to estimate the size of the region’s maritime transportation in the fourth century BC. The harbours and anchorages probably numbered at least thirteen in the fourth century BC. The writer indicated also *Phycus* as a Gulf and *Cherronesos* (Ras al-Teen) but without clear classification of settlements type. These have been considered to be minor harbours by some scholars, though Pseudo-Skylax did not say so (De Graauw 2016: 360; Hesein 2014: 25). Further investigations are thus needed. A port in *Cherronesos* may have existed at the end of the fourth or beginning of the third century BC. The inscription of Aristis son of Philon regarding some of his naval battles, one at *Cherronesos* and another at *Euesperides*, is probably important evidence regarding *Cherronesos* at a time before Berenice had been established (Laronde 1987: 67; SEG 9. 76).

Harbour (λιμήν)	Anchorage (ὑφορμος)
<i>Plynoi</i> (port of Sallum)	<i>Aedonia</i> (Jeziret el-Marakeb)
<i>Menelaus</i> (Μενέλαος λιμήν)	<i>Platea</i> (South of Bombah)
<i>Petras</i> , the small (Marsa Tarfaia)	<i>Aphrodisias</i> , (15 km North West of Derna)
<i>Antipygos</i> (Tobrouk)	
<i>Aziris</i> (Marsa al-Chabda Wadi Al Khaleej)	
<i>Naustathmos</i> (Ras al Hilal)	
Harbour of Cyrene (Apollonia)	
Harbour of Barce (Ptolemais)	
<i>Euesperides</i> (Benghazi)	
Total:9	Total: 3

Table VI.1: Harbours and anchorages identified by Pseudo-Skylax (108); See translation of Shipley 2011: 47, 48, 80, 81).

Pseudo-Skylax specified that three of these ports were anchorages, such as *Aphrodisias*. This may mean we can assume that the other eight were major harbours. If so, this means *Plynoi*, *Petras*, *Antipygos*, *Azirides*, *Naustathmos*, *Apollonia*, *Ptolemais* and *Euesperides* were harbours, in addition to those ports mentioned by Herodotus (*Menelaus* and *Platea*). They comprise altogether ten harbours (Figure VI.1). This

considerable number along with the three anchorages mentioned by Pseudo-Skylax, can be seen as important evidence of an active navigational connection between Cyrenaica and the other Greek regions contemporary with this writer, especially in relation to seaborne trade or naval matters. The extent of harbours along coast also supports idea of links towards Egypt as well. Some of these ports were also probably used for inter-regional transportation, because the distance between some of the Cyrenaican cities were too great. Euesperides, for instance, is about 250 km to the west of Cyrene.

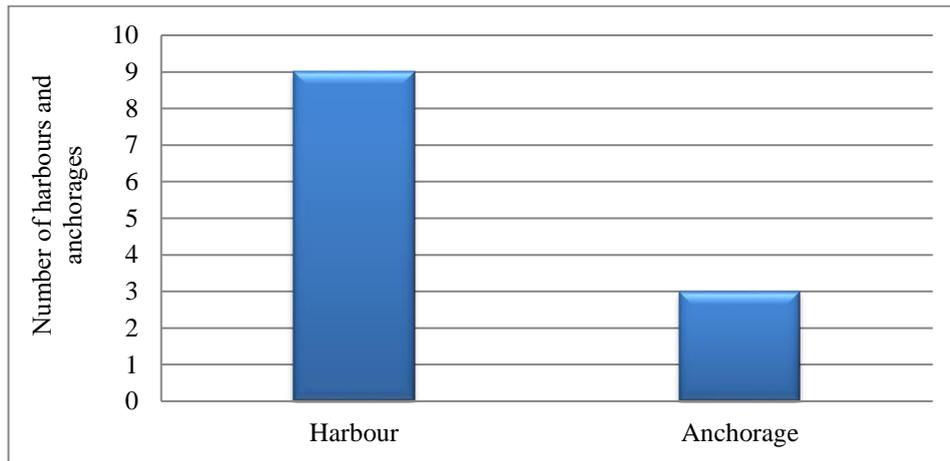


Figure VI.1: Number of large ports and anchorages according to Herodotus and Pseudo-Skylax in the fifth and fourth centuries BC.

VI.2.1.3 Cyrenaican ports during the Hellenistic period and after

Although discussion of Cyrenaican ports in literary documents of the Hellenistic period is quite limited, significant information about these facilities comes from Roman-era documents. They suggest that Roman-period Cyrenaica maintained its active maritime interaction with the rest of the Roman world. In the first centuries BC and AD, the geographer Strabo created a significant geographical description of different sites, including cities, towns and ports located on the Cyrenaican coast. This included a precise determination of the distances between the ports and cities as well as between the ports themselves. He indicated some harbours that had already been mentioned before by Herodotus and Pseudo-Skylax in the fifth and fourth centuries BC, and mentioned others for the first time (Table VI.2). The new harbours identified by Strabo (XVII. 20) included *Berenice* (Βερενίκη, Benghazi), which seems to have been established with the city in the mid-third century BC to replace the oldest port of *Euesperides*. It is important to mention that Strabo referred by name to the port of *Euesperides*, though the archaeological

evidence indicates that this port had been abandoned following the shift of the urban centre to the new city Berenice at some time around 250s BC (Buttrey 1994: 144). The *Cape of Phycus* (Φῦκος ἄκρα) located to the east of Ptolemais is another harbour (XVII. 20). In addition, he referred to the site *Zephyrus* as including a landing-place: ‘...Ζεφυριον πρόσορμον ἔχον...’ (Strabo XVII. 22). This is now called Ras Bu Meddad and located about 8 km west of Derna. It was probably used as a port for Derna, because it is located close to this city and is to the east of *Naustathmos* (Ras al Hilal). It is important to mention *Naustathmos*, which Pseudo-Skylax indicated was a harbour (108; Shipley 2011: 47, 80), and Strabo supported this by stating that it was a well-known place on Cyrenaica’s shore. This emphasizes the importance of Pseudo-Skylax’s classifications of these cites as harbours and anchorages. Furthermore, Strabo stated that *Cherronesos* possessed a port ‘...καὶ ἄκρα Χερρόνησος λιμένα ἔχουσα...’ (XVII. 22). *Ardanis* (Jeziret el-Marakeb or Ras el-Melah) was also among the points Strabo identified on the Cyrenaican coast. According to him, *Ardanis* possessed an anchorage ‘...καὶ Ἀρδανίς, ἄκρα ταπεινὴ ὕφορμον ἔχουσα ...’ (Strabo XVII. 22; De Graauw 2016: 358; Laronde 1987; 225). He also refers to another large port, unfortunately without acknowledging its name (Strabo XVII. 22). This is probably the port of *Antipyrgos*, Ἀντίπυργος (Tobrout) which was named by Pseudo-Skylax because Strabo located it before *Plynos* (πλύνος) the port of *Catabathmos* (Κατάβαθος) in Sallum and *Cherronesos* (Ras el- al-Teen), the port located to the west.

New harbour (λιμὴν) in Strabo	New anchorage (ὑφορμος) in Strabo	New Undetermined type in Strabo (ὁ πρόσορμος or ἄκρα)
<i>Berenice</i> (Bengahzi)	<i>Ardanis</i> Ἀρδανίς (Ras Bu Wushayyikah)	<i>Cape of Phycus</i> (Φῦκος ἄκρα)
Unnamed big port		<i>Zephyrus</i> (Ζεφυριον) πρόσορμος
<i>Cherronesos</i> (Ras al-Teen)		

Table VI.2: Number of large ports, anchorages, and unidentified types of ports according to Strabo in the first time.

In the second century AD, Claudius Ptolemy (Claudii Ptolemaei. *Geographia*, IV) and the *Stadiasmus* provided confirmation of the previously-mentioned harbours and anchorages, and listed new names of others. For example, the *Stadiasmus* mentioned 10 sites located along the coastline between *Cherronesos* and *Ptolemais* (Hoffmann 1841: 191, 192). Four of these were mentioned for the first time, including *Zarni* (Ζαρηνή or Ζαρηνῆς) the modern *Darna* (Δάρνις in Ptolemy IV. 4. 3), and *Erythron* (Ἐρυθρον) the

modern *el-Atrun*. The writer did not mention whether they had ports or anchorages. He described *Erythron* in particular as a village (κώμη), and did not link it with a harbour as some modern scholars have done (De Graauw 2016: 360; Hesein 2014: 259. Table 6-9).

However, *Phycus* (Φῦκος), the modern Al-hamamah, possessed an anchorage (ὄρμος) (Hoffmann 1841: 192). In addition, the *Stadiasmus* (Hoffmann 1841: 192) referred to another site located on the coast called *Nausis* (Ναυσίς in the nominative form or Ναυσίδα in the accusative form). This may mean that *Nausida* was used as an anchorage or harbour. The modern name of this place is Gasr Disa (De Graauw 2016: 361). *Nausida* was also mentioned by the geographer Ptolemy (IV. 4. 3) in the second century AD and by Stephanus Byzantinus (Meineke 1849: 147) in the sixth century AD, but they both called it *Ausigda* (Αὐσίγδα). Based on the linguistic meaning of the site's name in the *Stadiasmus*, Ναυσίς may derive from the word ναῦς (ship). If so, it is thus possible that the place was suitable for landing ships.

The *Stadiasmus* reported twelve key maritime locations between *Cherronesos* and *Bernice*, along a coastline 330 km long. However, the most important matter in the *Stadiasmus*' work is his indication of 15 maritime locations along the coastline between *Catabathmos* (Κατάβαθμος) in Sallum and *Cherronesos* (Χερρόνησος) Ras al-Teen (Figure VI.2 and Table VI.3). The development of such a numerous number of sites along a 250 km long coastline suggests the presence of active commercial maritime contact between Cyrenaica and Egypt during the second century. About five ports, six anchorages and six settlements have been attested in the *Stadiasmus* work and some of these were reported also by other contemporary or previous ancient writer. *Patrachus* (Πάτρακος) which the *Stadiasmus* described as a summer station for ships, and *Sidonia* (Σιδωνία), which possessed an anchorage used for carrying in loads during the summer, are important evidence of this point of view.

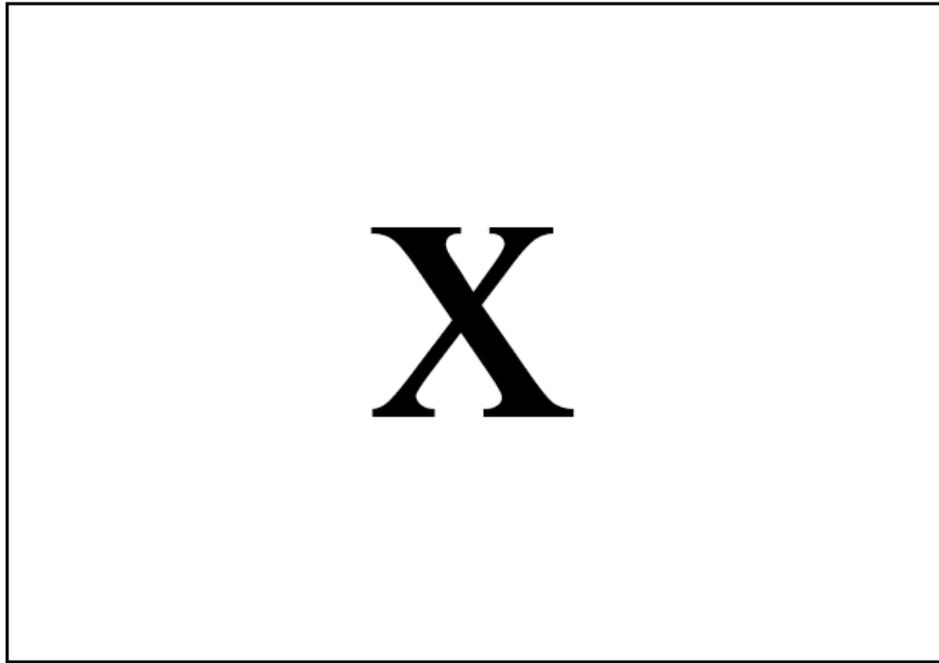


Figure VI.2: Map of ports and anchorages mentioned by the Stadiasmus and located on the coast between Catabathmos and Cherronesos (some of them indicated before by other writers).

In the Hellenistic and Roman-period, Cyrenaica seems to have possessed many harbours of various types. As we have seen, six ports and anchorages have been discovered via the work of Strabo, and more have been indicated by later writers (cf. Hesein 2014: 260). This can be illustrated by the number of major ports that the region possessed in the entire Mediterranean basin in the Roman era. Of a total of eighteen major ports, three were located on the Cyrenaican coast (Hesein 2014: 3. Fig.1-1). Furthermore, the latest study of Cyrenaica's harbours by Hesein (2014: 225) found that about six different types of harbour were situated on the region's coastal line over time (Table VI.4). These were distributed over a distance of about 250 km of the Cyrenaican coast between *Erythron* and *Bernice*. This means that there was a port or anchorage after each about 12 km. This raises a question about the need of this extensive number of harbours and anchorages.

Harbours, anchorages, and other costal sites located between <i>Catabathmos- Cherronesos</i>						
Ancient name	Modern name	Hdt.	Sky.	Stra.	Sta.	Comment
<i>Syke</i> : Συκῆ					✓	located on the sea (Sta.)
<i>Panormos</i> : Πάνορμος					✓	Means suitable for landing (Sta.)
<i>Eurea</i> : Εὐρείη/ Εὐρεία					✓	An anchorage (Sta.)
<i>Petras</i> : Πέτρας	Al-Bardie		✓		✓	A port (Ptolemy)
<i>Krdamis</i> : Κάρδαμης	Ras Bu Wushayyikah			✓	✓	An anchorage (Sta.)
<i>Menelaus</i> : Μενέλαος	Ras el- Awrah	✓	✓		✓	A port (Her.); (Stra.); (Sta.)
<i>Katanaïos</i> : <i>Katanios</i>					✓	It has sandy shore (Sta.)
<i>Skurthánios</i> : Scythranius, Κυρθάνειος in Sky.	Marsa el Afarid		✓		✓	Its sea-coast is a little depth (Sta.)
<i>Antipyrgos</i> : Ἀντίπυργος	Tobrouk		✓		✓	A port (Sky.)/ An anchorage (Sta.)
<i>Mikros Petras</i> : Πετραντός μικροῦ	Marsa Tarfaia	✓	✓		✓	A port (Sky.)
<i>Patrachus</i> : Πάτρακος	Wadi ed Sedd				✓	A summer station of ships (Sta.)
<i>Platea</i> : Πλατέα	South of Bombah	✓	✓		✓	A number of anchorages under Platea and Sidonia (Sky.)
<i>Sidonia</i> : Σιδωνία, Ἀηδωνία in Skylax	Jeziret el- Marakeb		✓	✓	✓	It has anchorage for carrying loads in the summer (Sta.); See the note on Platea (Sky)
<i>Paliouros</i> : Παλιουρος	At Tamimi				✓	It has salty shore (Sta.)
<i>Phthia</i> : Φθία	Bomba				✓	It has a shore (Sta.)
<i>Dionysios</i> : Διώνυσος	Near Zawiyat Umm Hufayn				✓	
<i>Cherronesos</i> : Χερρόνησος	Ras al-Teen		✓	✓	✓	It has a port (Stra.).
Total	18 sites on the sea coast between Catabathmos to Cherronesos including both of them.					

Table VI.3: Ports and anchorages mentioned by the Stadiasmus and located on the coast between Catabathmos and Cherronesos (some of them indicated before by other writers).

Port Type	Number
Large harbours	5
Medium harbours	5
Industrial harbours	4
Watching harbours	2
Private harbours	2
Military harbours	2
Total	20

Table VI.4: Types and numbers of Cyrenaican harbours in Greek and Roman periods (Author's table data from Hesein 2014: 225)

VI.2.1.4 Harbour commercial functions

The earliest documented indication of Cyrenaican maritime commercial interaction is dated to the second half of the fifth century BC, and appears in an account by the Athenian historian Thucydides. During his description of the Peloponnesian war, he mentions that the Athenians captured the port of Kythera (Κύθηρα) (an island located in south-eastern Greece), a place of Egyptian and Cyrenaican commercial ships.

ὄπλιτῶν τε φρουρὰν διέπεμπον αἰεὶ καὶ πολλὴν ἐπιμέλειαν ἐποιοῦντο.
ἦν γὰρ αὐτοῖς τῶν τε ἀπ' Αἰγύπτου καὶ Λιβύης ὀλκάδων προσβολή
(Thucydides, IV. 53).

Great attention was paid to the island [Kythera], as it was for them a landing-place for the merchantmen from Egypt and Libya (*P. D. L. T.*).

Although Thucydides did not determine which harbour these Cyrenaican ships came from, his description of the site used by trading vessels and Libyan merchant vessels (ὀλκάδες) is an important indication of the region's involvement in maritime trade from the fifth century BC. This leads to questions about the kinds of commodities that were exported in the fifth century BC. Furthermore, mentioning Libyan merchants alongside those of Egypt, who were well known in this field, implies that Cyrenaican and Egyptian commercial activities were equally important.

Although the literary documents do not mention Cyrenaican harbours before the fifth century BC, Cyrenaica seems to have had a strong commercial connection with the wider Mediterranean earlier than this. This can be archaeologically evidenced from the

considerable quantities of pottery derived from the excavations conducted in Cyrene, Taucheira, and Euesperides (Boardman and Hayes 1973; Elrashedy 1985; Kocybala 1999). Different types of pottery will be discussed in one of the following sections as evidence of Cyrenaica's diverse trade orientations.

In summary, the harbours can be considered an important part of Cyrenaica's successful economy, reflecting the significance of maritime connections between the regions during the Greek and Roman periods. Cyrenaica seems to have possessed considerable numbers of different kinds of ports. These may be an indication of the size of regional trade, and suggests a stronger involvement in various exchange activities throughout the Mediterranean world in the Greek and Roman periods.

VI.2.2 Indirect Epigraphic Evidence of Cyrenaican Merchants:

Honorific decrees and inscriptions were enacted to publicly recognize and commend persons who had served as patron or performed exemplary service for the city, they often include a citation of the exact text to be inscribed on a stele, column or a statue base (McLean 2002: 183, 184).

The purpose of inscribed honorific decrees and inscriptions in the Greek and Roman periods was to demonstrate that a city or a group of people appreciated someone's deeds. In some cases, this action would be support in kind or in money. Woolmer (2008: 180-81, 205, 206) identified a number of reasons for honouring merchants at Athens, including importing goods or importing products and selling them at a lower price, and they could be honoured for giving gifts such as grain. He investigates 31 honorific inscriptions from Athens dating from the fourth century BC. These were inscribed to honour foreigners who were involved in some commercial services. They indicate that the honour was in the most cases a reward for services relating to grain trade. The same issue may have applied to people honoured in Cyrenaica, especially given that most of them were normal citizens. This section examines some of the honorific inscriptions found in Cyrenaica, and argues that they were probably erected for services related to trade. It regards them as evidence of the region involvement in commerce with the Mediterranean or at least they can be regarded as an indication of Cyrenaicans popularity abroad. The source of the

honoured men's wealth is discussed with consideration of the political conditions of the region at the time when these decrees were made.

Although none of the Greek words such as ἔμπορος and ναύκληρος which refer to merchants or ship-owners have been yet attested in the Cyrenaican Greek and Roman epigraphy, some of the honorific decrees can be regarded as indirect evidence of the region's traders. This can be understood from the unusual amount of money which was indicated by some of these decrees (see below the amount of money paid by Epicerdes of Cyrene and its evaluation). The honorific decrees may also reflect the significant economic role the Cyrenaican traders played both in the region itself and beyond. Well-to-do Cyrenaican citizens seem to have been honoured locally as well as by other cities during the Greek and Roman periods. This honour is represented by some of the epigraphic and historiographical evidence. The most interesting example of this is the honorific decree of Epicerdes of Cyrene (Ἐπικέρδης ὁ Κυρηναῖος) (*IG I³ 125; IG II² 174*). Epicerdes and other honoured Cyrenaicans appear to have owned sufficient hard cash, or possessed a great quantity of a prime commodity such as cereals. Trade is the most probable source of these people's wealth. It is therefore possible to consider these people as evidence of the region's involvement in Mediterranean maritime commerce, at least from the fifth century BC.

VI.2.2.1 Epigraphic evidence of non-local honours for Cyrenaican citizens:

VI.2.2.1.1 Epicerdes of Cyrene (Ἐπικέρδης ὁ Κυρηναῖος) (the fifth century BC)

At the end of the fifth century BC, the Athenians honoured Epicerdes of Cyrene as a philanthropist (Ἐπικέρδης Κυρηναῖος εὐεργέτης). Two copies of honorific decrees regarding this honour have been found at Athens (*IG I³ 125; IG II² 174*). The texts indicate the great deeds of this benefactor: providing the Athenians with a considerable amount of money at a time of need. Both inscriptions describe Epicerdes as a saviour (bestowing σωτηρίαν), because he rescued a group of Athenians on an expedition who had been imprisoned in Sicily by paying one hundred minas (100 × 100 drachmas = 10,000 drachmas or about a *talent* and 40 minas) (Ferraio 2014:153-55). It is important to mention that the orator Demosthenes (*Oration*s, 20. 41-45), in a speech delivered in c. 355/354 BC, also indicated his great respect for Epicerdes. He stated that the Athenians honoured this man not only for his deeds, which were considered outstanding

benefactions, but also because they were given to the prisoners in the most problematic times to save their life from the danger of famine:

οὗτος γὰρ ἀνὴρ, ὡς τὸ ψήφισμα τοῦτο δηλοῖ τὸ τότε αὐτῷ γραφέν, τοῖς ἀλοῦσι τότε ἐν Σικελίᾳ τῶν πολιτῶν, ἐν τοιαύτῃ συμφορᾷ καθεστηκόσιν, ἔδωκε μνᾶς ἑκατὸν καὶ τοῦ μὴ τῷ λιμῷ πάντας αὐτοὺς ἀποθανεῖν αἰτιώτατος ἐγένετο (Demosthenes, *Oration*s, 20. 42).

Because this man [Epiclerdes], as this decree then passed in his honour declares, gave a hundred minae to our fellow-countrymen at that time prisoners in Sicily under such distressing circumstances, and thus he became the chief instrument in saving them from all perishing of hunger (P. D. L. T)

Demosthenes emphasized the importance of this donation and Epiclerdes' help in his speeches on a number of different occasions, even long afterwards. For instance, he stated that Epiclerdes shared his wealth with the people, although he gained only a nominal and honorary privilege (*Oration*s, 20.44). In the same speech, Demosthenes also persuaded the Athenians to honour the great deeds of their friends, and he used Epiclerdes as an example of such friends (*Oration*s, 20.46). The great degree of respect that Epiclerdes of Cyrene received from the Athenians reflects the high value of the money he provided. Presumably Epiclerdes' ability to act on behalf of the Athenians held captive in Sicily depend on his presence there with a sustainable quantity of cash, most likely as a revenue of a trading voyage. If one assumes that 10,000 drachma was income from a consignment of wheat or barley, and consider the average prices of these products at 6 and 3 *drachmas* in Athens in the fifth century BC (Rathbone and Von Reden, S. 2015: 193,194), the quantity and the income can be calculated and evaluated. Grain volume would be c.1,700 *medimnoi* (c.46 tonnes) of wheat (10,000 *drachmas* ÷6= 1,700 *medimnoi*) or c. 3,333 *medimnoi* (c.91 tonnes) of barley (10,000 *drachmas* ÷3= 3,000 *medimnoi*). The given 10,000 drachma thus is a considerable amount of money and could not have been possessed in cash by an ordinary person, and Epiclerdes is likely to have acquired his wealth via trade. The above literary indication of Thucydides (IV. 53) that the Libyan ships were accustomed to land on the island Kythera in the second half of the 5th century BC, may support this suggestion. This mention was contemporary with the time of Epiclerdes, the benefactor in question who lived at the end of the fifth century BC.

VI.2.2.1.2 Phalakros of Cyrene (Φαλάκρος ὁ Κυρηναῖος) (Third century BC)

Another important example of a Cyrenaican citizen honoured outside the region is the Cyrenean Phalakros, who lived in the third century BC. The Cyrenean Phalakros (baldheaded) son of Sosianakteios was honoured by the *Thessalian* city Mopson:

ἡ πόλις Μοψείου Φαλάκρου Σουσιανακτείου Κυρναίου ἔδουκε (*IG IX, 2 1056*).

The Cyrenean Phalakros son of Zosianakteios was honoured by the city of the Mopsians [Mopsion city].

It is important to mention that Phalakros was the only North African person to receive honours among all the foreign recipients of honours that the Thessalian cities received from different Greek cities, as identified in the honorific decrees of the Thessalian city (Kaczmarek 2015: 29, 30). Although we do not know for what kind of benefaction Phalakros gained his honour, the decree's importance lies in its use of a wealthy Cyrenaean citizen's name. In addition, the absence of any Egyptian name among those suppliers of the Thessalian cities is perhaps an important implicit indication that Cyrenaica's economic contribution was equal or greater than that of Egypt. This inference would be reasonable, if one bears in mind that Egypt had a vital commercial role of providing cereal in the Mediterranean area during Classic, Hellenistic and Roman periods. Also if Thessaly, the exporter of cereals (Kaczmarek 2015: 55), received cereals from Cyrenaica, this would highlight the productive capacity of the latter. The Grain decree of Cyrene evidently indicates this suggestion. It records that the Thessalians Larssia and Atragia received from Cyrene 50,000 and 10 *medimnoi* of cereals respectively. The portion of Larssia is the third largest volume mentioned in this evidence (*IGCyr010900*).

VI.2.2.1.3 Philoxenos son of Philiskos (Φιλόξενος ὁ Φιλίσκου) (31 BC– AD 16)

An honorific decree found at Cyrene indicated that the Athenians honoured the Cyrenaican citizen Philoxenos son of Philiskos for his actions towards their city on many occasions (*IRCyr.C.952*). As mentioned in Chapter Two, Philoxenos had received many different kinds of honours and rewards. He was given a golden crown with a purple stripe and a gilded shield adorned with a portrait of himself, and it was recommended that the

shield portrait be displayed in an important place in Athens and Cyrene. This was clearly stated in the decree's text. At the end of the decree, the Athenians again emphasized the virtuousness and good will of Philoxenos:

ὁ δ[ῆμο-ς ὁ Ἀθηναίων ·· 10? ·· Φιλόξε]νον Φιλίσκου φύσει δὲ
Εὐφάνου Κ[υρην- αἶον ·· 18·· γενόμε?]νον ἀρετῆς ἔνεκεν καὶ
εὐνοίας [ἦν ἔχ-ων ἀεὶ διατελεῖ πρὸς αὐτὸν ἀνέθη]κεν (*IRCyr.C.952*).

The people of the Athenians [··? ··] dedicated (the statue of)
[Philoxe]nos son of Euphanes, a C[yrenaean, who was ·· ? ··] on
behalf of the valour and good will that he continuously expresses
towards (*IRCyr.C.952*).

I have argued above that Philoxenos was probably in the cereals trade. The archaeological and literary evidence suggests that a notable commercial and cultural relationship between Athens and Cyrene across different periods. Athens received the highest quantity of cereals from Cyrene in the fourth century BC and this is the most important evidence of this strong tie. Therefore, it is plausible to assume that Philoxenos was one of the Cyrenaican traders of the end of the first century BC and beginning of the first century AD. The fact that Philoxenos was granted gold crowns supports this view. Woolmer (2008: 194- 96) stated that the granting of gold crowns to individuals was the costliest privilege available to the Athenians, and they were given for trade-related services. Supplying grain is the most probable reason in this case. Based on this epigraphic evidence, which demonstrated the names of probable Cyrenaican traders, it is thus reasonable to conclude that the region had wide connections and have made significant economic contribution in both the Greek and Roman epochs.

VI.2.2.2 Epigraphic evidence of locally honoured Cyrenaican philanthropists:

VI.2.2.2.1 Lists of contributors dated to 380 BC

The Cyrenaican honorific epigraphy represented a number of local wealthy citizens who provided support to their region on different occasions. The data of the Hellenistic period provided a number of lists, including the names of well-heeled inhabitants. These indicate that there were sizable numbers of affluent people in the region, especially in Cyrene at the beginning of the fourth century BC. For example, part of an incomplete

inscribed list of contributors included 12 names, and indicated that five of them had paid 500 drachmas (equal to 5 *minae*), while the amount paid by the other seven citizens is missing (*IGCyr009300*). However, as their names were enrolled in the honoured list, it is more likely that they also provided an appreciable financial grant. This can be seen in part of another inscription dated to the same period, though it lacks the names of donators and other details (*IGCyr097170*).

Nevertheless, the most important epigraphic evidence of affluent individuals (dated to 380 BC) is a list of the names of 294 benefactors. They made financial contributions ranging from between 250 ($\sigma \nu$) to 4000 ($\tau \eta \delta$) drachmas. The Greek letter value in Cyrenaica is 1,000 (about the Greek numbers see App. IV. D). The record indicates that about 51 people paid considerable amounts of money, from 1000 drachmas (*IGCyr065200*, 065210). Among them at least 23 men donated cash of a quarter of a *talent* (1,500 drachmas or 15 *Minae*), a half of *talent* (3,000 drachmas or 30 *Minae*) and sometimes even more. This amount of money seems to have been valuable, as can be implicitly understood from the fact a memorial was erected to these people. The size of this sum in the fourth century BC can also be comprehended from the recorded incomes of the *demiourgoi* members, as the epigraphic evidence has shown. The data shows that there were about three appointed members of the *damiorgoi* who recorded the products harvested from the lands annually which were devoted to the god Apollo. They received 3 *Minae* (300 drachmas), which means one *Mina* for each man (*IGCyr011600*; *SEG* 9. 13). This amount of money was perhaps given to them annually, because each inscription includes a summary of the annual income and expenses with an indication of the *demiourgoi* income. If each member of the three *demiourgoi* received an annual salary of about 100 drachmas, this would be equivalent to about 8 drachmas and 2 obols every month ($100 \div 12 = c.8.33$). Even if one assumes that each of the three *demiourgoi* was paid 100 drachmas each month or had 300 drachmas as reward, the money paid by the listed contributors (which was between 250-4,000 drachmas) would still be valuable and beyond the reach of ordinary people. This value can be understood from the cost of some of the main products in the fourth century BC, as represented by the *damiorgoi* inscriptions. For example, the average cost of a *medimnos* of wheat was 2 drachmas. So, the smallest financial contribution of 250 drachmas would be a cost of 125 *medimnoi* of wheat ($250 \div 2$). This would be about 4 tonnes of wheat ($125 \times 31.5 = 3,875$ kg), if the *medimnos* of wheat estimated at *c.* 31.5 kg (Bresson (2011:87)). It is therefore likely that

these were wealthy people and possibly some of them were involved in inter-regional or intra-regional commercial services.

VI.2.2.2 Aiglanor son of Damatrios of Cyrene (Αιγλάνορα Δαματρίω Κυραναῖον) (Secod/first centuries BC)

Appreciation for the philanthropist's support is one of the most common direct implications of the Cyrenaican honorific inscriptions found in the region. These inscriptions provide significant evidence regarding the wealth of these individuals and their regional economic role. If Epicerdes of Cyrene was regarded as a benefactor or well-doer (εὐεργέτης) by the Athenians in the 5th century BC, then citizen Aiglanor son of Damatrios of Cyrene was considered to be the greatest contributor (μέγιστα εὐεργετήσαντα) by the Cyrenaeans at the end of the second or the beginning of the first century BC.

Αιγλάνορα Δαματρίω Κυραναῖον τὸν συγγενῆ τῷ βασιλεύσαντος ἀμῶν Πτολεμαίῳ τὰ μέγιστα εὐεργετήσαντα τὴν πατρίδα καὶ τὰς ἄλλας πόλιας καὶ τὰ κατὰ τὴν χώραν ἔθνεα Κυραναῖοι (*SEG* 20. 729).

The statue of Aiglanor son of Damatrios, Cyrenaean, of his family of Ptolemy once our king, greatest benefactor of his home-city, of the other cities and to the people of the country (countryside), was dedicated by the Cyrenaeans (Applebaum 1979:203. *IGCyr*065000; Vickers and Reynolds 1971: 44).

Since regional honours in this period were traditionally devoted to the Ptolemaic kings, Aiglanor was presumably honoured for issuing charity from his own properties, despite the fact that he was related to the ruling king. This honour was provided not only because of his local contribution to the city of Cyrene and the surrounding area, but also for his donations to other cities. Although the proposed cities cannot be determined from the text, they may be other cities in the region because the honour was granted by Cyrenaican citizens. Whatever the identity of these cities in this context, the source of Aiglanor's substantial wealth is an important matter worthy of examination.

This inscription may be the key that will help us to uncover Aiglanor's source of wealth. Cyrenaica in the time of Aiglanor had been transferred from the Greeks to the

Romans according to the will of Apion in 96 BC (Applebaum 1979:63). As a consequence, the region suffered from political chaos and probably an economic downturn (Riley 1979: 409). This was enough to unsettle the region for some time. If so, the region's productive capacity for foods such as wheat and barley may have been negatively affected. Covering food shortages was presumably the most important deed for those who inhabited Cyrenaica at this time. On the other hand, Cyrenaica's overseas commercial activities involving cereals were possibly limited, as can be evidenced from the few literary indications of the region's cereal in the era between the second and the first half of the first century BC (App. I. 1). The importance of literary references to cereals lies in the fact that they were written about in most cases by non-Cyrenaican historians. This implicitly means that the product was extensively traded to other Greek or Roman regions and cities.

The salient literary evidence therefore hints that Cyrenaican cereals in the first half of the first century BC were probably a sign of the region's narrow inter-regional commercial connection at this particular time. If so, this may have led local Cyrenaican traders to support their cities with cereal or money. In return, the region's citizens showed they appreciated these deeds by enacting honorific decrees and placing inscriptions in different places around the region. The honorific decrees of Maskika Agamemno of Ptolemais and Apollodoros of Berenice are a case in point (Laronde 1987: 463- 72, 478; Reynolds 1974:19-24; *SEG* 9. 417, 28. 1540). This interpretation can be clearly evidenced from the contents of the honorific decree of the Tauchiorean citizen Aleximachos (Ἀλεξιμαχος) (Laronde 1987: 472-79; Reynolds 1976; *SEG* 26. 1817). As mentioned above, Aleximachos provided his city with a consignment of cereals from his own cereal store at a time when the city lacked its own food supply. The cost of this supplied cereal comprised 2 ½ *talents* (15,000 drachmas). The fact he possessed this sizeable amount of cereal is clear evidence that Aleximachos was involved in commercial activity relates to cereals (see chapter III).

VI.3 Imported Pottery as Evidence of Cyrenaica's Trade Orientations

Coarse and fine pottery are among the visible commodities that Cyrenaica seems to have imported in both the Greek and Roman eras. Pottery is thus important proxy evidence that we can use to trace the region's commercial connections over time. The archaeological evidence indicates that these types of artefacts had been imported from the

archaic epoch. This section reinvestigates the local and imported coarse and fine pottery based on previous studies of Cyrene, Teucheira, Euesperides, Berenice and Ptolemais. The pottery of the Archaic period is briefly introduced, because it helps us in understanding the region's importation size and its changing orientation during the Hellenistic period.

VI.3.1 Commercial connections in the Archaic and Classical periods (the fine pottery of Cyrene and Teucheira)

The fine pottery of the archaic period retrieved from the sanctuaries of Demeter at Cyrene and Teucheira reflects similar trends in trade. Data from both sites suggests that there were significant quantities of Laconian fine pottery in Cyrenaica, which may be the result of commercial contact between Cyrenaica and Laconia, especially with Sparta (Schaus, 1985: 395-403). In addition, fine Corinthian pottery appeared at the extramural sanctuary of Demeter and Persephone in Cyrene, and in the sanctuary of Demeter at Teucheira (Kocybala 1999: 118-47). These suggest a trade connection with different Peloponnesian cities. However, Schaus (1985: 101) suggested that the Laconian wares were perhaps brought to Cyrenaica indirectly via Samos. The Samian merchants supposedly maintained strong links with Naukratis, where Laconian vases similar to those found in Cyrene and Teucheira have been uncovered. This suggests that Samos served as a stopping-off point for traders in Laconian pottery on their way to Cyrenaica and Naukratis.

Attic Black-figured and Red-figured pottery has been found in considerable quantities in most of the Cyrenaican archaeological sites, though the latter has featured less in both quality and quantity (Elrashedy 1985: 205-17). Elrashedy (1985) examined objects from the Louvre, the Bibliothèque Nationale de France and the British Museum, and discussed different types of the two categories which were mostly recovered from tombs and sanctuaries. This data is important evidence as it implies the existence of strong commercial ties between Cyrenaica and Attica in the archaic and classic eras.

Euesperides seems to have also had a commercial connection with the Greek mainland in this period, including the Aegean islands (Riley 1979: 404, 405). This is based on Riley's study of the coarse pottery of Euesperides dated to the sixth century BC (Riley 1979: 405). Ceramic material has also been found in the votive deposits of the

Demeter sanctuary at Taucheira dated to *c.* 620 BC - *c.* 520/10 BC. Imports of Parian, Melian, and Siphnian wares (cf. Boardman 1998: 128-130) from the Aegean islands are all absent in Cyrene. However, Cyrenaica's commercial interactions with its neighbours such as Egypt and Tripolitania are still unclear, although Purcaro Pagano argued that the main maritime route in the fourth century BC was Egypt-Cyrenaica-Crete-Peloponnese (cited in Riley 1979: 405).

VI.3.2 Commercial connectivity in the Hellenistic period up to 250 BC (Local and imported amphora of Euesperides)

The amphorae of Euesperides suggest an economic exchange took place between Cyrenaica and a number of regions during the Hellenistic period. This evidence is representative of trading varied products that may have included wine, oil and others. Göransson's (2007) examination of the Hellenistic amphorae of Euesperides is the most important evidence for assessing the region's contact in this period. Göransson (2007: 190-92) conducted a quantification study of the amphorae based on Rim-Base-Handle (RBH), and the figures were quantified by count only. This revealed the variety of Cyrenaica's commercial destinations, which included many regions in the West, Centre and East of the Mediterranean (Figure VI.3). As Göransson (2007: 232) notes, Cyrenaica's trading links included the:

Punic world including Morocco, the Iberian peninsula, Tunisia, Tripolitania and western Sicily; Massalia; Sicily and South Italy; Corcyra; Corinth; Thasos and Mende in the North Aegean; Chios, Samos, Kos, Knidos, Rhodes and the so-called Solokha I amphorae from the South Aegean; and Cyprus. The links with Sicily appear to be strong, with cities in southern and eastern Sicily playing important parts in trade with the commodities [probably wine] contained in B amphorae and Greco-Italic amphorae (Göransson 2007: 92, 116, 232).

However, local amphorae were also found in good quantities at Euesperides. They comprised about 23% of the total amphorae found at the city, which may be regarded a sign of intra-regional trade (Göransson 2007: 220) as shown in Figure VI.3 and Table VI.5. Regarding the contents of these local amphorae, Göransson (2007: 217, 18) suggested that silphium was supplied alongside wine, olive oil and cereal from other

Cyrenaican cities to Euesperides. This view can be archeologically evidenced from the distribution of some industrial elements of some of these suggested products. For example, there is evidence of wine production in the area around Cyrene and Balagrae, as stated in the chapter on fruit and grape production. Also, a considerable number of oil presses have been attested in different Cyrenaican cities. Although their dates are still questionable (Ahmed Buzaian, pers. comm.), they reflect the fact that oil production took place across the region.

It is important to mention that oil production was indicated by the *damiorgoi* inscriptions at Cyrene from the fourth century BC, while wine appeared during the third and second centuries (App. II. D. 4, 5, 7). In addition, Euesperides may have imported honey and animal fats from the lands around Cyrene. The high quality of Cyrenaican honey is highlighted by a number of literary documents from the second century AD. Furthermore, medieval Arab travellers and European travellers of the eighteenth and nineteenth centuries AD write about how Euesperides was supplied with abundant quantities of animal fats, sheep tails, ghee and honey from these places. Arab travellers stated also that honey was exported from Ptolemais to Alexandria (App. I. C. 1.6-9). Honey may therefore have been traded in one of the different kinds of local amphorae found at Euesperides.

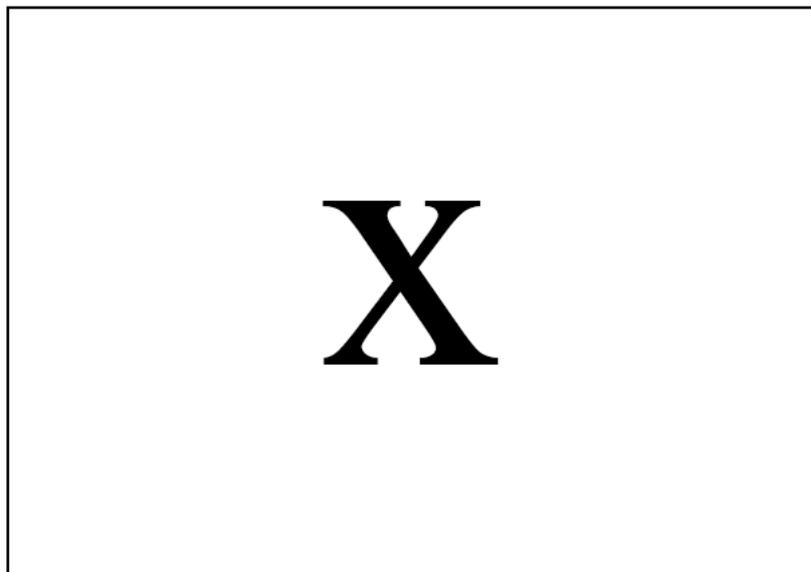


Figure VI.3: Relative proportions of all quantified amphorae (RBH) at Euesperides dated to the Hellenistic period (Göransson, 2007: 191. Fig.41. nos. correspond to data in table VI.5).

Amphora type	Source	Probable content	Possible content	%
Punic	Morocco, the Iberian peninsula, Tunisia, Tripolitania	Fish passed/ olive oil	Wine	5%
Cypriot	Cyprus	Fish passed/ olive oil	Wine	0%
Massaliote	Massalia	Olive oil/ Wine	Fish passed	0%
South Aegean	Chios, Samos, Kos, Knidos, Rhodes and Solokha	Wine		8%
North Aegean	Thasos and Mende	Wine		4%
B amphorae	Corinth	Wine		36%
Greco-Italic amphorae	Sicily	Wine		3%
Cyrenaican	Cyrenaica	Silphium/ wine/ olive oil/ cereal		23%
Corinthian A, A Corcyra?	Corinth?, Corcyra?	Olive oil		2%

Table VI.5: Probable or possible content, source and percentages of amphorae (RBH) found at Euesperides dated to the Hellenistic period (nos. correspond to those types shown in Figure VI.3).

Regarding the amphorae imported from outside Cyrenaica, Corinthian (B Amphora) represented the largest volume found amongst the amphorae of Hellenistic-period Euesperides. It made up 36% of the total examined data, while Sicily and South Italy maintained small-scale direct trade contact with Euesperides (Göransson 2007: 223, 225). As the probable content of the B Amphora is wine, this may reflect that this commodity was the most needed for the city in the Hellenistic period (Table VI.5) Göransson (2007: 224) suggested also that Euesperides may have served as a transshipment port for onward trade of Corcyrean, and possibly Corinthian amphora-borne commodities with the Punic cities in Tripolitania. Göransson (2007: 224) also proposed that Punic amphorae probably came to Euesperides loaded with wine. This might be true if one bears in mind Strabo's (XVII. 3. 20) narrative on the occasion when the Carthaginians smuggled wine instead of Cyrenaican silphium juice through Charax, the preferred commercial spot (located in the gulf of Sirte). This commercial connection seems to have occurred before the middle of the 2nd century BC, or possibly much earlier (Riley 1979: 406). The different forms of amphorae imported into Euesperides indicate economic ties with many Mediterranean regions during the Hellenistic period (Figure VI.4).

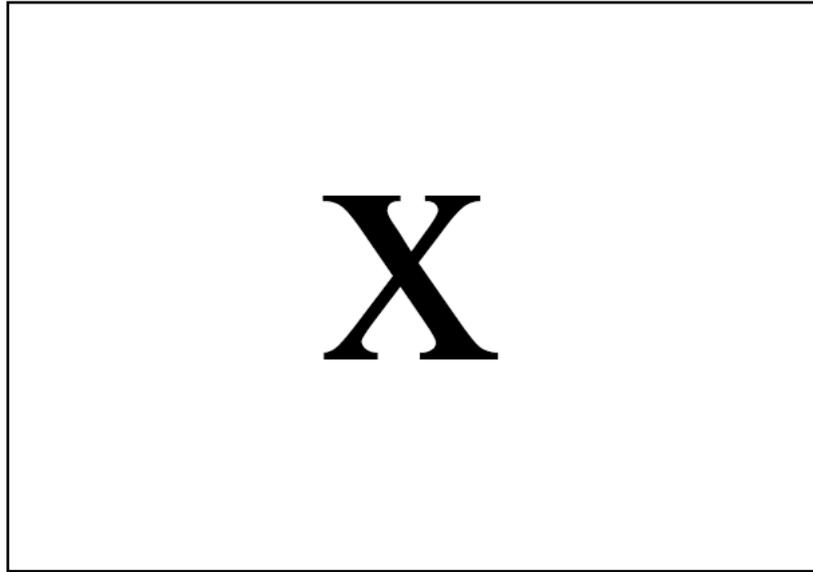


Figure VI.4: Suggested routes for the common amphorae types found at Euesperides (after Göranson, 2007: 225, 227, 229).

In addition, large amounts of coarse pottery have been recovered from the recent excavations of Euesperides. These have provided useful information about the diverse commercial relationships between the city and the Mediterranean world, based on a provenancing study of the pottery. The local coarse pottery was also represented. The two main groups of coarse ware found at Euesperides appear to have been produced locally comprising about 37% of the assemblages, while around 40-60% was imported. Corinthian pottery represented some 10% of the imported coarse wares. There was also a large quantity of imported pottery from volcanic regions. Punic coarse pottery accounted for 15% of the total coarse wares, represented by two fabrics: oxidised–reddish and reduced fabrics (Wilson et al. 2003: 220). These percentages are based on the preliminary results which have appeared in *Libyan Studies*, and are awaiting final publication (Wilson et al. 1999; Bennett et al. 2000; Wilson et al. 2001; 2002; 2003; 2004).

VI.3.3 Hellenistic period from 250 BC and early/mid-Roman connectivity

VI.3.3.1 Imported and local amphorae at Berenice

The pottery analysed following the excavation of Berenice suggests that the city used both local and imported coarse pottery. The city was to some extent self-sufficient in these products in the Hellenistic and Augustan periods (Riley 1979: 107, 108). This view was based on the evidence of the local Hellenistic Amphora 1, which made up 20% and 22% respectively of the total Hellenistic and Augustan amphorae found in stratified deposits (Riley 1979: 119, 403). The Local Hellenistic Amphora 1 made up 38% (67 sherds out of 181 sherds) of the total identified Cyrenaican amphorae (RBH) found at Euesperides (Göransson (2007: 51, 79). The quantities of coarse pottery imported into Berenice appear to have increased from the first century AD onwards (Figure VI.5).

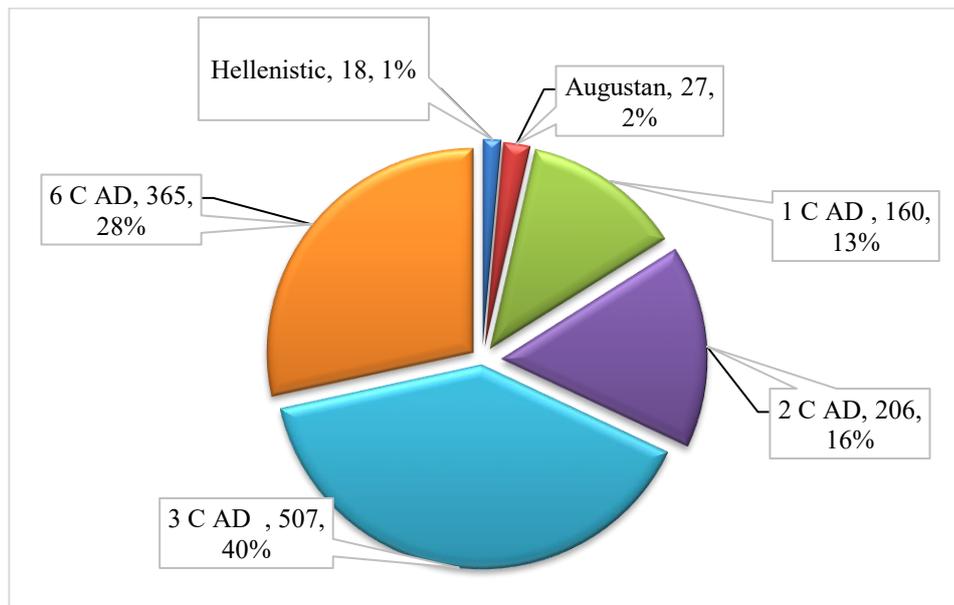


Figure VI.5: Number and percentages of imported amphora sherds (BRH) representing the period from the Hellenistic to the third century AD at Berenice (The graph is based on a quantitative study conducted by Hesein 2014: 286-289 based on data from Riley 1979).

As with the other Greek cities, the most significant goods imported into Berenice during the Roman period were olive oil, wine and probably honey. Riley (1979: 120) stated that there was a decline in the presence of local amphorae in the Roman period, especially from the first century AD onward, and noted that Berenice relied heavily on external markets to meet its local needs. Riley (1979: 120, 402) interpreted the low presence of local amphorae as implying that the agricultural potential of the region was

underestimated - particularly regarding olive oil and wine production, which were the probable contents of these amphorae. Furthermore, he mentioned that in this period the region may have focused on cereal production.

However, despite the clear representation of imported amphorae from the first to the third centuries AD, the number of local amphora sherds (BRH) collected from each period at Berenice declined slightly in the first century BC before gradually increasing in the first three centuries AD (Table VI.6 and Figure VI.6). The average increase and decrease of the local imported amphora to Berenice seems to have followed the same trend as the inter-provincial amphorae between the first and sixth century AD (Figure VI.7). This may imply that some of the other Cyrenaican cities were producer of wine and olive oil over time, and continued to supply Berenice. The large quantity of the local amphora 1 in Bernice is important archaeological evidence which can support this suggestion. This argument runs counter to Riley’s suggestion that Cyrenaica may have focused on cereal production at this time rather than the other products Riley (1979: 120, 402). Another matter should be considered is that wine dominated the imports of Berenice in the Hellenistic and first centuries BC/AD, and oil in the second and third centuries AD. This may reflect that wine and oil were the major need of the city and it was self-sufficient in one of them alongside cereal in these periods (Table VI. 5 above; Hesein 2014: 302).

Period	Sherds (BRH) Number	Percentage
Hellenistic	36	10% 
Late 1 C BC	31	9% 
1 C AD	51	14% 
2 C AD	82	23% 
3 C AD	144	40% 
6 C AD	16	4% 

Table VI.6: Number and percentage local amphora sherds (BRH) collected from each period at Berenice (Table data gained from Hesein 2014: 515 based on data from Riley 1979).

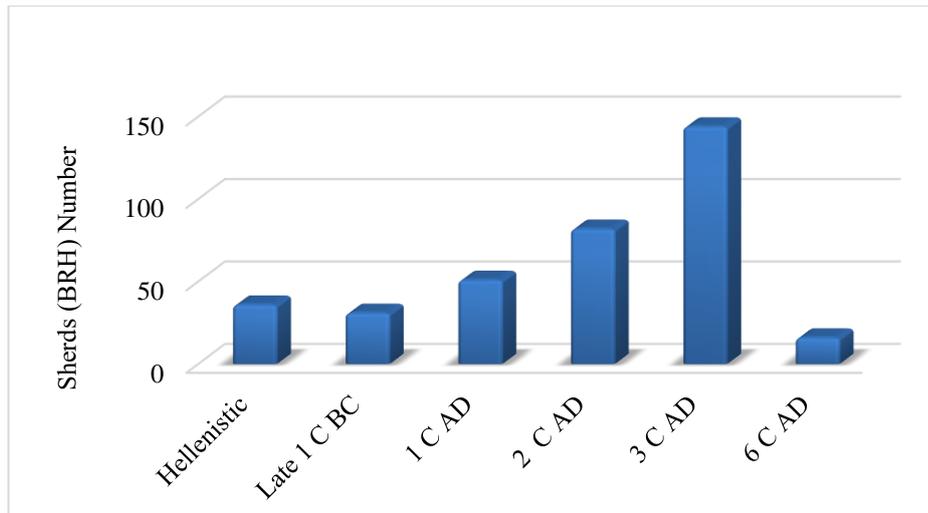


Figure VI.6: Quantities of local amphora sherds (BRH) collected from each period at Berenice (The graph is depending on quantification conducted by Hesein 2014: 515 based on data from Riley 1979)

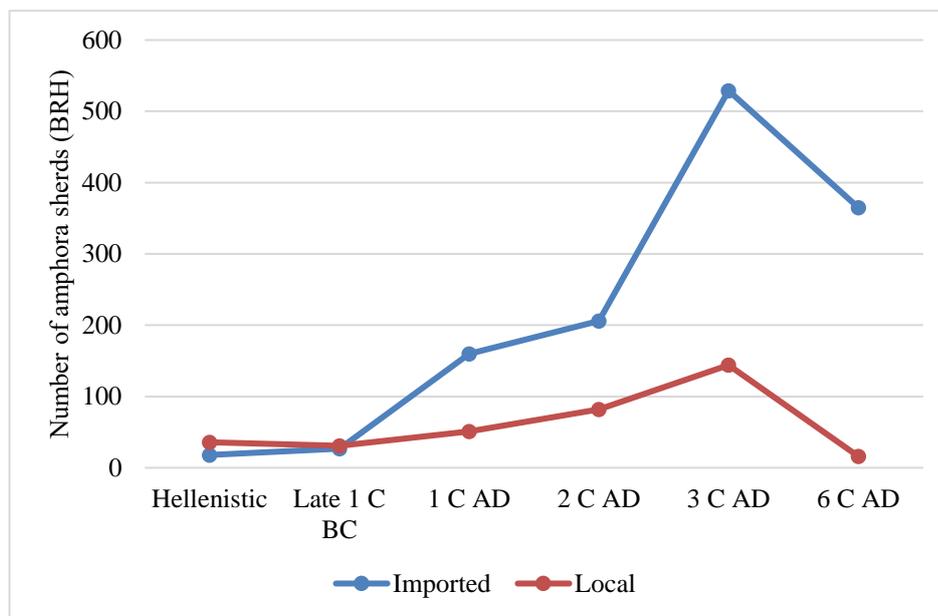


Figure VI.7: Trends of imported and local amphora at Berenice based on sherds (BRH) collected from each period (Chart data is from quantification conducted by Hesein 2014: 515 based on data from Riley 1979).

The number of amphora kilns that discovered in the area around Cyrene and Apollonia can support this theory. Ten amphora kilns have recently been discovered at three coastal sites. Four kilns were found at the *Cape of Phycus* (el-Mamluh), and three kilns in both *Mahel Mael* and *Aptouchou* (el-Hanya) (Table VI.7). These are located to the west of Apollonia and dated to the Mid-Roman period (Hesein 2014: 115, 178, 268, 269). In addition, one kiln was previously found at *Erythron* (Lathron) to the east of

Apollonia. Only one amphora kiln dated to the Hellenistic period has been found at Taucheira. Some of these kilns may have produced MRA8, MRA1, or both (see Table 7). These kilns are important evidence of the region's potential for local production of goods such as wine, olive oil and perhaps other products. The literary documents also provide a significant indication of the region's export of olive oil to Italy in the second century AD. The most important example is a cargo which included 3,000 metretai (μετρηταί: Attic metretes (μετρητής) = 39.1 litres) or about 120 tonnes of olive oil, alongside a quantity of grain exported specifically from Cyrene to the Italian city Aquileia. (Scaevola, *Digest*, 19. 2. 61. 1. VII).

Amphora kilns N.	location	Kiln of MARI	kiln of MRA8	Reference
1	<i>Erythron</i> (Lathron)	1		Mazou and Capelli 2011; Hesein 2014: 180
1	<i>Teucheira</i>		1	Bentaher 1994; Buzaian 2000; Wilson 2001, Hesein 2014: 181
4	<i>Cape of Phycus</i> (el-Mamluh)	4	4	Hesein 2014: 178-181, 268
3	<i>Mahel Mael</i>	3		Hesein 2014: 178-180, 269,
3	<i>Aptouchou</i> (el-Hanya)	3		Hesein 2014: 115, 178-180
Total 12	5	11	5	

Table VI.7: The number, and location of MRA1 and MRA8 kilns at Cyrenaica in the Mid-Roman period (some produced both types of amphora).

This indication is important proof of Cyrene's productive capacity in olive oil. It also shows that the region was among those who supplied Aquileia, which was located at the head of the Adriatic at the edge of the lagoons. The importance of this location lies in its existence close to the Veneto region, where the Cyrenaican Amphora 8 of the second century has also been found (Wilson 2004: 148). This may lead us to assume that olive oil is the most likely product exported in this amphora to Rome, Ostia and the Veneto, as Ferrarini (1993: 158 Cited in Wilson 2004: 148. N. 15) suggested, and that it was not used to transport fish sauce as Hesein (2014: 344, 349) stated.

In addition, exporting olive oil from Cyrene to Aquileia with its population of about 100,000 citizens, in the second century AD, is perhaps evidence of Cyrenaica producing a surplus of olive oil that enabled it to contribute to the economy of the Mediterranean world in the mid-Roman era. Also, based on the considerable number of kilns of MARI1 founded in the area around Cyrene in this period, the city probably supplied Berenice with

wine. This may be true because Berenice's inter-regional imports of wine had declined as mentioned before.

VI.3.3.2 Imported and locally made lamps of Berenice

In addition, the locally made lamps and fragments found in the excavations of Berenice during the first half of the 1970s indicated the good presence of locally produced lamps in most periods (Bailey 1985: 195-198). The ratio of locally produced to imported lamps of the Hellenistic period, from the mid-third century BC to the first century BC, was two to one. Locally-produced lamps appear also in the data representing the Roman period from the first century down to the mid-second century AD, but show some decline. The proportion of imported to locally-produced lamps is more than three to two. Although there was an influx of Italian lamps alongside a modest presentation of other imported lamps, the local manufacture of lamps seems to have been most important from the second half of the first century AD to the mid-third century AD (Bailey 1985: 203).

However, a clear decline in locally made lamps can be seen in the period from the third century AD up to the mid-sixth/seventh centuries AD. The general picture of increase and decrease in local lamp production at Berenice is quite similar to that of the local amphorae (see Figure VI. 6 above). This is probably more evidence of the city's economic growth over time, which may have opened it to commercial connections with different markets. It is thus reasonable to assume that growth in Berenice's regional and inter-regional imports is a sign of its economic growth as a consequence of rising population growth in the early and mid-Roman periods. The population growth can be hypothesized from increasing quantities of animal bones found at the city during the period from the late first to the mid-third centuries AD (Barker 1979: 12) (see Figure II.14 and Table II.4 above). Population growth, increasing demand and the growth of inter-regional exchange seem to have occurred in Berenice during this period. These three points are among the seven features that may be associated with economic growth (Hopkins 1980, 1983: xv-xxi, 2002: 190 - 230). This growth was probably happened in the rest of the Cyrenaican cities in the early/mid-Roman period. Increasing numbers of the ephebes at Cyrene, for example, as some lists demonstrated, may support this view (*IRCyr.* C.115, 126.1, 133; Reynolds 2000: 555).

VI.3.3.3 Imported and local Fine pottery of Berenice

The fine pottery revealed during the excavations at Sidi Khrebish, in Benghazi (Berenice) in the 1970s helped to establish a chronological sequence of the city's commercial links (Kenrick 1985a). Berenice has produced 16,531 fine ware fragments, which reflects the economic status of the city (Kenrick 1985a: 514-15). Examining these pieces revealed that Berenice produced its own fine pottery during the Hellenistic period, and had meanwhile imported various types of pottery from beyond the region (Kenrick 1985b: 250). Kenrick (1985b: 250) also stressed that the city's geographical location enabled it to engage in maritime trade across the Mediterranean.

During the period spanning from 200 BC to the beginning of the first century AD, Berenice manufactured and imported fine pottery (Figure VI.8, Figure VI.9 and Table VI.8). Kenrick (1985b: 250) confirmed that alongside Berenice's local production of fine ware, a considerable amount of black glaze ware was also imported from Campania and the south of the Italian Peninsula, in addition to Aegean products. However, after this period different fashions arose in terms of the pottery imported from the Mediterranean.

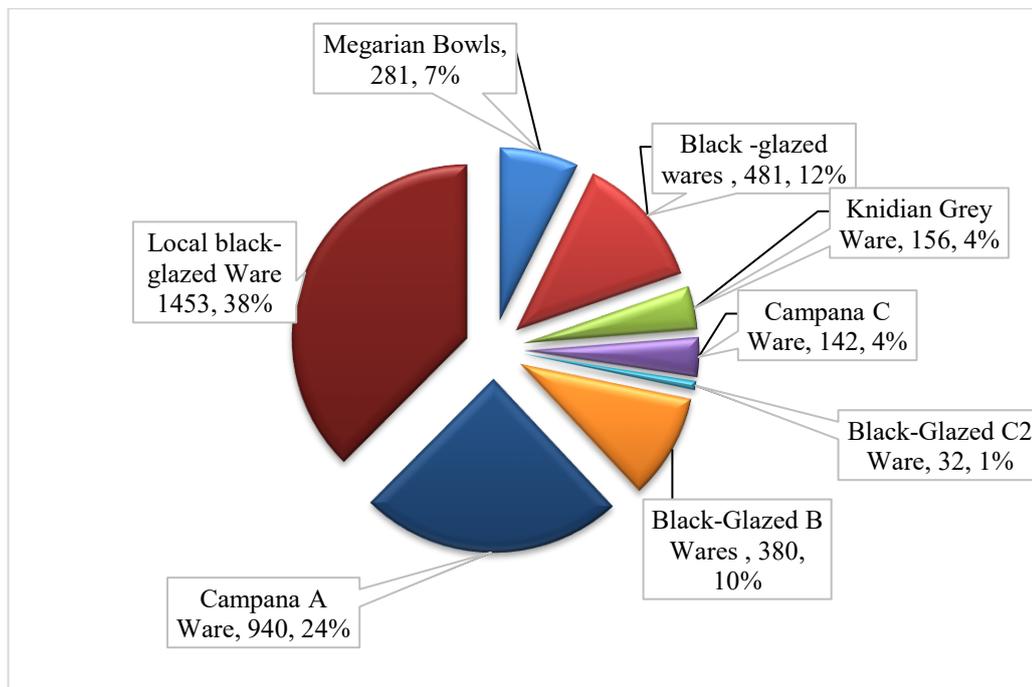


Figure VI.8: Hellenistic imported and local fine wares found at Berenice (nos. correspond to the ware types shown in Figure VI. 9 and Table VI. 8), (Kenrick 1985a: 514; Kenrick 1985b: 252).

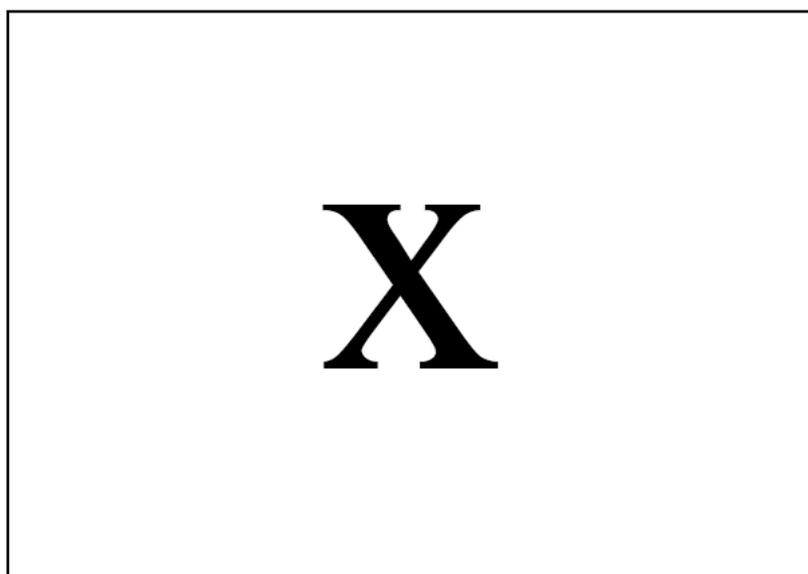


Figure VI.9: Sources of imported Hellenistic fine wares at Berenice. Numbers correspond with those shown in Figure VI.8 and Table VI.8) (Kenrick, 1985b: 252).

No.	Type	Quantity	Percentage
1	Megarian Bowls	281	%7
2	Black-glazed wares (Gnathia, black glaze, West Slope and Megarian Bowls)	481	12%
3	Knidian Grey Ware	156	4%
4	Campana C Ware	142	4%
5	Black-Glazed C2 Ware	32	1%
6	Black-Glazed B Wares (including Attic, pre-Campana and Campana B)	380	10%
7	Campana A Ware	940	24%
8	Local black-glazed Ware (plain and painted)	1453	38%

Table VI.8: Hellenistic imported and local fine wares found at Berenice (nos. correspond to the ware types shown in Figures VI.8 and 9) (Kenrick 1985b: 252).

The turning point for fine wares imported into Berenice occurred around 100 BC (Figure VI.10). The occurrence of the Eastern Sigillata A at Berenice was interpreted by Kenrick as a shift to the East Mediterranean market, where pirate activity was less disruptive than in the West. It is worth noting that at this time the corn supply to Rome was also under threat (Plutarch, *Pompey*, 25.1; Cicero, *Pro Lege Manilia*, 12).

The end of the first century AD saw the introduction of Eastern Sigillata wares from Asia Minor, such as Eastern Sigillata B, Çandarlı, Cypriot Sigillata and Pontic Sigillata

(Figure VI. 10, Figure VI.11 and (Table VI.9). In the early Roman era, Berenice seems to have mainly relied on two markets located in different areas in the west and the east.

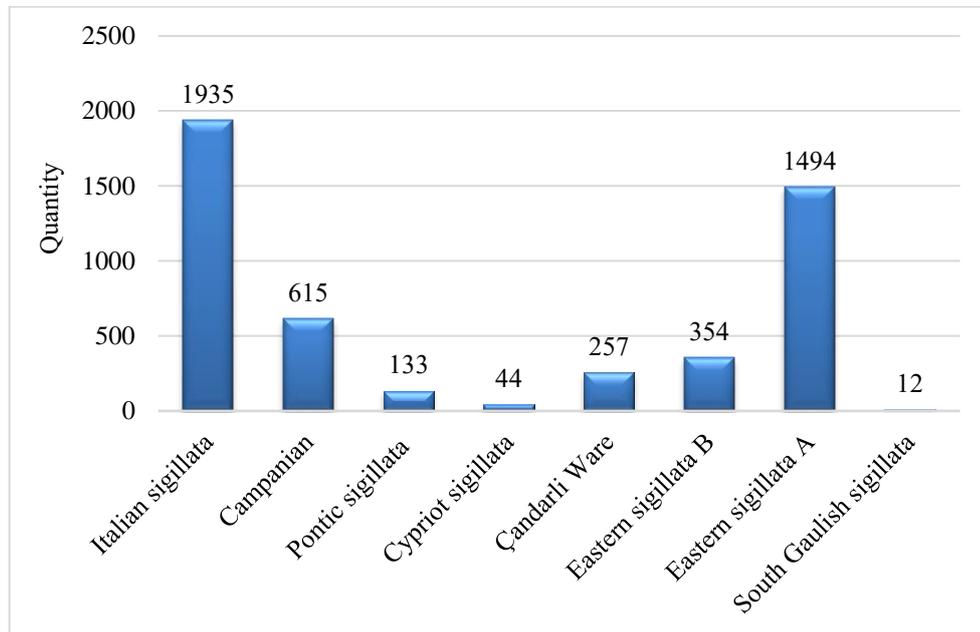


Figure VI.10: Early Roman fine wares found at Berenice (nos. correspond to the ware types shown in Figure VI. 11 and Table VI. 9) (Kenrick 1985a: 514; Kenrick 1985b: 254; Soricelli 1987: 73).

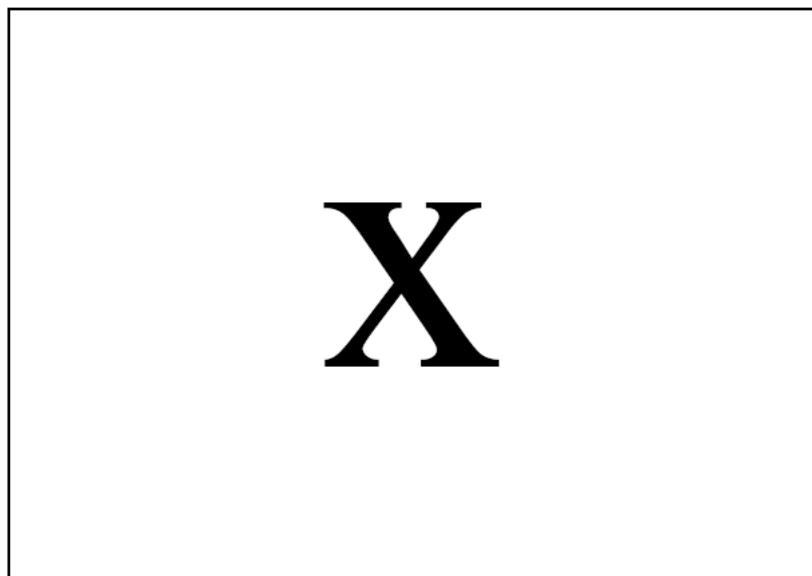


Figure VI.11: Main sources of Early Roman fine wares at Berenice (nos. correspond to the ware types shown in Figure VI.10 and Table VI.9) (Kenrick 1985b: 254; Soricelli 1987: 73).

No.	Type	Quantity	Percentage
1	Italian Sigillata	1935	40%
2	Campanian	615	13%
3	Pontic Sigillata	133	3%
4	Cypriot Sigillata	44	1%
5	Çandarli Ware	257	5%
6	Eastern Sigillata B	354	7%
7	Eastern Sigillata A	1494	31%
8	South Gaulish Sigillata	12	0%

Table VI.9: Number and percentage of early Roman Fine Wares found at Berenice (nos. corresponding to the ware types shown in figs. VI. 10, 11), (Kenrick 1985a: 514; Kenrick 1985b: 254; Soricelli 1987: 73).

Kenrick (1985a: 275) explains the probable reasons for the limited presence of some types of fine pottery, such as Pontic Sigillata at Berenice (Table VI.9). These and others were common in many ancient Mediterranean sites, despite their remoteness and limited production scales. A major wine producer, Knidos exported its products throughout the classical Mediterranean, and ships were loaded with Knidian wine amphorae to transport across the region. There was clearly spare cargo space on these vessels to transport a limited quantity of fine pottery, which is how this type of pottery spread along the Mediterranean basin. Lamboglia (1961:145) confirmed that this kind of casual enterprise involving fine wares accompanied ancient maritime trade in wine and olive oil. This interpretation can be applied to the Pontic Sigillata from the Black Sea region, which was renowned for its production of wood and wheat (Kenrick 1985a: Appendix III. 514-5). According to Kenrick (1985b: 256), African Red Slip prevailed sometime around AD 50. This continued until AD 600, although it faced some competition from Tripolitanian Red Slip Ware between 300 and 500, and from late Roman C Ware between 400 and 600. Meanwhile other types of Red Slip ware were imported from Asia Minor, Cyprus and Egypt.

In summary, fine ware indicated considerable contact between Berenice and the North-West Mediterranean during the Hellenistic period. It also demonstrated that first-century BC Berenice had strong commercial interaction with the East Mediterranean. Both the North-West and East Mediterranean seem to have been Berenice's preferred markets during the first century AD. The most active trade epochs are probably the first and third centuries AD. This can be seen from the two highest numbers of fine ware sherds found in Berenice that comprised 28% and 29% of the total imported fine wares (Table VI.10). However, Hellenistic-period Berenice also seems to have had great

commercial activity, if one bears in mind the sizable quantities of local fine ware which were perhaps imported from the other regional cities (Figure VI.12). This was completely absent in the other periods.

Period	Imported	Local	Total
Hellenistic	1963	1453	2416
1 C BC	782	0	782
1 C AD	3761	0	3761
2 C AD	1329	0	1329
3 C AD	3811	0	3811
4-5 C AD	1184	0	1184

Table VI.10: Total sherds of local and imported fine wares at Berenice representing each period (nos. corresponding to the data shown in Figure VI. 12) (data from Hesein 2014: 522).

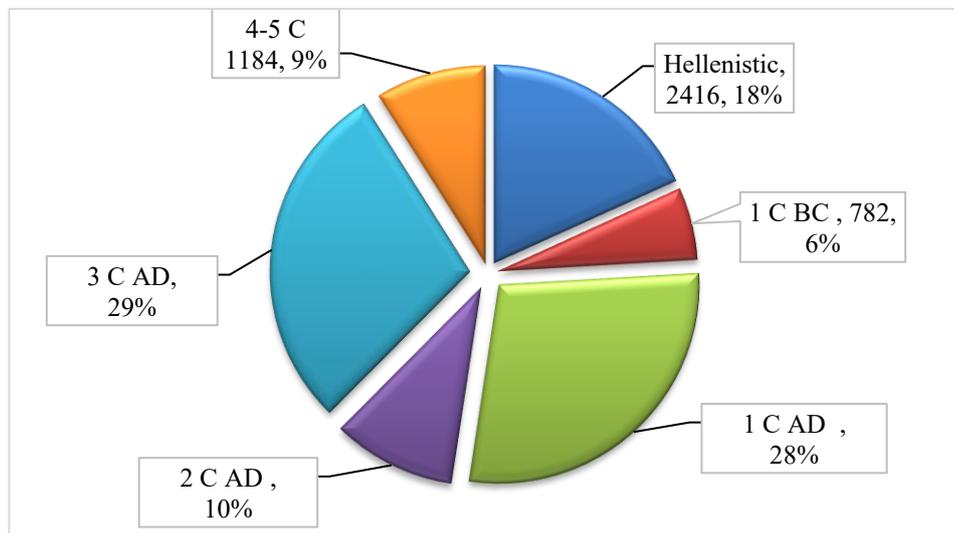


Figure VI.12: Change in trade size based on the imported fine wares to Berenice in different eras. (nos. corresponding to the data types shown in table VI.10).

VI.4 Imported Fine Wares into Ptolemais from the late Hellenistic to late Roman periods

Cyrenaica's commercial connectivity during the period from c.100 BC to the sixth century AD can be understood via the imported fine pottery obtained from the recent excavations conducted by the Polish Mission to Ptolemais (2002-2009). The importance of these excavations lies in their analysis of the fine ware, unlike the previous excavations at Ptolemais which mainly focused on monumental buildings and associated architectural elements (Caputo, 1940; 1954; Goodchild, 1964; 1967; Kraeling, 1962; Pesce, 1950; Ward-Perkins et al. 1986). About 665 sherds of fine ware found during the excavations

in the so-called House of Leukaktios (Domžalski 2012: 319). These sherds were discovered in one of the residential *insulae* east of the Palazzo delle Colonne. The site is a villa which seems to have been used by wealthy individuals, because it is furnished with lavish mosaics and wall paintings. Its date ranged from between the late second and early third century, and lasted until the fourth century AD when it was abandoned before collapsing after an earthquake. However, the ruined villa and its surroundings became associated with industrial activity around 600 AD (Żelazowski, 2012: 121-56).

The fine ware discovered in this villa indicated that the tendency of early imported fine Roman pottery of Ptolemais (Figure VI.13 and Figure VI.14) corresponds to the general tendency observed in Berenice (Kenrick 1985a and b).

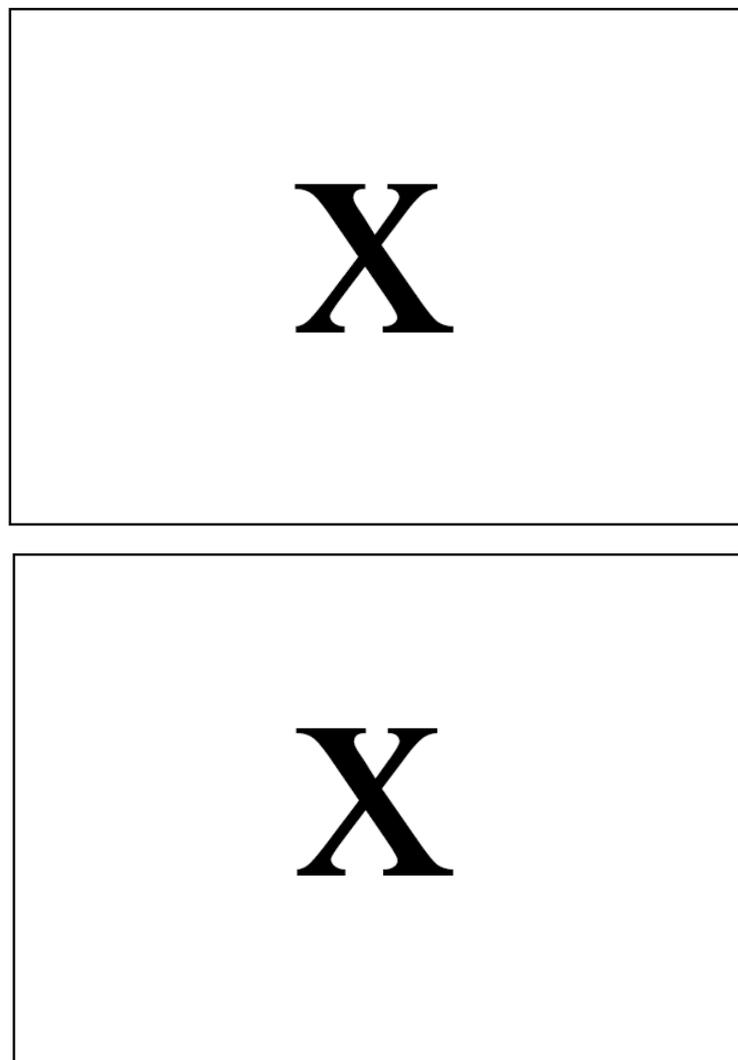


Figure VI.13: Ptolemais. Identified sources of terra Sigillata and late Roman Red Slip wares respectively, from c.100 BC - AD 300 (A) and c. AD 300-650 (B) (nos. corresponding to the Eastern Roman Red Slip Wares in Ptolemais shown in figure VI.14 and table VI. 11) (Domžalski 2012: 324-33).

The fine ceramics found in the Polish excavations were imported from outside Cyrenaica, and there was no evidence of local manufacture of this type of pottery (Domzalski 2012: 322). The data indicated the presence of different kinds of early Eastern Roman Red Slip Ware, as shown in Table VI.11 and Figure VI.14). The African Red Slip (ARS), Italian Sigillata (IS) and Eastern Sigillata A (ESA) were the most frequent types found from the late first century BC to the end of the first century AD (Domzalski 2012: 321, 322). Domzalski (2012) stated that by the late first century AD, Terra Sigillata imported from the Levant and Italian Peninsula had lost their market in Ptolemais in favour of Aegean products. In addition, various forms of African Red Slip Ware have been found in Ptolemais and in different sites around the region, and its trade seems to have continued into the seventh century AD (Coster 1968: 130; Domzalski 2012: 322). However, a small group of fine pottery dated to the Hellenistic period from the third century to the first century BC was retrieved from the early levels in the excavated area. Although it has not been studied, it is a sign that the city was engaged in commercial interactions with other parts of the Mediterranean world.

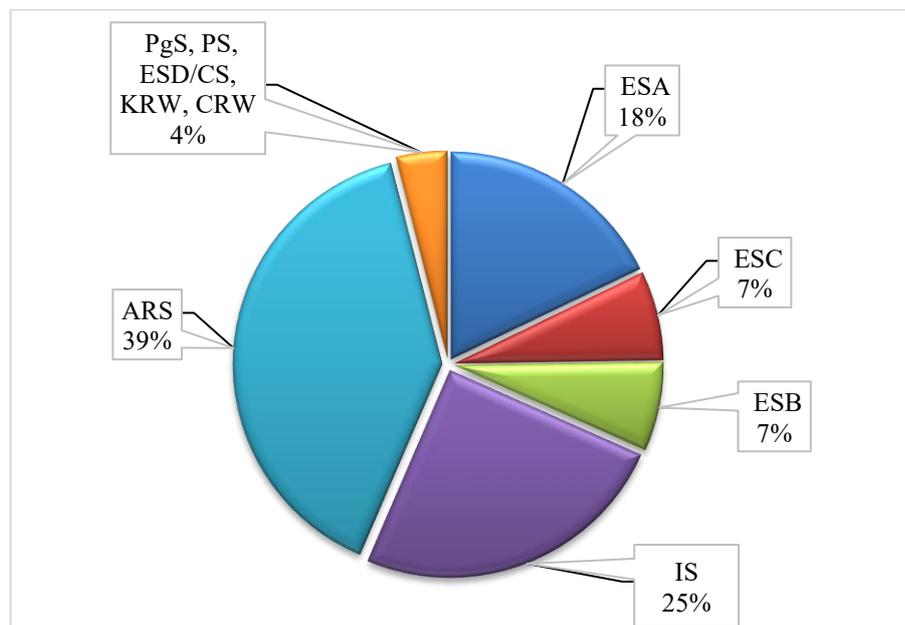


Figure VI.14: Percentage of early Roman Red Slip wares found in the Polish excavations at Ptolemais (c. 100 BC- AD 300) (nos. corresponding to the Eastern Roman Red Slip Wares in Ptolemais shown in figure VI.13, table VI.11) (Figure data from Domzalski 2012: 322).

Type	Date
Eastern Sigillata A (ESA)	150 BC to 2nd century AD.
Pergamene Sigillata (PgS)	Late 1 st BC.
Italian Sigillata (IS)	Late 1st century BC to 2nd century AD.
Cypriot Sigillata (CS)	Late 1 st to early 2nd century AD.
Pontic Sigillata (PS)	Late 1 st to early 2nd century AD.
Eastern Sigillata B (ESB)	Late 1 st to mid-3rd century AD.
The African Red Slip (ARS)	Late 1 st to early 7 th century AD.
Çandarlı (ESC)	mid-1 st century to the end of the 3 rd century AD
Knidian Relief Ware (KRW)	2nd century AD to mid-3rd century AD.
Corinthian Relief Ware (CRW)	3rd century AD.

Table VI.11: The different early Eastern Roman Red Slip Wares in Ptolemais (Table's data from Domzalski 2012: 321-22 cf. figs. VI. 13, 14).

Domzalski (2012: 328) stated that some decline occurred in the African Red Slip (ARS) imported into Ptolemais during the second century AD, as well as between 400 and 550 AD, although he gives no explanation for this. Clearly the Jewish revolution in the early second century greatly affected the whole region's economy, but evidence was found in Ptolemais to suggest that the turmoil had a particularly significant impact on the city (Applebaum, 1979: 288-90). Merrills (2004: 10-11) denied that the Vandal occupation marked an era of economic stagnation, claiming instead that the Vandals established new industrial centres of ARS production. Evidence of this can be seen in their wide distribution of ARS wares across the Mediterranean, suggesting production flourished in this period. The olive oil industry also persisted, and was not greatly affected by the Vandal rule over North Africa (Mattingly, 1996: 582). However, there are some evidence from Leptiminus suggested some impact on the olive oil industry (Stone et.al. 2011). Other explanations for the decrease of ARS ware in Ptolemais must thus be sought, which means broadening our view of the movement of goods traded between Cyrenaica and the rest of the Mediterranean basin during the Roman period. We cannot rule out that Ptolemais was affected by the loss of its status when the regional capital was relocated to Apollonia at the end of the fifth century AD. The city faced difficulties in securing a water supply because its aqueduct was not adequately maintained (Kraeling, 1962: 27-8). Pando (1940: 5) argued that Synesius' (*Homily* 2) accounts cannot be taken as referring to Ptolemais. However, it seems that the town experienced some economic growth soon after the restoration of Justinian, around 550 AD (Procopius, *On Buildings* VI. 2).

In summary, although Cyrenaica's maritime commercial routes seem to have varied between the East and West over time, the region kept a connection with its Archaic markets including Attica and Peloponnesus as well as the Aegean and Cycladic islands. During the Hellenistic period, Cyrenaica produced reasonable quantities of pottery and started importing Campanian fine ware from the West as well. Regional contact increased significantly in the Roman period, and Italian Sigillata wares were imported in large quantities into Berenice and Ptolemais. In addition, the region had an active commercial interaction with the East. The presence of Eastern Sigillata A and B at Berenice and Ptolemais in the early Roman period is evidence of this.

Furthermore, the data indicate that Cyrenaica appears to have traded with its neighbours in the West, in particular with Tunisia and Tripolitania from the Hellenistic time onwards. Meanwhile its connection with Egypt was not represented, either in the period under investigation nor in the archaic epoch. However, the mediaeval indications of trade between Ptolemais and Alexandria are probably evidence of the existence of a maritime connection between them. Cyrenaica and Egypt made similar products, which may explain the absence of Egyptian pottery in Cyrenaica. An important question which requires further investigation is whether any Egyptian pottery has been attested elsewhere.

VI.4 Marble Imported to Cyrenaica

Marble is not native to the province of Cyrenaica, which was entirely dependent on imports for its marble sculptures, buildings and so on. Marble can thus also be used to identify Cyrenaica's commercial contacts over time. Unfortunately, very few studies have been conducted in this field, and little progress has been made in identifying the source of the marble found across Cyrenaican sites (Dodge 1992: 61- 105; Harrison 1985b: 231-5; Stucchi 1975; Ward-Perkins 1943; 1976: 267-92; 1980: 23-69; 1981). This section will investigate the marble used in sculptures in order to identify its sources. It also addresses marble used in epigraphy in Cyrenaica from the Hellenistic to the mid-Roman period. This will allow us to provide a general overview of the quantity of this commodity imported over time, which will sometimes include direct linguistic indications of the marble's source.

VI.4.1 Marble used in sculpture

Kane (1985: 237-48) examined thirty sculptural samples from the Sanctuary of Demeter, and used a scientific approach to identify the marble's origins which sheds light on Cyrene's wealth and commercial contacts. The samples selected dated from between the sixth century BC to third century AD, and isotopic signature analysis was used along with stylistic and characteristic examinations. Most of the examined marbles were found to have been imported from the eastern Mediterranean. Over half appears to have come from Greece and the Aegean region, with the rest equally divided between Italy and Turkey (Table VI.12 and Figure VI.15), represented primarily by Ephesos, on the coast of Ionia, and the Italian city Carrara, located in the Province of Massa and Carrara. The latter was famous for its quarries of white or blue-grey marble. Kane (1985: 241) indicated that the marble imported from Ephesos and Paros was used most frequently during the Hellenistic era, while the marble of Thasos and Carrara appeared during the Roman period and was used alongside marble from Ephesos and Paros. However, commercial interactions between Thasos and Euesperides appear to have existed earlier in the Hellenistic epoch, as demonstrated by the presence of amphorae dated to this period (Göransson (2007: 227). This may reflect the different commodities Euesperides and Cyrene needed. Cyrene's trading relationship with Paros at the beginning of the Hellenistic era can be evidenced from the grain decree of Cyrene. Paros received 10,000 *medimnoi* from the cereals Cyrene supplied to many Greek cities and communities in 330-326 BC (*IGCyr010900*; *SEG* 9. 2).

City or island	Terrain	Quantity	Percentage
Ephesos	Ionia	7	23%
Carrara	Italy	7	23%
Thasos, Paros, Naxos	Aegean Sea	13	44%
Pentelicus and Hymettos	Attica	3	10%
Total	4	30	

Table VI.12: The number, percentage of sculptures made from marble imported from different places to Cyrene by city and terrain in the period between the 6th BC to AD 3rd. (Author's data is from Kane 1985: 238).

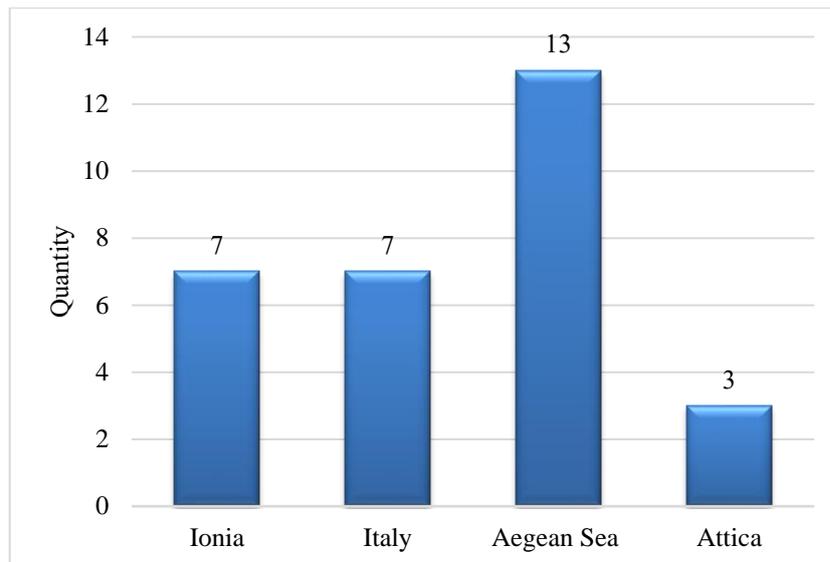


Figure VI.15: The sources of marble imported to Cyrene by terrain in the period between 6th BC to AD 3rd (Author's data is from Kane 1985: 238).

Cyrene's distance from both Thasos and Carrara means importing marble in Roman time was undoubtedly expensive. This may reflect the city's prosperity during the early/mid-Roman period, though silphium became rare or entirely disappeared. In addition, importing high-quality of white marble such as that of Thasos, Paros and Carrara, which were all well-known in antiquity, is also another indication of Cyrene's wealth (Dodge 1992: 15-16).

VI.4.2 Marble used in epigraphy

Despite the lack of fabric analyses of the marble introduced to Cyrenaica over time, the wide use of this material in the epigraphy of Hellenistic and Roman Cyrenaica probably implies it imported sizable quantities of importation. This can be regarded as a sign of the region's good economic condition, at least in certain centuries. The use of marble for inscribing texts seems to have been more common in Cyrenaica during the Hellenistic period than in the Roman era. Funeral inscriptions are a good illustration of this. There are 119 Cyrenaican funerary inscriptions from the Hellenistic period, only five of which come from Apollonia, Berenice, and Ptolemais, and four of these were engraved on marble. The other 114 inscriptions come from Cyrene alone. Most of the texts are inscribed on marble panels, and make up 87% (90 out of 114) of the total funerary inscriptions of the city. In contrast, only 51 out of 187 (27%) funeral inscriptions were inscribed on marble in Cyrene during the early/mid-Roman period (Table VI.13).

Period	Total inscriptions	On marble	%	On others	%
Hellenistic	114	90	87%	24	13%
Early/mid-Roman	187	51	27%	136	73%

Table VI.13: The numbers and percentages of the funeral inscriptions inscribed on marble dated to the Hellenistic and early/mid-Roman period found at Cyrene (Author's table data based on a collection from *IGCyr.* and *IRCyr.* projects).

It is important to mention that the bulk of funerary inscriptions in Cyrene representing the Hellenistic era are dated to the third century BC. However, many inscriptions lack a precise date and could be from any time over the following centuries, such as, the inscription which may date to the second half of the fourth and first half of the third centuries BC, titled 4/3 BC on the graph below (Figure VI.16). Moreover, most funerary inscriptions dated to the fourth century are dated to its second half. This may suggest that Cyrene imported large quantities of marble at the beginning of the Hellenistic period. If so, this would mirror the region's economic prosperity in this period.

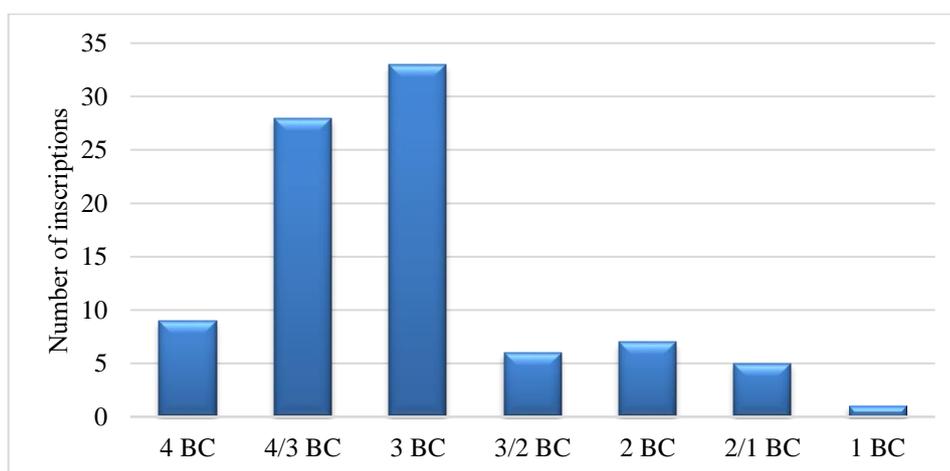


Figure VI.16: The number of Hellenistic marble funerary inscriptions from Cyrene in each century and those whose date is uncertain. These probably represent the end of one century and the beginning of another, e.g. 4/3 BC. (Author's graph data based on inscriptions gathered from *IRCyr.* project).

Cyrenaica's early/mid-Roman funerary inscriptions inscribed on marble indicate that imports of this material fell across the region. It also shows that Cyrene may have dominated this type of trade, while the other regional cities used less marble in their funerary inscriptions. This may have been the case in Ptolemais and Taucheira in particular, where merely 5% and 1% of inscriptions respectively were inscribed on marble (Table VI.14). Furthermore, Cyrene seems to have witnessed a slight increase in the marble trade during the first and second centuries AD (Figure VI.17).

City	Total inscriptions	On marble	%	On others	%
Cyrene	187	51	27%	136	73%
Ptolemais	121	6	5%	115	95%
Berenice	12	2	14%	10	86%
Apollonia	14	3	18%	11	82%
Taucheira	394	2	1%	394	99%

Table VI.14: Total funerary inscriptions and the number and percentages of those inscribed on marble and on other materials during the early/mid-Roman period in different Cyrenaican cities (Author's table data is based on calculating the inscriptions from *IRCyr* project).

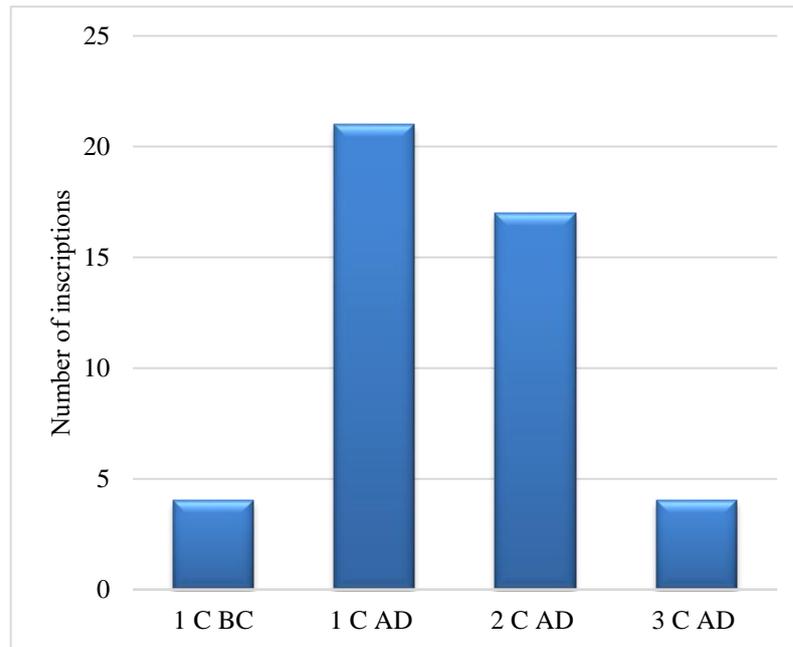


Figure VI.17: Number of funerary inscriptions carved on marble in early/mid-Roman period Cyrene (Author's graph data based on inscriptions gleaned from *IRCyr* project).

It is worth noting that Cyrene seems to have imported marble from the period of Augustus (31 BC- AD 14) onwards up to at least AD 117, the time of the Jewish revolt. This can be seen from the use of this material in funerary epigraphy, and also from the use of marble in the ephebic texts found in this city. The ephebic inscriptions of Cyrene included in *IRCyr* indicated that marble was used in a similar fashion to the funerary inscriptions (Figure VI.18). Some 32 out of 35 ephebic texts were engraved on marble at Cyrene during the early/mid-Roman era, most of which dated to the period between the late first century BC and the second century AD. However, marble was used to inscribe ephebic and funeral texts most often in the first century AD. This may be an important indication of how much marble Cyrene imported in this era. Nevertheless, if one assumes that some of these marble panels were imported during the Hellenistic era and reused in

the early/mid-Roman period, this could reflect the city's stable socioeconomic condition in the first century AD.

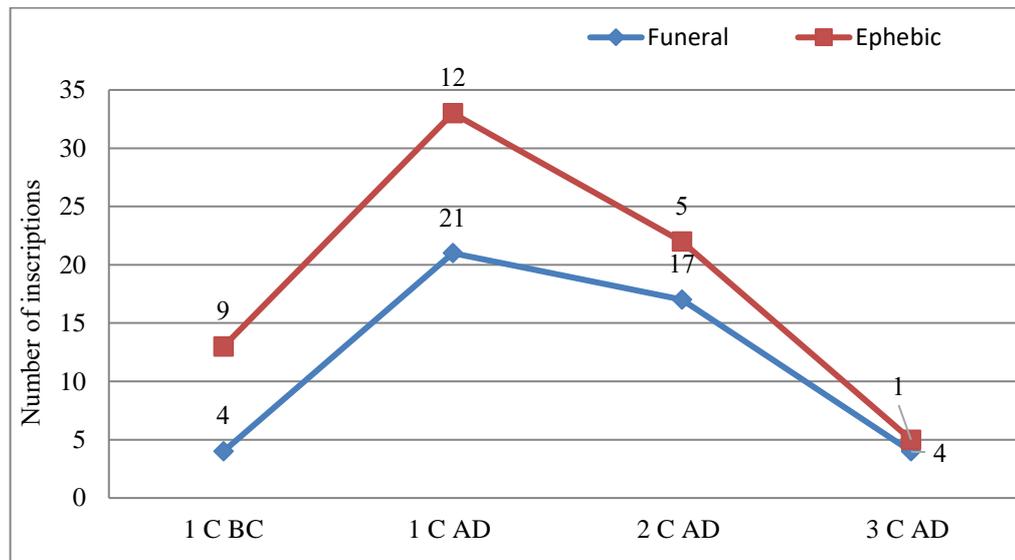


Figure VI.18: The number of marble panels used for engraving the funeral and ephebic inscriptions during the early/mid-Roman period in Cyrene (Author's graph data is based on epigraphy from *IRCyr* project).

Nevertheless, the provenance of marble imported by Cyrenaica can frequently be identified from direct linguistic indications in some of the region's epigraphy. For instance, marble from Paros is mentioned in a number of inscriptions dated to the end of the first century BC and the beginning of the first century AD. This textual evidence appeared in at least six inscriptions recorded in the Greek language. These were honorific decrees and found at Cyrene, Ptolemais and Berenice. The interest of these indications of Parian marble lies in the closeness of the dates, in addition to being mentioned in formal texts. One such text recommended that a statue be made for an honoured person, or an honour be inscribed on Parian marble. The next example demonstrates this:

δὲ ἄρχοντας ἀναγράψαι τὸ ψήφισμα εἰς στήλην λίθου Παρίου καὶ
θεῖναι εἰς τὸν ἐπισημότερον τόπον τοῦ ἀμφιθεάτρου (*IRCyr*.B.119)

The archons are to inscribe the decree on a stele of Parian stone [marble] and to place it in the most conspicuous part of the Amphitheatre (*IRCyr*.B.119 cf. B. 68; B. 71; C, 36 the latter has not been published yet).

The panels of these inscriptions are made from marble. This can therefore be considered sufficient evidence for the correct translation of the phrase (στήλην λίθου

Παρίου) as ‘a block of Parian marble’, though the word ‘marble’ (μάρμαρος) is not mentioned in the text.

Another interesting example dated to the Augustan period is a civic decree from Cyrene, which displays a formal recommendation for making two statues to honour a citizen from the city, one to be made from Parian marble and the other from bronze (*IRCyr.C.65*). The recommendation that an inscription be made on a piece of Parian marble is also indicated by another inscription from Ptolemais. This is an [unpublished] fragmentary decree dated also to the first 1st BC/AD 1st centuries (*IRCyr.P.105*).

Dodge (1992: 68) explained that the aim of stipulating the type of marble in the epigraphic texts is to exhibit ostentation. If so, the frequent references to the use of Parian marble in honorific inscriptions in Cyrenaica during the first 1st centuries BC/AD probably implies the existence of vital trade activity, in which the region was concerned with importing good-quality marble. In addition, it may be a sign that Cyrenaican cities had a special commercial relationship with Paros, especially Berenice, where most of the epigraphic data come from.

To conclude, Cyrenaica seems to have preferred to import marble from the eastern Mediterranean during the Hellenistic period. However, in the Roman era it seems to have initiated contact with new markets, including the western Mediterranean, while keeping its older trading partners. The largest import of marble into the region may have occurred in the Hellenistic period, if one considers the very frequent use of marble in the epigraphy dated in particular to the beginning of this epoch. Furthermore, Cyrene may have monopolized marble importation in both proposed periods. The region in general seems to have continued importing marble even during the late Roman era, but in more modest quantities as it was mainly used in churches. The question to be addressed is: what did Cyrenaica export in the Hellenistic and early/mid-Roman eras in order to obtain these considerable quantities of ceramic, marble and other materials?

VI.5 Products Likely Exported from Cyrenaica

VI.5.1 General Introduction

The discussion of the materials imported into Cyrenaica in the period demonstrates its considerable quantity, variety, and good quality. This section will examine which products were exported from Cyrenaica. Regarding the archaeological evidence has provided little proof of substantial regional exports. The direct and indirect textual data, including epigraphy and literary sources, indicate Cyrenaica's trade should be given some consideration. This section argues the exportation of different Cyrenaican commodities, including products of the Sahara, animals and their by-products, the fish in addition to silphium, the wild crop, and oil, wine, cumin, almonds, legumes and wheat as examples of cultivated products. Some of these products are only briefly presented here because they have already been discussed in previous chapters. These are introduced in this section to demonstrate the region's potential for producing and exporting different kinds of commodities.

VI.5.2 Sahara products

Cyrenaica may have exported products from the Sahara, such as dates, ivory and slaves, as well as ostriches and ostrich eggs and feathers. For example, Theophrastus (*Hist.Pl.*, II. vi. 2; IV. iii. 5-7) indicated that palm-trees were native to Libya, Egypt and Phoenicia. He explained that these places produced lots of good-quality dates because of their salty soil, which made the dates last longer (App. I. A. 4. 2, 4). Libyan tribes may have sold dates to the Greeks and Romans in Cyrenaica, who then shipped them to other regions. It is important to mention that palm trees were depicted alongside silphium on the Cyrenaican coins in the Hellenistic period (Figure VI.19) (Robinson 1927:61-3). The palm trees were depicted with fruit and as being larger than silphium, which may reflect the economic importance of the dates. Another product from the Sahara which was probably traded is ivory (ἐλέφας). This was reported by Hermippus (*Comic Test. Frag*) in the fifth century BC, and Athenaeus, (*Deipnosophists*, I, 27f) at the end of the 2nd and the beginning of the 3rd century AD (App. I. C.2.1, 2).

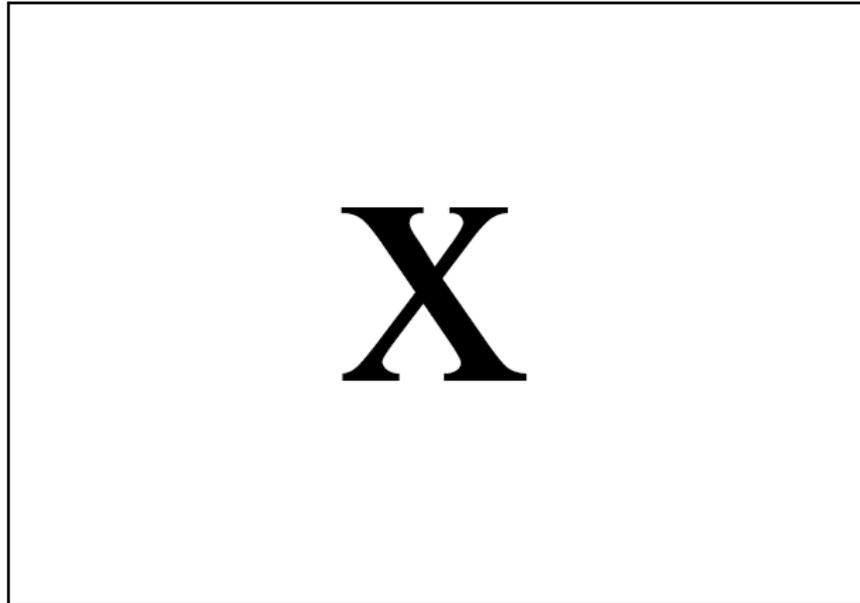


Figure VI.19: Coins from Cyrene dated to the third century BC. Ob. Head of Zeus-Ammon. Re. Palm tree with fruit, silphium and crab (Robinson 1927: 61-63, Pl. XXVI. 2. See also, 1, 3- 14).

Archaeological evidence of Saharan traded commodities dated to the second half of the fifth century has been found in both the temples of Artemis and Apollo, including fragments of ivory and ostrich eggs (Laronde 1987: 208). Furthermore, figures dated to the third/second centuries BC and believed to represent black slaves appeared on a series of painted metopes in a Cyrenian tomb (Laronde 1987: 208; Pacho 1827: 210). These various products suggest that land routes existed between Cyrenaica and the Sahara from the Hellenistic period, or even before via the Libyan tribes and Aujila was probably the gate for this contact, as Laronde suggested (1987: 206, 212 and Figure VI.20). Herodotus (IV, 172) may indicate this when he mentioned that Nasamones used to leave their herds near the sea in the summer, and go to Aujila where there were many palm trees to gather dates. This commercial activity with Fazzan may have increased after the introduction of the camel into Cyrenaica at the end of the first century BC (Coster 1968: 136).

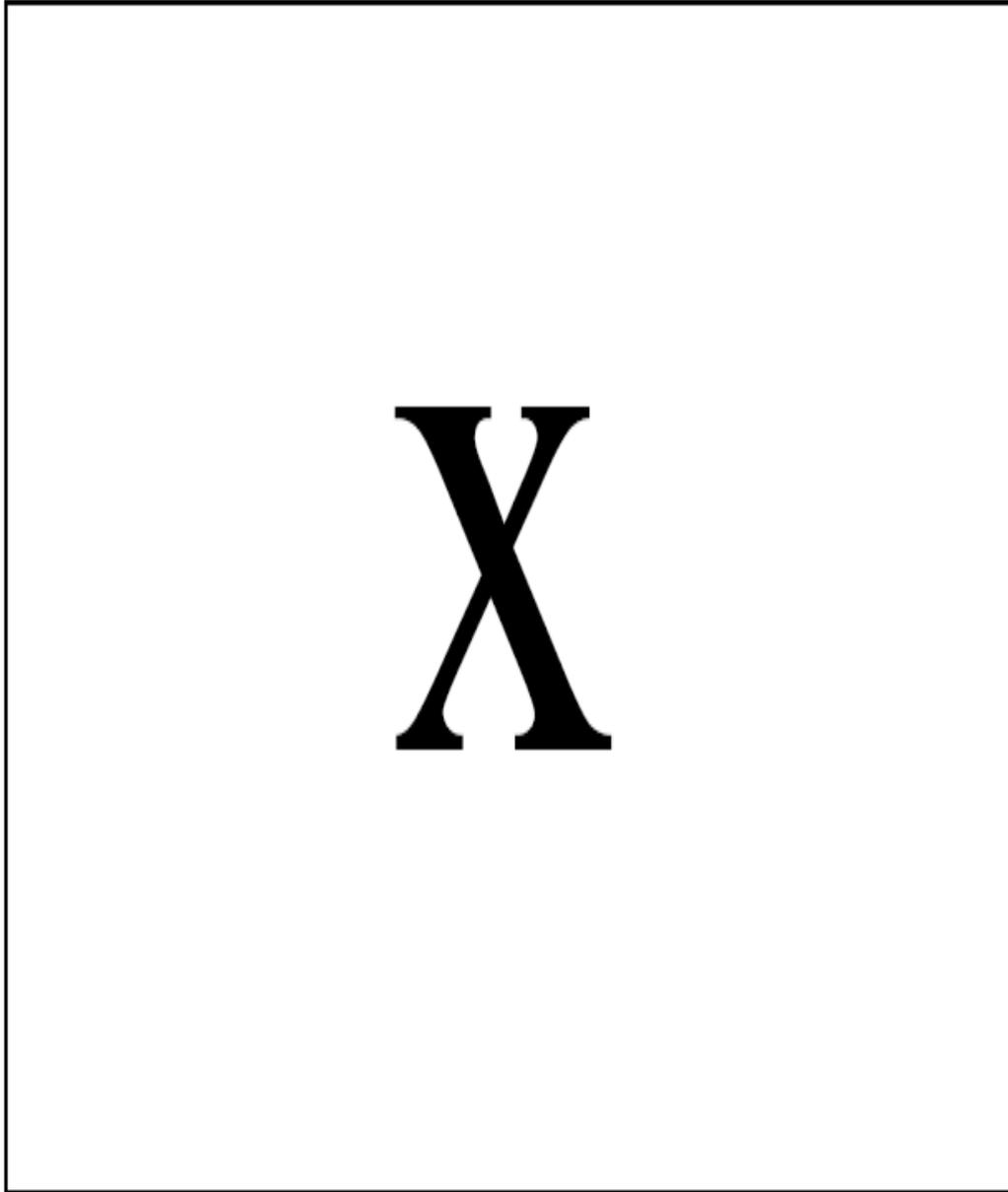


Figure VI.20: Trade routes of Cyrenaica, internal Libya and deep Africa as suggested by Laronde (1987: 212).

VI.5.3 Animals, animal by-products and manufactured items

Animal breeding in Cyrenaica had a high appreciation among many ancient Greek and Roman writers as has been shown in chapters II and V. Horses, cattle, camels, sheep and goats are the most common animal raised in the region over time (see App.I. D.1,2,3). Different animal by-products seem to have been exported from the region and some industrial activities such as textiles were probably based upon them. Coster (1968: 119.n. 68) and Tarn (1927: 205) considered Cyrenaica to have been a woollen cloth or wool exporter. Tarn (1927: 205) during his talk about the main sources of textiles during the

Hellenistic period, mentioned that Aeolis and Cyrenaica were wool producers and Alexandria and Pergamum exported woollen cloth. As the export of sheep and wool from Cyrenaica to Egypt was mentioned by some of Mediaeval writers, it is more likely that these goods were traded between these regions during and after the Hellenistic period (see App.I. D.1.10,11). If so, Cyrenaica was probably one of the most important sources of wool for Egypt.

VI.5.4 Fish industry

Cyrenaicans were perhaps, like other Mediterranean regions, consuming and trading in seafood from at least the Greek era. Athenaeus (*Deipnosophists*, 73) mentioned that Battus IV's (514-470 BC) reign, the new priest of Apollo used to invite the previous ones, in the Artemisian festivals, for a feast including several kinds of sea-fish and pickled fish. These types of fish were probably a local product or may have been a mixture of imported and locally manufactured. It is important to mention that recent archaeological evidence related to fish processing attesting in some coastal sites has indicated a probable large scale of salted fish production (Hesein 2014: 217). These sites located between Apollonia and Ptolemais including *Aptouchou* (Al-hania), *Assa Musa*, *Phycus* (Zawiet el-Hamama), the *Cape of Phycus* (el-Mamluh), and *Kainopolis* (el-Agla) (Hesein 2014: 197) (Figure VI.21).

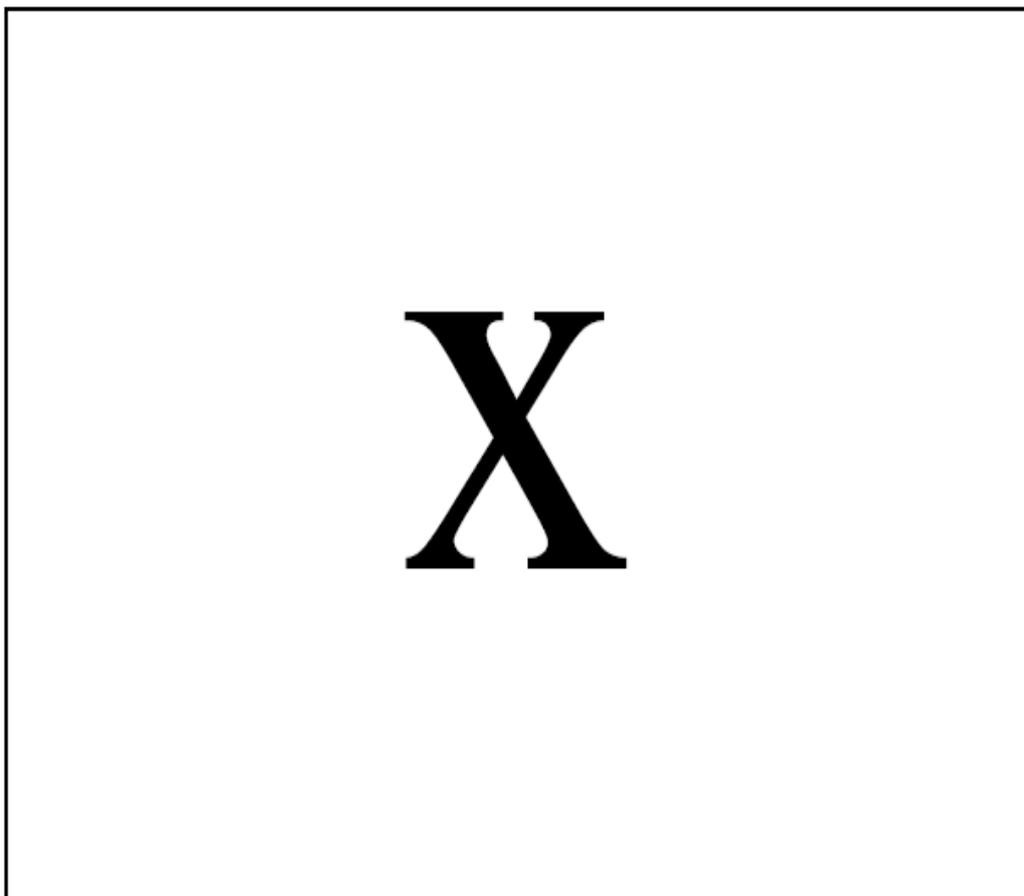


Figure VI.21: Archeological sites represented instalisions related to fish processing (Hesein 2014: 197).

VI.5.5 Wild and Cultivated products

Silphium, as has been discussed in chapter II, was one of the most significant plants traded from Cyrenaica during the Battiad regime. However, during the Hellenistic period silphium had started its decline and this may have lead to the region's governors paying more attention to the growing of and trading in other products. These products are cumin, almonds and a variety of legumes, oil and wine (see chapter II and IV). These were perhaps exported from the region during the Hellenistic period and thereafter. Furthermore, cereals seem to have been the main product exported from Cyrenaica over time. This thesis has argued, in chaper III, that wheat may have become a significant product exported from Cyrenaica during the Hellenistic period and onwards.

VI.6 Cyrenaica's Distinctive Location and the Profits of Exporting Diverse Products

Land transportation cost roughly sixty times as much as sea transport and ten times as much as transport by river (Hopkins 1983: xx)

The data from the last section suggests that Cyrenaica exported various commodities. These may have included silphium, wheat, olive oil, wine, cumin, almonds, legumes, dates, animal and animal by-products (such as leather, feathers, wool and ivory) and manufactured products (including textiles, leather, fish and others). Some of these commodities are regional productions, while others may have brought from the Sahara and re-exported to other Mediterranean regions. This may raise questions about whether the region benefited from the possible combinations of exports to subsidise each other.

The low cost of sea transportation probably explains why Cyrenaica possessed so many harbours during the Hellenistic and early/mid-Roman periods. These harbours and anchorages are clear evidence that maritime routes were the principal lines for the region's commercial connectivity. They also reflect the significance of Cyrenaica's strategic location, which made communication with most of the Mediterranean regions much easier. Cyrenaica was also a bridge between the African Sahara, the Mediterranean world, Tripolitania and the Nile Delta.

Alongside the advantages of sea transportation, which provided cheap access to a wide range of possible destinations, Cyrenaican traders and farmers also likely benefited from export subsidies. In other words, the region's potential for exporting a variety of commodities allows a sufficient technique in which a combination of exports. This allows some products to subsidise others as they are traded for profitable goods. Silphium may have played this role during the Classical and Hellenistic periods. However, the decline in silphium production after this time may have encouraged an increase in production of other commodities to subsidise the transportation costs of agricultural staples. Other products probably took on the role of silphium. For example, one of the *demiourgoi* inscriptions dated to 3/2 centuries BC indicated Cyrenaican wheat cost 6 drachmas per *medimnos*, while soft-shelled almonds were 64 drachmas per *medimnos* and olive oil was 33 drachmas per *smireus* (DMI 20). The cost of transporting wheat may have been subsidised by the revenue of the other two products, because the latter costs were much

higher. The main target of this hypothetical cargo would be wheat and olive oil, but a small quantity of almonds could cover the cost of trading.

This can be true in Cyrenaica in particular, if one bears in mind the appearance of a number of new agricultural products in Cyrene's Hellenistic epigraphic lists. However, the market's prior needs may have been considered. Cereals, olive oil and wine were mainly the most commonly traded products in antiquity. The Cyrenaican traders may benefit from the usual higher prices of some agricultural products such as olive oil to cover the cost of the transportations. The cargo sent from Cyrene to Aquileia in Italy in the second century AD is a good example. It includes about 40 tonnes of cereal and 120 tonnes of olive oil (Scott 1932: 19. 61. Scaevola, *Digest*, Book VII). Although the price of each product is unknown, the price of olive oil was generally higher in ancient times. The volume of cereals in this cargo is quite modest in contrast to that of olive oil. Aquileia mainly seems to have needed olive oil, although a small quantity of cereal was probably added to take advantage of the prior transportation costs.

VI.7 General Conclusion

In conclusion, the data presented in this chapter and the other three indicated that Cyrenaica seems to have traded wild and cultivated plant products in addition to animals and their products in the Hellenistic and early/mid-Roman periods in return for large quantities of imported goods. Exports include silphium, cumin, almonds, different types of pulses and cereals. Wine and olive oil from Cyrenaica may also have been exported locally and provincially. Honey was probably among the commercial commodities that Cyrenaica exchanged over time, if one considers the accounts of medieval Arab travellers, who mentioned its export from Ptolemais to Alexandria on a number of different occasions. Additionally, Cyrenaican horses, sheep and cattle seem to have played an important role in the region's trade. Some animal products were perhaps also sold overseas, in particular ivory, cow leather, wool, ghee and other fat.

The region's productive capacity in varied commercial products was the probable result of Cyrenaica's need to establish a considerable number of harbours. These seem to have played a vital commercial role for connecting the region with the wider Mediterranean world and sometimes to be a bridge between regions.

Chapter VII : Conclusion

VII.1 General Review

Cyrenaica's strategic location meant it enjoyed direct maritime contact with various regions of the ancient Mediterranean, and this helped it to play a significant role in connecting the ancient world. The region's varied land morphology, with its diverse temperatures and annual rain distributions, presented opportunities and constraints to the Greek-Libyan communities and their Roman-Libyan successors. These groups occupied the region for about 14 centuries.

Despite the modest archaeological data and paucity of most studies of the region's economy, this thesis has clearly shown Cyrenaica's economic potential for producing miscellaneous products. Herodotus (IV. 199), Pindar (*Pyth*, IX. 7), Theophrastus (*Hist. Pl.*, VIII. iv. 3), Strabo (XVI. 3. 21) and others highlight the fertility of Cyrenaica's land, and shed light on its high productive capacity for wild and agro-pastoral crops from the fifth century BC to the beginning of the fourth century AD (App. I). The region's economic contribution to the Mediterranean world can be understood from Aeschylus (mid-fifth century BC). Aeschylus (*Supp*, 315) indicates that Libya yielded the largest quantities of crops:

Λιβύη, μέγιστον γῆς <πέδον> καρπουμένη (*Supp. Wom.*, 315).

Libya, the land that produces the largest volume of crops of the earth
(Translation of the *P.D.L.T.* with some changes)

Although Libya (Λιβύη) can refer to the whole of Africa, not just modern Libya or Cyrenaica, the latter was the place in Aeschylus' mind since it was the most productive part of Africa in Greek knowledge and separated from Egypt. But if he means Egypt alone, he would have said Αἴγυπτος. Furthermore, the term Libya is attested in other works contemporary with Aeschylus and clearly refers to Cyrenaica and its productive capacity. For example, Pindar (*Pyth*, IV. 6) says 'Medea asked Battus [The founder of Cyrene] to find a city with fruit-bearing (καρποφόρος) land in Libya, a place favourable for the growth of many crops. This term is a compound adjective structured from 'καρπός' which refers to different types of crops both cultivated and wild, and the suffix 'φόρος', which means 'bearing'.

Some scholars who focus on the region's economic history argue that Cyrene, the region's capital city, reached its peak wealth in the fourth century BC because of silphium. However, in the third and the second centuries BC production of this plant declined and the city lost its economic position, while the economic importance of the coastal cities increased because they possessed ports which enabled them to interact with the Mediterranean world (Coster 1968:405; Chamoux 1985:170). However, the textual data demonstrate that Cyrene, like the coastal cities, kept its economic importance through the Hellenistic and early/mid-Roman periods and the extinction of silphium did not noticeably affect the region's economy. The literary and epigraphic references, dating to the Hellenistic period and after, refer to considerable quantities of different products especially cereals. These are evidence that after silphium had started its decline during the Hellenistic era, the Greco-Libyans and Romano-Libyans heavily exploited the other available economic mainstays to support the region's economy after losing silphium which was a prior commercial product during the Classical era.

This thesis has argued that the main Cyrenaican cities, including Cyrene, Apollonia, Ptolemais, Taucheira (Tocra), Euesperides and Berenice, had the same features as the 'commercial cities' of Weber's ideal type during the Hellenistic and early/mid-Roman periods. This result mainly appeared from the analysis of a combination of direct and implicit epigraphic and literary evidence related to cereal production, horse husbandry, and honorific decrees given to wealthy Cyrenaican citizens by Cyrenaica itself or other regions (Chapters III, V, VI). The Hellenistic grain decree of Cyrene and the Aleximachos decree of Tocra dated to the end of the second or beginning of the first century BC are among the most important examples which indicate the region's commercial connectivity with the other Mediterranean world. The case study which examined grape cultivation and estimated wine production also suggested the creation of a surplus, though it may have been primarily traded locally during the early/mid-Roman periods (Chapter IV). The thesis argues also that wheat was probably the intended product mentioned in the Hellenistic exported consignment and it was the same product which is designated by the word 'σῖτος' in the other textual references (see chapter III).

Different factors seem to have stimulated Cyrenaica to produce and export varied products and, in particular, cereals. The lower capacity for cereal cultivation in other regions, Cyrenaica's location in contrast to other Mediterranean regions which may have

allowed earlier harvests, and the high density of population in other regions such as Attica which opened markets to the Cyrenaican products, all seem to have been factors behind the region's substantial agricultural capacity in the Hellenistic and early/mid-Roman periods. Despite the lack of archaeological evidence, the literary documents and epigraphic data provide evidence that this was the case. Previous researchers have tended to pay insufficient attention to this data. The ancient writers emphasized the region's high potential to yield many different kinds of crops. For instance, Pindar (*Pyth* IV. 6) indicates that Apollo recommended Battus to establish a settlement at 'fruitful Libya', or the fruit-bearing οὐκ ἀποδάμου Απόλλωνος τυχόντος, ἰέρεια χρῆσεν οἰκιστῆρα Βάττον καρποφόρου Λιβύας. Furthermore, Herodotus (IV. 199) states Cyrenaica had three harvests due to the region's diverse land morphology and climate. Strabo (VI. 3. 21) also indicates that Cyrene was a place rich in producing bountiful crops καλλίκαρπος and that was one of the main factors of its prosperity.

These literary indications and others are important evidence that Cyrenaica was well-known throughout the Greek Mediterranean world as a producer of many different goods, including silphium (see App. I. A, B, C). This truth is evident from the products recorded in the list of the *demiourgoi* of the 4th - 2nd centuries BC. These include different types of legumes, almonds, four kinds of grapes, raisins, wine, figs, olives and others (see App. II. A.1- D. 5; Chapters II, I and IV). Additionally, honey, processed fish, textiles, cowhides and other products seem to have contributed to the region's economy. However, cereals, in particular wheat, oil, wine, ovicaprids and horses were likely the most important elements of the Cyrenaican economy.

VII.1.1 Cereals

Cereals appear to have been one of the region's most important products in the proposed period and over time. This was frequently highlighted in both the literary and epigraphic evidence from the Greek and Roman eras (Pindar, *Isthm*, IV. 54; Theophrastus, *Hist.Pl*, VIII. vi. 3, 6; Diodorus, III. 50. 1; *SEG* 9. 2). Furthermore, it was emphasized by a number of medieval Arab writers, such as Al-Idrisi (الإدريسي) (AD 1100-1165: 311-313) and Abu al-Fida (أبو الفدا) (AD 1273- 1331: 149). The region's superabundant production of cereals was also highlighted by both European and Arab travellers prior to the Italian occupation. Hamilton for example reported large-scale cereal exports, and emphasised that their production took place in an area east of Benghazi. Hamilton stated that:

Its [Cyrenaica] crop of cereals...furnished large exports...The soil [in the area east of Benghazi] is a rich loam, yielding without any sort of tilling, abundant harvest of wheat and barley. It seems probable that, if a moderate amount of labour were expended in the husbandry of this country, its ample crops would vie with those of Egypt or Sicily (Hamilton 1856: XX, 167).

The probable factors that made Cyrenaica an excellent producer of cereals were the good quality of its soil along with the particular cultivation methods that the Cyrenaicans used to grow wheat and barley during the Hellenistic and early/mid-Roman periods (see Chapter III and VI). The crops seem to have been cultivated in slightly different ways to those common in the rest of the Mediterranean. These include the use of herds of sheep to fertilise the land in the summer, and lightly ploughing the land when sowing seeds (Hamilton, 1856: 167, 168; Applebaum 1979: 95). These methods are quite different to non-Cyrenaican approaches. This has been understood from Stevens' theory which argues that the decline of the ancient Mediterranean agricultural lands was due to forbidding animals grazing in these lands in the summer (1942, 91, 92, cited in Applebaum 1979: 95). Stewart (2007: 48) referred also to the use of sheep and goats for manuring lands in rural Modern Greece, but in different ways to that of Cyrenaica. Farmers bring herds and let them walk over ploughed and sown lands to fertilise them. However, arable lands in Cyrenaica were (and even are today) manured by these animals before they were ploughed and sown. Furthermore, two factors that perhaps made cereal cultivation in Cyrenaica so successful were the requirement for only light ploughing, and the nature of the soil itself that could produce abundantly without the need for tilling (Chapter III.3.1 and III.3.3).

Another significant reason that probably stimulated the export of cereals from Cyrenaica in the Hellenistic and early/mid-Roman periods was the recurrent shortage of grain in other regions of the Mediterranean. The cereal surplus of 805,000 *medimnoi* which was exported from Cyrene in the Hellenistic period far exceed other quantities recorded in epigraphic evidence relating to other regions (Chapter III.3.4.1.2). The Eleusis inscription indicates the total annual cereal production of Attica at 377,000 *medimnoi*, and that of the dependent territories at 460,850 *medimnoi* of wheat (Garnsey 1988: 98, 99; *IG II²* 1672). Moreover, the shortfall of cereal production in non-Cyrenaican

regions in the period under study, especially the Hellenistic era, is reflected in the notable number of honorific decrees. These written decrees were made and erected to honour benefactors who provided cereals for free or at a reduced price, and sometimes gave money to be used for buying cereals. This evidence indicated that many cities and regions had been receiving donations of grain from individuals, or from other cities or regions. However, the honorific decrees related to Cyrenaica demonstrate the abundant giving of grain to the regional and non-regional cities and, so far, no epigraphic evidence has been found to indicate that Cyrenaica needed to import cereals from these outside regions.

The thesis argues also that the exported cereals' quantity which indicated by the Hellenistic Grain Decree comprised about a quarter or less of the total annual production of Cyrene, and most likely consisted of wheat only (see Chapter III). Therefore, we can conclude that Cyrenaica's reputation for prodigious wheat-bearing was fully deserved. It was capable of producing enormous quantities, far exceeding its own needs and allowing it to profit from wheat exports, especially during periods when there were wheat shortages elsewhere. The argument can be summarised:

- There were grain shortages (in particular of wheat) outside Cyrenaica in many Hellenistic cities and regions.
- There was a noticeable increase in the price of wheat during the third century BC in Cyrenaica in contrast to barley (App. II. C. 2. DMI 25, 18).
- The sequence of barley and wheat was swapped in the *demiourgoi* inscriptions of Cyrene in the fourth, third and second centuries BC. Wheat was subsequently recorded first instead of barley in the Hellenistic inscriptions.
- Quantities/prices of wheat were higher than barley according to two Cyrenean *demiourgoi* inscriptions dated to the second century BC.

The word 'wheat' is used more frequently than 'barley' by literary documents and in more important contexts.

VII.1.2 Olive oil, wine and other agricultural products

Alongside cereals and silphium, Cyrenaica produced a number of different crops including various legumes, fruits and spices. The data discussed in Chapters II indicated the region's concern with cultivating pulses and fruits such as figs, as well as olives from

the fourth century BC. Additionally, other agricultural products appeared in the third century BC, such as almonds.

Cyrenaica seems to have produced its own olive oil from the fourth century BC and wine from the third century BC. This is clear from the *demiourgoi* inscriptions and Greek and Roman literary documents. In addition, the mediaeval narratives highlighted the region's potential for these products. The 120 tonnes of olive oil exported with cereals to Aquileia in Italy in the second century AD, is evidence of existing a surplus of this commodity during the mid-Roman period (App. I. A.2). Furthermore, the French consul's statistics from 1850 report the export of 1,375 tonnes of olive oil to Egypt and Malta alongside various other products from Cyrenaica (Bresson 2011: 89, 90, Wright 1982: 22). This is no surprise, because the vast majority of Cyrenaican lands are suitable for olive cultivation. Olive oil production likely made a significant contribution to the region's economy during the Greek and early/mid-Roman eras. This can be supported by examining the archaeological evidence related to regional oil production (Buzaian forthcoming). The lack of olive oil production from the Italian period onwards in Cyrenaica has been discussed in this thesis. Two interpretations have been advanced to explain the ignorance of olive cultivation: people's tendency to revert to a pattern of a pastoral life, and the abundant animal by-products of butter, ghee and fats. These products were consumed instead of olive oil and they still feature as important ingredients of the peoples' traditional dishes in the region today.

Raisins also seem to have been produced in the region from the fourth century BC, while wine was perhaps produced from the beginning of the third century BC onwards. This is highlighted by a range of archaeological evidence, including epigraphy, artefacts and some architectural elements. Despite the lack of excavations and studies of the available relevant industrial evidence, fairly positive results appeared from the wine production estimation provided in Chapter IV based on textual data gained from the papyrus of Cherronesos (Ras et-Tin) and indicated by the case study area (see Chapter IV). It indicated an average of 2,200 litres of wine was produced per hectare in Cherronesos, and 2,400 litres of wine in the case study area. The potential total wine production capacity of the case study and the rest of the region have been estimated at c.20, 000,000 litres of wine per year. While this quantity could meet the demands of 133,000 inhabitants, the region's total population during the Roman period was

approximately 255,000 people as estimated in this thesis. About 127,000 of these would have been wine-drinkers. A surplus capacity thus seems to have existed in the case study area, at least in some years, and it met perhaps about 65% of the wider region's need. Wine production from the rest of Cyrenaica is likely to have surpassed by 35% the regional consumption, creating the possibility of export capacities by Roman period. Evidence from cities such as Euesperides and Berenice demonstrate a mixture of locally and externally sourced wine (see Chapter VI). These two cities were being supplied with some wine from Cyrenaica in the late Hellenistic and early/mid-Roman periods, based on finds of local amphorae. Regional wine amphora 1 (RBH) found at Euesperides and dated to the Hellenistic period represents about 38% of the total discovered imported amphorae (RBH). Meanwhile in Berenice, wine amphora 1 comprised 20% and 22% respectively of the total Hellenistic and Augustan imported amphorae found in stratified deposits (Göransson 2007: 51, 79; Riley 1979: 119, 403).

VII.1.3 Animal and animal by-products

Cyrene is rich with many sheep (πολύμηλος) (Pindar, *Pyth.* IX. 7); Libya is the nurse of sheep or sheep-feeding (μηλοτρόφος) (Herodotus IV.155, 157); Cyrene is rearing horses (ἵπποτρόφος) (Strabo, XVII. 21); Libya, the horse-nourishing or the pasture-land of horses (ἵπποβότου Λιβύης) (Oppian, *Cyneg.* II. 253).

Many different kinds of animals seem to have been raised in Cyrenaica during the Hellenistic and early/mid-Roman periods. These included cattle, pigs, donkeys, camels, ovicaprids (sheep and goats), ostriches and horses. Sheep were among the best-known animals in the region, and seem to have significantly contributed to the region's economy in both the past and the present (see Chapter II). They were an essential part of the region's socio-cultural traditions of transhumance used in its agro-pastoralism. They were used to manure the region's agricultural lands during the summer. Sheep and goats were probably the most important animals to be consumed in the region, as can be understood from the faunal remains representing this animal at Berenice (see Figure II.14 and Table II.4).

Additionally, the region may have benefited from sheep and goat by-products. Wool or textiles, garments, may have been locally manufactured and then exported. Murex shells, used for purple dye production and loom weights, have been found at

Cherronesos, Euesperides and Tocra. These suggest that wool was locally produced, and that woollen cloths were probably among the commodities exported from the region from the Hellenistic period (Buzaian 2000; Riley 1979: 316, 17, Hesein 2014: 219; Ahmed Buzaian, pers. comm.). A copy of Diocletian's Price-Edict found at Ptolemais also indicates manufactured carpets and varied kinds of garments with different prices (Caputo and Goodchild 1955: 106-15). Although this copy was not issued in particular for Cyrenaica, it confirms that the region was part of Roman commercial world in which textiles played a significant part.

Furthermore, the textual references of Arab travellers during the second Ottoman era referred to the export of sheep tails from the region to Tripoli, Tunisia to Alexandria and Italy (see Chapter II). The spread of sheep husbandry across Cyrenaica during the Hellenistic early/mid-Roman epochs may have allowed the spread of wool production. If so, this can be seen as a sign of the development of craft production in the major cities, such as Euesperides and Tocra, in addition to small towns such as Cherronesos. If this hypothesis is correct, it is possible to equate with one of Hopkins' (1980, 1983: xv-xxi, 2002: 190-230) growth features entitled the 'Spread of craft production'. Sheep breeding continues to be one of the main economic activities in the region today.

In addition, horses appear to have made an important contribution to the economy of Cyrenaica. They kept their association with the nobility in both the Hellenistic and early/mid-Roman periods. This is reflected by their use in entertainment, as demonstrated by the relevant literary and epigraphic data. The clear presentation of the horse in the equestrian practices of the Cyrenaican ephebes is a significant indication of the importance of this animal in the region. The noticeable achievements of the Cyrenaican horses and chariots in the Greek and Roman Panathenaic Games were probably a result of the excellent training that they received from the region's ephebic institutions.

The literary textual data also highlights the importance of horse breeding at Cyrenaica. These data represent the horse using different themes. Alongside the unquestionable figure of the Cyrenaican *quadriga* making its distinctive contribution to the Greek and Roman games, another significant theme was the economic value of the horse (see figure V.7 and App. I. D. 3. 20). This theme focused on the region's potential for producing considerable numbers of good-quality horses. Oppian's (*Cyneg.* II. 253) description of Libya as 'horse-nourishing' (ἵπποβότου Λιβύης) is clear proof of this.

Strabo (XVII. 21) also emphasised this when he reported that Cyrene possessed excellent soil which was especially suitable for breeding horses and cultivating fine crops, and regarded this as the reason behind the city prosperity. Regional concern with breeding this costly animal may be an indication of its importance as an export. Hyginus (*Astronomia*, II. 24) frequently stated that some authors, including Callimachus, reported that Berenice II (c. 266 - 221 BC) was interested in raising horses, and used to send them to Olympia.

VII.2 Trade

Cyrenaica's commercial interactions were examined in Chapter VI. The investigation included a number of harbours indicated by the ancient writers Herodotus, Pseudo-Skylax, Strabo and the *Stadiasmus*. Except for Herodotus these were all geographers, and some of the sources distinguish between types of site located on the coast of Cyrenaica in different periods. The thesis has highlighted the existence of nine large ports and three anchorages, as mentioned by Herodotus and Pseudo-Skylax in the fifth and fourth centuries BC (see Figure VI.1). However, the number of harbours and anchorages had clearly increased during the Roman period.

Interestingly, the *Stadiasmus* reports numerous maritime points of interest on the Marmarican coastline between *Catabathmos* (Κατάβαθος) Sallum and *Cherronesos* (Χερρόνησος) Ras al-Teen (see Figure VI.2 and Table VI.3). These include six ports, five anchorages and about seven settlements. The terrain in this area is not as fertile as that of around Cyrene or the rest of the Cyrenaican coastal lands, and it has a lower inhabitant density than Cyrenaica even today. This thesis therefore argues that the extent of the harbours, anchorages and settlements along the coast towards Egypt suggests the presence of active maritime links between Egypt and Cyrenaica after the time of Strabo. It also concurs with Purcaro Pagano's argument that Egypt-Cyrenaica-Crete-Peloponnese was one of the region's main maritime routes (cited in Riley 1979: 405), although he dated it back to the fourth century BC. The difficulty in sailing from Egypt to Cyrenaica is still a controversial matter between a number of modern scholars (Göransson 2007: 229; Fulford 1989; Hesein 2014: 338). These scholars suggested the ships came from Egypt to Cyrenaica via Crete. However, Strabo (XVII. 22) mentioned that sailing along the Cyrenean shore from Apollonia to *Catabathmos* was not easy, and listed logistical reasons which included the scarcity of ports, anchorages, settlements and water resources.

μετὰ δὲ τὴν Ἀπολλωνίαν ἐστὶν ἡ λοιπὴ τῶν Κυρηναίων παραλία μέχρι Καταβαθμοῦ σταδίων δισχιλίων διακοσίων, οὐ πάνυ εὐπανάπλους; καὶ γὰρ λιμένες ὀλίγοι καὶ ὕφορμοι καὶ κατοικίαι καὶ ὕδρεϊα (Strabo XII. 22).

After Apollonia is the rest of the sea-coast of the Cyreneans which extended up to Catabathmus for two thousand and two hundred stadia; but sailing beside it is not easy, because harbours, anchorages, habitations and places to supply water are few.

This account highlights lack of facilities rather than navigational problems related to currents or prevailing winds. In other words, the coastal voyage, though difficult, was practised as Pseudo-Skylax also implies by narrating a continuous voyage westwards.

Additionally, to assess whether people from the region were involved in trade with the Mediterranean world, Chapter VI examined epigraphic data to highlight some possible names of Cyrenaican merchants who were honoured by the region or by others. The evidence suggests the involvement of Cyrenaican citizens in the Mediterranean commercial network from the fifth century BC. This project argues that these individuals were most likely cereal traders, because the vast majority of the honorific individual decrees granted during the Greek and Roman periods were given to those who donated cereals or money to a city or community.

Regarding Cyrenaica's maritime interactions, this thesis has investigated coarse and fine pottery in addition to marble as examples of traceable articles which may reflect the region's imports in the Greek and Roman eras. This project has also examined the products which were likely exported from the region based on textual data. It appears that Cyrenaica maintained its commercial maritime connections with Attica and Peloponnesus, as well as the Aegean and Cycladic islands. Cyrenaica opened new routes with the West during the Hellenistic period, which saw the importation of fine ware from Campania. Imports from both West and East clearly increased in the early Roman period. The large quantities of Italian Sigillata and Eastern Sigillata A and B wares found at Berenice and Ptolemais are clear evidence of this (see figures V. 10, 11, 13, 14 and tables V.9, 11). Although the Hellenistic Eastern Sigillata A (ESA) was found at Berenice, it was most common in the early Roman period.

The Cyrenaican cities seem to have also traded with their neighbours in the west, especially Tunisia, Tripolitania and the African Sahara from the Hellenistic period. The literary sources suggest Cyrenaica exported ivory, which would have come from the Sahara (Hermippus, *Comic Test. Frag.*; Athenaeus, *Deipnosophists*, I, 27f; App. I. C.2). Laronde (1987: 212) suggested trade routes linked Cyrenaica with the Libyan interior and deep African Sahara through Aujila (see figure V.20). The cities located on the coast perhaps played an important role in transporting goods between the various Mediterranean regions in the East and West and linked them with the African Sahara.

My investigation of Cyrenaica's economy finds that in all periods, level of imports indicates the export of an equivalent value of commodities. Silphium, which was probably extinct in the 1st centuries BC/AD, was probably one of the most significant goods exported during the Hellenistic period. However, other miscellaneous products were probably exported from the region in both the Hellenistic and early/mid-Roman epochs. These likely included wheat, olive oil, pulses, cumin, almonds, figs, raisins, wine, honey, ivory, dates, slaves, animals (in particular sheep, goats, horses, cattle and ostriches) and animal by-products including wool, animal fat (from both sheep and cattle), ghee, leather, feathers, cowhides and tiger skins. In addition, Cyrenaica may have exported some manufactured items, such as purple dye, textiles, leather goods and processed fish.

Despite uncertainties in the evidence as regard quantities produced, these imports and exports confirm the region's high productive capacity and active commerce in the period under study. One may therefore suggest with some confidence that large numbers of harbours and anchorages on the region's coast were the result of these notable activities. It is also reasonable to argue that the economic growth figure suggested for Berenice in the early/mid-Roman period also applied to the other Cyrenaican cities. The archaeological data from this period indicates imports into Berenice were increasing, including local and inter-regional fine and coarse pottery. The imported items reveal the area had commercial connections with a number of different new markets. In addition, increasing quantities of animal bones were found in the city in this period (Table II.4; Figure II.14). An increase in Berenice's demand for imported commodities and animals for consumption suggests the city's population was growing, and this may be a sign of its economic growth in the early and mid-Roman periods. This thesis has suggested that

other Cyrenaican cities probably experienced economic growth across the rest of this period by examining the materials used for engraving funeral and ephebic inscriptions in Cyrene as examples of the use of marble in the epigraphy. The investigation has indicated increasing numbers of marble panels used for engraving both funeral and ephebic inscriptions during the early/mid-Roman period in Cyrene (Figures VI.17, 18).

Additionally, recommending the use of a particular kind of marble, such as Parian, for inscribing an honour or making a statue for a person is another important sign of the economic level of a city or region. This demonstrates that people in this place were concerned about the use of good-quality marble. Even if one assumes that some of these panels were reused, the use of marble at all is a sign of economic prosperity (*IRCyr.* C.115, 126.1, 133; Reynolds 2000: 555). The increase in the numbers of ephebes at Cyrene, for example, as some lists demonstrated, should also be considered. This is because practising this activity was expensive, and from the beginning of the Hellenistic period was paid for privately.

VII.3 Were Libya and Cyrenaica the Same Place in the Ancient Literary Sources.

The ancient sources highlighted different economic resources in Libya/Cyrenaica during the Hellenistic and early/mid-Roman periods. These resources included fertile lands, abundant crops along with a great quantity of animals of quality. However, some of these assertions are ambiguous because they do not mention Cyrenaica directly, but refer to Libya in general. For example, Callimachus, *Hymn*, II. 65, Lucanus, *Pharsalia*, III. 1, Strabo, XVII. 19, Theophrastus, *Hist. Pl*, VIII. iv. 3 (see App. I. A.1.10, 14, 23; D. 3. 16). Nevertheless, it is possible to argue that in most of these cases ‘Cyrenaica’ was meant, with ‘Libya’ used as a synonym. A key argument is that Cyrenaica was the only part of Africa known to the Greeks. Herodotus is probably the best example. He mentions that Libya is sheep-feeding (μηλοτρόφος) (Herodotus IV.155, 157). However, it is clear that here he refers to Cyrenaica because he already devoted his fourth book, where this phrase come from, to highlight the history of Cyrenaica. Another matter to bear in mind that is some writers mention ‘Libya’ but in association with key words that relate directly to Cyrenaica. These could refer to places located in Cyrenaica or a person’s name associated with this region. For instance, Polybius (V.65. 5, 6) during his description of the Ptolemaic army, which was prepared for the battle of Rhabia in 217 BC, mentions the presence of cavalry and infantrymen from Libya (see chapter V). Although he did not

mention Cyrenaica he indicated that the leader of the Libyan infantry was from Barce. Moreover, Cyrenaica was already politically linked with Egypt at this time.

Additionally, some other literary references which mention Libya include information related to Cyrenaica and these were known from epigraphic evidence. In the second century BC, Aristides, *Παναθηναϊκός*, Vol. I. 188. 12 (App. I. A.1.16), refers to the cult of Demeter Libyssa in Argos and confirms that it was established because of the wheat the city received from Libya during the time of a famine. According to the Grain decree of Cyrene, Argos was among the Greek cities which were supplied with sizable volume of cereals at the beginning of the Hellenistic period during the food shortage (see chapter III). Thus, Libya which was considered by many literary sources as a fertile place, a producer of varied agricultural products and animal husbandry, usually means Cyrenaica. These literary references seem to have represented a real indication of the region's excellent in economic potential as has been shown by the varied data discussed in chapters II-VI.

VII.4 Final conclusions: the nature of Cyrenaican economy in the Hellenistic and early/mid-Roman

One of the aims of this project is to use different types of evidence to assess the economic nature of the ancient Cyrenaican cities during the Hellenistic and early/mid-Roman periods, and in particular to test the assumption often based on literary sources that Cyrenaica was especially fertile and therefore primarily agricultural in its outlook.

The evidence analysed in this dissertation suggested ancient Cyrenaica was indeed very fertile. As well as supporting a wide range of crops, wild plants, and animals throughout antiquity (Chapter II), Cyrenaica was an especially strong producer of grains (especially wheat) from the Hellenistic period onwards (Chapter III), of vine products from the early Roman period onwards (Chapter IV), and seems to have been particularly successful at horse-rearing throughout antiquity (Chapter V). This evidence does not imply, however, that the Cyrenaican economy was dominated by agriculture or by these three sectors. Instead, the evidence suggests that Cyrenaican cities demonstrated had some characteristics of the commercial city models, with a mixed and diversified economy

The clearest indication of this is the strong evidence for the export of a range of goods, to include cereals (probably wheat), olive oil and other animal products (see Chapters II-VI).

The main coastal Cyrenaican cities and some small towns perhaps therefore conform to Weber's commercial city model (for which, see Chapter I.2).

The valuable imported traced items such as pottery and marble, and the textual references to exporting cereals, olive oil, animal and their by-product, though some of them report small quantities or without indication of the exact amount, confirm the region's cities important commercial role over time. Some of the textual data explicitly mentioned the names of some cities in a commercial context. Cyrene, Ptolemais, Tocra and Berenice are examples (Abu al-Fida 'ابو الفدا' 1273-1331: 149; Al- Aiashe 'العياشي' 1661-63: 201; Scaevola, Digest, 19. 2. 61. 1.VII; *SEG* 9. 2; *SEG* 26. 1817; Synesius, *Letter*, 134).

The textual evidence also indicates the involvement of a number of small-town anchorages in commercial activities. For instance, Pseudo-Skylax describes *Naustathmos* (Ναυστάθμος), the modern Ras al Hilal, as a harbour (108; Shipley 2011: 47, 80) in the fourth century BC. Strabo (XVII. 22) supported this by stating that it was a well-known place on the Cyrenaican shore, probably due to its commercial function. Other important examples are two anchorages reported by the *Stadiasmus*. These are *Patrachus* (Πάτρακος) and *Sidonia* (Σιδωνία), which were located in Marmarica around Platea (Πλατέα) (Chapter VI. Figure 2 and Table 3). The *Stadiasmus* describes the former as a summer station for ships, and the latter as a place where loads were carried from it in the summer as well. Other anchorages were also involved in trade, which has been confirmed from their location in industrial areas. The *Cape of Phycus* (Φῦκος ἄκρα (el-Mamluh), *Mahel Mael* and *Aptouchou* are the most interesting examples (Hesein 2014: 178-181, 268). Ten amphora kilns and other fish-processing and wine-making features dated to the mid-Roman period have been recently discovered in these sites. They are also located in the selected case study area in this project, which shows a clear presence of different industrial installations of wine production and some of the have not published yet (App. III. A, B).

This thesis argues that the general social and institutional conditions of the Cyrenaican societies reflect a good economic level of life at the region's cities in most of the study periods. This is based on an investigation of the horse's economic value via its involvement in the Cyrenaican institutions of the army and ephebate. The relationship between the economy and the institutions was considered by Bresson (2016:15, 16, 170) as one of the significant economic feature of any society.

A combination of different aspects may have featured in and contributed to Cyrenaica's economy. Meikle (1995, 2002: 233) stated that 'use value' (resale goods) was a significant factor that contributed to the development of the ancient economy. The Cyrenaican cities may have profited from reselling commodities bought from the African Sahara, including ivory, slaves, and ostrich eggs and feathers (see Chapter VI).

In addition, some of Hopkins' features which associated with economic growth are visible in the region, at least in the second century AD. Hopkins (1980, 1983: xv-xxi, 2002: 190 - 230) underlined seven features that may represent economic growth: tax collecting, inter-regional exchange growth, increasing population, increasing demand, spread of craft production, average per capita production, and improving the manner of work. The first four of these seven points are reflected in the textual and archaeological data of Cyrenaica (see Chapters II, III and VI).

Two further sources of evidence suggest economic growth and prosperity at Cyrenaica. These can be added to the list assembled by Hopkins and applied to other ancient places. Using expensive imported materials is an important factor which could represent this. The use of marble in Cyrene's ephebic and funerary inscriptions is a good illustration of this (see Chapter VI). The other suggested aspect is the increase in the number of harbours, anchorages and coastal settlements over time. The testimony of ancient geographers related to Cyrenaica demonstrates a rise in the number of these nautical facilities over time, especially from the second century BC (Chapter VI.2.1). This suggests the region was involved in active maritime commerce with many different regions throughout the Mediterranean basin. This growth probably mirrors the region's agro-pastoral potential for the production and export of different goods instead of silphium, if one bears in mind the fact that silphium was extinct from the 1st centuries BC/AD. The appearance of considerable number of Roman kilns in both Cyrenaica and Marmarica and the Roman policy of restoring agricultural lands as displayed by many

boundary stones which mostly are dated to the first century AD, are important archaeological evidence of possessing the region different resources which could make an economic growth without silphium. This may diverge from the general belief that the great wealth and prosperity that the region enjoyed was mainly due to the silphium trade (Chamoux 1985: 170).

Finally, in this thesis, I confidently indicate that there are valuable and varied data representing the economy of Cyrenaica over time. They include direct and indirect textual references (literary sources and epigraphic evidence) and other different archaeological evidence (see chapter II.1). This diversity allowed me to compile information about the main economic mainstays of Cyrenaica and to build a clear picture of the region's general economic condition in different periods. The importance of the various kinds of data lies in allowing us to cover each period with a special source of information.

VII.5 Recommendation for further work:

- The majority of Greek and Hellenistic inscriptions were inscribed on marble. Examining the types of marble used could thus shed light on the region's commercial contact in these periods, because this material was imported into Cyrenaica.
- Much concern should be given to the epigraphic evidence in particular those associated with honouring people. This is because they are significant source of information could include direct or indirect hints to the region economy and its relationship with others.
- Some products that may have been exported from Cyrenaica in antiquity require more investigation in the future. These goods include almonds, legumes, honey, animal products including leather, butter, ghee, wool and ivory, and others. This can be implemented by examining the relevant textual evidence that represents the region's produced and traded commodities over time. Additionally, the present Libyan government should raise the Cyrenaican farmers' awareness of the economic importance of these products and it should encourage and support these agro-pastoral enterprises to contribute to the region's current economy.
- Amphorae imported into the other region cities require similar quantitative and qualitative studies to that of Euesperides and Berenice. Amphorae of those two cities indicated that wine was the main needed product in most of its time and

olive oil was needed in sometimes. Therefore, examining amphorae will shed more light on the region's probable imported products and its commercial interactions.

- Archaeological investigation of wine and oil production facilities can shed light on the scale of their production. For wine, this thesis has provided lists of published and [unpublished] different industrial installations of wine production from different parts of the region (App. III. A, B). This data could be used in further research to assess whether some Cyrenaican cities may represent features of a producer city alongside the commercial role.
- The countryside around the Cyrenaican cities is important as it could provide more archaeological and textual evidence relating to the region's productive capacity. These areas should thus be one of the main targets of any future excavations.
- Assessing the region's productive capacity and whether there was some surplus of any product would be difficult if the approximate number of its population has not been confirmed yet. So far, there have been some attempts to approximate the size of the population of the main cities in the Roman period. However, the population numbers of the rural areas in this period and others have been neglected. Although this thesis has approximated those who populated the rural areas in the Roman period, more research in this field is still needed. Implementing extensive and intensive surveys in some chosen areas, as case studies, will probably help in approximating the number of the settlements and their sizes, and this would provide a probable figure of the region's inhabitants during the Roman period. The Roman visual remains spread in the region are a good leader for implementing such a work.
- Further research is needed to understand to what extent economic development in Cyrenaica was the result of internal processes or external 'pull' factors.
- Reinvestigation of the Egyptian Greek textual data including the papyri and the epigraphy to assess whether Cyrenaican cereals comprised a portion of the quantities exported from Egypt to other regions during the Greek and Roman periods. This question has been raised for the reasons outlined below.
 1. Cyrenaica was politically linked with Egypt for most of the Greek and Roman periods.

2. Abu al-Fida ‘أبو الفداء’ (AD 1273- 1331:149) reports exporting barley and honey from the port of Ptolemais to Alexandria.
3. French consul statistics from AD 1850 indicate the export of 21,270 tonnes of cereals and various other products from Cyrenaica to Egypt and Malta.
4. Herodotus (III. 91, 92) discussed the *talents* in silver paid as annual tribute to the Persian king ‘Darius’ (549-486 BCE) by seven regions. The highest value was paid by Egypt and Cyrenaica at 700 *talents*. This was from unidentified income in silver from the fish of the lake Moeris alongside 120,000 *talents* of cereal gained from Egypt and Cyrenaica. The writer here frequently states that the cereal volume was from both Egypt and Cyrenaica. The amount of 120,000 *talents* comprises a mere 3,288 tonnes ($120,000 \times 27.40 \text{ kg} \div 1000$) of cereal. Whatever portion was provided by Cyrenaica, this quantity is very small in contrast to that exported from the region in the Hellenistic (22,057 tonnes) period or that of AD 1850 (21,270 tonnes). The value of Herodotus’ hint lies in specifying Cyrene and Barce when he mentions Cyrenaica and these two cities are still producers of cereals at the present time, especially wheat. Furthermore, this questionable matter calls to mind a question about the type of goods which were probably exchanged between Cyrenaica and Egypt in the second century AD, where active maritime links between them was confirmed by the reference of *Stadiasmus*.

Part II

Appendices and Bibliography

Part II: Appendices

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

I. A. Cultivated Crops A. 1. Cereal

N.	Ancient Sources	Context	Date
A.1.1	Pindar, <i>Isthm</i> , IV. 54	He describes the area around Cyrene as a wheat-bearing (πυροφόρον).	474/3 BC
A.1.2	Pindar, <i>Pyth</i> , IX. 7	Apollon makes Cyrene the controller of the land, which is rich in sheep (πολυμήλου) and crops (πολυκαρποτάτας). Cereals certainly were among the desired crops in this regard.	474 BC
A.1.3	Pindar, <i>Pyth</i> , IV. 6	Medea asked Battus to find a city in Libya - the fruit-bearing land (καρποφόρος).	462 BC
A.1.4	Aeschylus, <i>Supp</i> , 315	Libya produces the largest amount of crops (καρπουμένη) in the whole world. Although the term (καρπός) refers to any harvest of fruit or field of vine, cereals must be included.	Mid 5 th cen. BC
A.1.5	Athenaeus, <i>Deipnosophists</i> , 73	In the reign of Battus IV (514-470 BC), the new priest of Apollo invites the previous ones to the Artemisian festival, and makes a big meal which includes different types of bread.	End of 2 nd / beginning of 3 rd cen. AD
A.1.6	Herodotus, IV. 198	The land of Euesperides is one of two fertile parts in Libya, its production of grain is considerable.	Late 5 th cen. BC
A.1.7	Herodotus, IV. 199	In the upper part of Libya, in particular at the region of Cyrenaica, there are three harvesting seasons. The people firstly pick up the yield of the coastal area, and then they pick up the crops in the upper area or the plateau of Cyrenaica. Finally, after consuming these crops they gather their production from the highest land. Thus, the length of the harvest season continues for 8 months.	Late 5 th cen. BC
A.1.8	Herodotus, III. 91.2, 3	Cyrenaica and Egypt paid seven-hundred <i>talents</i> of silver and 120,000 thousand <i>talents</i> of cereals as a tribute to Darius, the Persian king. This is the highest amount that was paid among seven subject territories Cyrenaica and Egypt are the only terrains that the writer identifies in which the cereal was the source of this monetary amount of the tribute.	Late 5 th cen. BC
A.1.9	Thucydides, <i>Pelop</i> , IV. 53	The Athenians captured Kythera because it was a landing place for merchant ships coming from Egypt and Libya. Cereals were certainly the shipping consignment known at that time.	2 nd half of the 5 th cen. BC

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	The date
A.1.10	Theophrastus, <i>Hist. Pl</i> , VIII. iv. 3	The writer specifies six types of wheat which were known during his time, each one taking its name from the area where it was cultivated. He mentions Libyan wheat and provides a description as to some of its features.	2 nd half of the 4 th cen. BC
A.1.11	Theophrastus, <i>Hist.Pl</i> , VIII. vi. 5	Barley can be negatively affected by heavy rain.	2 nd half of the 4 th cen. BC
A.1.12	Theophrastus, <i>Hist.Pl</i> , VIII. vi. 6	During his talk about pulses and cereals, he mentions that in the places where there is scarce or little rainfall, the dews are sufficient to feed the cereals. The area around Cyrene and Euesperides are among the mentioned examples.	2 nd half of the 4 th cen. BC
A.1.13	Theophrastus, <i>Hist.Pl</i> , VIII. x.4	He mentions that grubs sometimes eat root or hulk of wheat as is the case in Libya and Lelanton (in Euboea).	2 nd half of the 4 th cen. BC
A.1.14	Callimachus, <i>Hymn</i> , II. 65	The poet was proud of his city Cyrene. This appears from his talk about Battus when he says: ‘who is from my city of the productive soil’. Because Silphium does not grow around Cyrene, and the writer mentions Demeter in another Ode, describing her as ‘provider of much cereal’, I suggest that cereal should be one of Cyrene’s productions.	c. 310/05-240 BC
A.1.15	Callimachus, <i>Hymn</i> , VI. 1, 2	He describes Demeter as the ‘provider of much grain’. This can be implicitly understood from the word <i>πολυμέδιμνε</i> which means ‘much <i>medimnoi</i> ’. This word was given during his description of a festival at Cyrene where women celebrate this Goddess.	c. 310/05-240 BC
A.1.16	Aristides, <i>Παναθηναϊκός</i> , Vol. I. 188. 12 (Reimer 1829: 321, 322)	People in Argos set up a cult for Demeter Libyssa in memory of the wheat ordered from Libya at a time of famine.	2 nd BC
A.1.17	Strabo, XVI. 3. 21	According to Strabo, having a good crop (<i>καλλίκαρπος</i>) is one of the main factors of Cyrene’s prosperity. He sheds light also on the horses and the fertile lands of Cyrene. From the context cereals are the most logical crop referred to.	Late 1 st cen. BC or early 1 st AD (He describes Callimachus’s time in c. 310/05-240 BC)
A.1.18	Diodorus Siculus, III. 50.1	The land near Cyrene is fertile and produces several types of products alongside grain (most likely wheat)	1 st cen. BC

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
A.1.19	Caesar, <i>Civil War</i> , III. 3	From different countries namely Thessaly, Asia, Egypt, Crete and Cyrene, Pompeius gains huge amounts of corn to support his fighters during his struggle against Caesar.	1 st cen. BC
A.1.20	Quintus Horatius Flaccus, <i>Carmina</i> , <i>Poem</i> I.1	When the poet talked about one of the Libyan competitors in the Olympic games he said: "...if his granary has stored away of the entire yield of Libya's thousand threshing floors ..." He implicitly refers to all of Libya's rich harvest of cereal.	1 st cen. BC
A.1.21	Pliny, <i>NH</i> , V. 5 (33)	The area around Cyrene, which is situated 15 miles (c. 20 km) inland from the sea coast, is suitable for cultivating trees. The land found thirty miles away is good for growing cereals.	1 st cen. AD
A.1.22	Pliny, <i>NH</i> , XVIII. 50	Pliny explains different methods that were required for planting cereals and legumes in many places, but he excludes Cyrene and Bactria where these crops do not need any care after sowing the seeds. Farmers, however, come to collect the harvest only. He considers the warm weather with the dew and the dry soil to be the main features which allow a better and easier cultivation of cereals.	1 st cen. AD
A.1.23	Lucanus, <i>Pharsalia</i> , III. 1	The writer reports that Libya, where the soil is fertile, was one of the granaries of Rome at Caesar time.	1 st cen. AD (Caesar 100-44 BC)
A.1.24	Scaevola, <i>Digest</i> , 19.2.61.1. VII. Transferred in Digest of Justinian. XIX.	It was reported that a cargo of cereal and olive oil was exported from Cyrene to the Italian city of Aquileia. The cereal volume was 8,000 <i>modii</i> (c. 36 tonnes of barley or c.40 tonnes of wheat).	2 nd cen. AD
A.1.25	Synesius, <i>Letter</i> , 148	He comments on use of wheat for making cake in Cyrenaica.	AD 408
A.1.26	<i>Expositio Totius Mundi et Gentium</i> , LXII	Grain and horses are essential products of Cyrenaica.	Mid 4 th cen. AD
A.1.27	Al-Idrisi (الإدريسي), (1100-1165: 311-313)	Little wheat and much barley and legume alongside other grains were cultivated around Ajdabia	AD 1100-1165
A.1.28	Abu al-Fida (ابوالفدا), (1850: 149)	Barley and honey were exported from the port of Tolmeita to Alexandria.	AD 1273-1331

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
A.1.29	Beechey, F. W. and H. W. (1828-2: 548)	They visited building remains located in a field cultivated with wheat, in the area between Cyrene and al-Merj. According to them, the owner was very angry because they caused harm to the crop which was an important matter for him.	AD 1828
A.1.30	French consul statistics	These statistics record the export of 21,270 tonnes of cereals and various other products from Cyrenaica to Egypt and to Malta.	AD 1850
A.1.31	Hamilton, <i>Wandering in North Africa</i> (1856: XX, 167, 168, 176)	The grain production of Cyrenaica was as valuable as it was in Sicily and Mauritius. The scale of export was considerable for this product. He also reports high cereal productivity in the lands located to the east of Benghazi.	AD 1856
A.1.32	Hamilton, <i>Wandering in North Africa</i> (1856: 82)	He describes a view of threshing cereals. The inhabitants use six oxen in this operation.	AD 1856
A.1.33	Hamilton, <i>Wandering in North Africa</i> (1856: 176)	He mentions an exchange between cereals from Cyrenaica and dates from Jalo and Ajdabia.	AD 1856

Note: Athenaeus' indication counted to the 5th century BC, Strabo's indications counted to the 3rd century BC, and that of Lucanus counted to Caesar's period (100-44 BC).

I. A. 2. Olives and Oleves oil

N.	Ancient Sources	Context	Date
A.2.1	Pseudo-Skylax, <i>Periplus</i> , 108	He describes some trees in a garden near Euesperides. Olive trees, cultivated (ἐλαία) and wild (κότινοι), were among them.	Mid 4 th cen. BC
A.2.2	Theophrastus, <i>Hist.Pl.</i> IV. iii.1	Olive trees grow in Cyrenaica and the oil is the greatest (πλεῖστος).	2 nd half of the 4 th cen. BC
A.2.3	Diodorus Siculus, XIII. 81. 5	He stated that the Agrigento in Sicily exported their wine and oil production to Carthage and Libya. He mentions also that the Agrigento gained their prosperity from the wealth of Libya. The writer talks about the period of the 3 rd /2 nd centuries BC in this context. However, we are not sure that Libya here refers to Cyrenaica	1 st cen. BC
A.2.4	Diodorus Siculus, III. 50. 1	Large areas around Cyrene were cultivated with olives and vineyards, and both alongside wheat.	1 st cen. BC

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
A.2.5	Diodorus Siculus, IV. 81.1	He says that the God of agriculture, Aristaeus, the son of Apollo and Cyrene was born in Libya and sent to Thebes in Boeotia to be the first person instructed in the basic skills of bee-keeping, cheese-making and growing olive trees.	1 st cen. BC
A.2.6	Pliny, <i>NH</i> , V.5.	He praises the density of the trees in the fertile area around Cyrene. Olive trees more likely to be among them.	1 st cen. AD
A.2.7	Scaevola, <i>Digest</i> , 19.2.61.1. VII. Transferred in Digest of Justinian. XIX	It was reported that a cargo of cereals and olive oil was traded from Cyrene to the Italian city of Aquileia. The quantity of olive oil was 3,000 metretai (c.120 tonnes).	2 nd cen. AD
A.2.8	Synesius, <i>Letter</i> , 134	According to him, Cyrene exports olive oil.	AD 406
A.2.9	Synesius, <i>Letter</i> , 148	He indicates that the oil of Cyrenaica is excellent and people prefer the heavier oil and use it for several purposes. These are for making cakes, lighting lamps and for athletes as massage oil.	AD 408
A.2.10	Al-Idrisi (الإدريسي), (1100-1165: 311, 310	He mentions exporting olive oil from the port of Tolmeita to Alexandria.	AD 1100-1165
A.2.11	Paolo della Cella (1822: 118)	He reported that Cyreneans use butter instead of oil to cook their food. He notices that they also did not realise the importance of the olive trees and their products, because they did not produce oil.	AD 1817
A.2.12	French consul statistics (cited in Wright 1982: 22)	These documents recorded the export of 1,375 tonnes of olive oil and other various products from Cyrenaica to Egypt and Malta.	AD 1850
A.2.13	Manfredo Camperio (1881:70)	According to his scientific report, an Ottoman census indicates 111,000 cultivated olive trees in Derna and the surrounding area.	AD 1881
A.2.14	Giuseppe Haimann (1882)	His scientific mission estimated there were 200,000 wild olive trees between Benghazi and Derna.	AD 1882
A.2.15	Hamilton, <i>Wandering in North Africa</i> (1956: xx, 80)	He reports spreading groves of olive trees in the area between Wadi al-Kuf and Balagrae (modern al-Beida), though they were neglected by the local inhabitants and were used for feeding their animals. He interprets the survival of olive trees as due to two reasons. The first is that the trees seem to have been widely cultivated in the past and the second was the good quality of the region's soil.	AD 1956

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

I. A. 3. Grapes and Wine

N.	Ancient Sources	Context	Date
A.3.1	Herodotus, IV. 199	He states that there are three harvested seasons in Cyrenaica. After eating and drinking the first two harvests, the latest yield is to be ready. (ὥστε ἐκπέπεται τε καὶ καταβέβρωται ὁ πρῶτος καρπὸς καὶ ὁ τελευταῖος συμπαραγίνεται). The possible product that can be picked and then become a drink 'ἐκπέπεται' is grapes.	Late 5 th cen. BC
A.3.2	Callimachus, <i>Epigram.</i> 35	The writer describes his lovely feeling when he was walking near Battus' tomb and simultaneously enjoying drinking the wine (ὁ οἶνος).	c. 310/05-240 BC
A.3.3	Theaetetus of Cyrene (Cited in Catani 1985: 149)	He talks abouts burning down the Palace of Antagoreos where all the residents and their slaves died because they were all drinking too much wine. This is probably in indication of the abundance of wine.	c.375 BC
A.3.4	Pseudo-Skylax, <i>Periplus</i> , 108	He describes different kinds of trees in the garden of Euesperides including those of vineyards.	Mid 4 th cen. BC
A.3.5	Pseudo-Skylax, <i>Periplus</i> , 108	He calls the modern village of Al-Hamama Ampelos (ἄμπελος). The word 'ἄμπελος' in ancient Greek means grapevine (Catani: 1985).	Mid 4 th cen. BC
A.3.6	Diodorus Siculus, XIII. 81.5	He stated that the Agrigento in Sicily exported olives and wine to Carthage and Libya in the 3/2 centuries BC. Which part of Libya did the writer refer to here?	1 st cen. BC
A.3.7	Diodorus Siculus, IV. 17. 4	Grapes and olive trees are the main cultivated plants of the Cyrenaican fruitful land.	1 st cen. BC
A.3.8	Diodorus Siculus, III. 50. 1	The lands around Cyrene are fertile and produce several types of crops alongside wheat. It includes large areas of vineyards and olive groves.	1 st cen. BC
A.3.9	Strabo, XVII. 3. 20	Carthaginians exchange their wine for the silphium of Cyrenaica at Charax. This was the preferable commercial place for them, however they were charged unlawfully for the silphium's juice.	Late 1 st cen. BC/ early 1 st AD

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
A.3.10	Aelian, <i>Characteristics of Animals</i> , III.36	Grape-spiders of Cyrenaica had a black colour like the grapes according to Aelian. This indicates continuous cultivation in the region of black grapes from the 4 th cen. BC [cf. grapes mentioned in the <i>demiourgoi</i> lists App. II. D. 6, 7].	AD 175-235
A.3.11	Athenaus, <i>Deipnosophists</i> , 7c	He mentions that the Cyrenean philosopher, Aristoxenus, used to water the lettuce in his garden with wine and honey at night, then cut and ate them in the morning. This may reflect his life of luxury with an abundance of wine.	End 2 nd /beginning 3 rd cen. AD.
A.3.12	Synesius, Letter, 134	Synesius reports exportation of wine from Cyrenaica.	AD 406
A.3.13	Synesius, Letter, 148	He indicates that the lightest wine was served in his society with the main meal.	AD 408
A.3.14	Hamilton, <i>Wandering in North Africa</i> (1856: xx)	He mentions that during his stay in Cyrenaica for four months he ate ripe grapes, while the fruit was still half formed and hanging in the trees in other parts of the region.	AD 1856

I. A. 4. Dates

N.	Ancient Sources	Context	Date
A.4.1	Herodotus, IV. 172	In the summer, Nasamones leave their herds near the sea and go to Aujila, where many palm trees grow, and there gather dates.	Late 5 th cen. BC
A.4.2	Theophrastus, <i>Hist.Pl.</i> , II. vi. 2	Libya (and two other places) produces plenty of dates because of their salty soil, and therefore this product could be kept longer.	2 nd half of the 4 th cen. BC
A.4.3	Theophrastus, <i>Hist.Pl.</i> , IV. iii. 1	Date-palm is grown in the area of the Nasamones.	2 nd half of the 4 th cen. BC
A.4.4	Theophrastus, <i>Hist.Pl.</i> , IV. iii. 7	We are told that in the dry part of Libya, palm-trees were grown alongside many other trees and they were cultivated in salty soil, and in a place where surface water existed just below the soil.	2 nd half of the 4 th cen. BC
A.4.5	Strabo, XVII. 3. 23	Aujila is located beyond Cyrene to the south and is also a producer of palm trees.	Late 1 st cen. BC/ early 1 st AD
A.4.6	Pliny, <i>NH</i> , XIII. 9	Cyrenaica's dates could be kept longer because they were grown in sandy and salty soil.	1 st cen. AD
A.4.7	Al-Idrisi (الإدريسي), (1100-1165: 319)	He refers to a considerable number of palm trees that grew in the mountains around Tolmeita.	AD 1100-1165
A.4.8	Hamilton, <i>Wandering in North Africa</i> (1856: 176)	According to Hamilton, dates of Jalo and Ajdabia were exchanged with cereals from Benghazi.	AD 1856

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

I. A. 5. Other Fruits and Nuts

N.	Product	Ancient Sources	Context	Date
A.5.1	Apple, Bay-trees, mulberry, pear, pomegranate, walnut and strawberry	Pseudo-Skylax, <i>Periplus</i> , 108	These fruits listed by Pseudo-Skylax to have grown in the garden of Euesperides	Mid 4 th cen. BC
A.5.2	Almond	Pseudo-Skylax, <i>Periplus</i> , 108	It is one of the nuts listed by Pseudo-Skylax to have grown in the garden of Euesperides	Mid 4 th cen. BC
A.5.3	Saffron	Theophrastus, <i>Hist.Pl.</i> , IV. iii. 1	Cyrenaica produces saffron-crocus in great quantity and of good quality.	Mid 4th cen. BC
		Pliny, NH, XXI. 17	The saffron of Cyrenaica is not of good quality.	1st cen. AD
		Synesius, <i>Letter</i> , 134	Saffron was one of the most important products of Cyrenaica in the period of Battus.	AD 406
A.5.4	Fig	Synesius, Letter, 148	The fig-tree and the vine are both part of the Cyrenaican songs in which they ask the God to maintain them.	AD 408

I. B. Wild Plants

I. B. 1. Silphium (σίλφιον)

N.	Ancient sources	Context	Date
B.1.1	Herodotus, IV, 169	Silphium is grow in the area which lies between Platea and the entrance of Syrtis.	Late 5 th cen. BC
B.1.2	Herodotus, IV, 192	He mentions that the weasel is found in the silphium.	Late 5 th cen. BC
B.1.3	Aristophanes, <i>Knights</i> , 894-95	A sausage-seller asks a citizen: Do you remember the time when silphium was so cheap? The writer did not mention the silphium of Cyrenaica, but he probably means that of Battus.	424 BC
B.1.4	Aristophanes, <i>Plutus</i> , 901, 925	In a conversation between two persons, one say's: 'If Plutus himself or the silphium of Battus are given to me, I would not change my life in any way.	c.408 BC
B.1.5	Athenaeus, <i>Deipnosophists</i> , XIV. 17	He reports that there was a message sent from the writer Antiphanes to his friend in Theba. The Libyan silphium which dries in the midday sun is among the supplied commodities that Antiphanes listed in this letter.	Antiphanes (c. 408-334 BC and he lives in Athens)

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
B.1.6	Pseudo-Skylax, <i>Periplus</i> , 108	Silphium is grown in the area which stretches from Cherronesus (Ras et-Tin) to Euesperides. It is around 1,500 stades	Mid 4 th cen. BC
B.1.7	Theophrastus, <i>Hist.Pl</i> , IV. iii. 1	Silphium is the most important plant in Cyrenaica	2 nd half of the 4 th cen. BC
B.1.8	Theophrastus, <i>Hist.Pl</i> , III. i. 6	Silphium appearance in Cyrenaica was a result of heavy rain-fall.	2 nd half of the 4 th cen. BC
B.1.9	Theophrastus, <i>Hist.Pl</i> , VI. iii.2, 3	Silphium grows in Libya. It exists plentifully near Syrtis, and starts from the territory of Euesperides. The plant does not grow in cultivated land, but in the wild. According to the local settlers, this plant appeared in Cyrene 7 years before the Greeks founded the city.	2 nd half of the 4 th cen. BC
B.1.10	Pliny, <i>NH</i> , XIX. 14,15	Greeks use the juice of the Cyrenaican silphium for medical purposes, and its price was similar to that of silver. At the beginning of the civil war, Caesar uses around 1,500 pounds (680 kg) of silphium juice from the public treasury, alongside the gold and silver. Pliny provides also a description of some ancient writers' opinions and other important details about the silphium of Cyrenaica.	1 st cen. AD (Caesar's time is 100-44 BC)
B.1.11	Strabo, XVII. 3. 20	Carthaginians exchange their wine for the silphium of Cyrenaica at Charax. This was the preferable commercial place for them, however they were charged unlawfully for the silphium's juice.	Late 1 st cen. BC/ early 1 st AD
B.1.12	Strabo, XI. 13.7	A medical juice was made from silphium which was grown in the area below Cyrene.	Late 1 st cen. BC/ early 1 st AD
B.1.13	Strabo, XVII. 3. 23	He describes an area where silphium grew to be long, narrow and dry. Its length is about 1,000 stadia towards the east-west and its width 300 stadia north-south.	Late 1 st cen. BC/ early 1 st AD
B.1.14	Pliny, <i>NH</i> , V. 5 (33)	Pliny divides the coastal area of Cyrene into three types of land, each one grew particular plants. The first one is good for trees; the second is suitable for cereals and the last one producing silphium.	1 st cen. AD
B.1.15	Pliny, <i>NH</i> , XXII. 48	He says: 'Silphium of Cyrenaica becomes extinct'.	1 st cen. AD
B.1.16	Dioscorides, <i>The Greek herbal of dioscorides</i> , III. 94	Silphium of Cyrenaica has more juice-content than the others, and it also has a nice smell.	1 st cen. AD

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
B.1.17	Arrian, <i>Anab</i> , III. 28	Silphium was valuable for the Cyrenaicans, therefore they tried to graze their sheep, which liked its taste, as far away as they could from the plant.	2 nd cen. AD
B.1.18	Aretaeus, <i>Treatment of Acute Diseases. Aret</i> , I. 7	He writes: silphium grows in Syria, Armenia, Media and Libya, and he also provides a description as to some features of that of Cyrenaica.	2 nd cen AD
B.1.19	Athenaeus, <i>Deipnosophists</i> , I. 27e	Cyrene was especially an exporter of silphium stalks and cowhides.	End 2 nd / beginning 3 rd cen. AD
B.1.20	Athenaeus, <i>Deipnosophists</i> , I. 100f	He reports the speech of Lynceus of Samos, where he mentions that the words silphium and horse dominate any discussion at Cyrene, and this is a sign of the life of luxury during Ptolemy's regime.	End 2 nd / beginning 3 rd cen. AD
B.1.21	Synesius, <i>Letter</i> , 106	He says that his brother grows all kinds of fruit in his garden alongside silphium.	AD 402

Note: One of Pliny's references added to those of the 1st century BC (Caesar's time is 100-44 BC) and Athenaeus indications added to those of 4th BC.

I. B. 2. Other wild plants

N.	Wild Plants	Ancient Sources	Context	Date
B.2.1	Christ's thorn	Theophrastus, <i>Hist.Pl</i> , IV, iii. 3	Christ's Thorn grows in Libya. He describes the shape of its fruit and says that sweet wine could be made from it.	End 4 th cen. BC
B.2.2	Cypress	Theophrastus, <i>Hist.Pl</i> , IV, iii. 3	Cypress grows in Cyrenaica	2 nd half of the 4 th cen. BC
B.2.3	Ivy	Pseudo-Skylax, <i>Periplus</i> , 108	It is one of the fruits listed by Pseudo-Skylax to have grown in the garden of Euesperides	Mid 4 th cen. BC
B.2.4	Lotus	Euripides, <i>Helen</i> , 167. Lin 170	He mentions that the Libyan flute was made from lotus	c. 480- 406 BC
		Herodotus, II. 96.1	According to him, Lotus of Cyrene is very similar to a type of wood which was used by the Egyptians for making boats. This may mean that the lotus of Cyrene was also used for the same purpose (cf. Theophrastus, <i>Hist.Pl</i> , IV, iii.1- 4).	Late 5 th cen. BC

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Wild Plants	Ancient Sources	Context	Date
B.2.4	Lotus	Herodotus, IV. 177. 1	He mentions that the size of the lotus fruit which grew in the land of Lotus Eater (Λωτοφάγοι) is the same size as that of mastic-berry and is sweaty like dates. He indicated also that people there eat lotus fruit and make wine from it.	Late 5 th cen. BC
		Herodotus, IV. 178	The writer mentions that the lotus was also used by the Machlyes	Late 5 th cen. BC
		Pseudo-Skylax, <i>Periplus</i> , 110	People called λωτοφάγοι (<i>Lotus-eaters</i>) live around Syrtis. They use lotus as food and drink, the drink he mentions is probably wine. (cf. Herodotus IV. 177. 1).	Mid 4 th cen. BC
		Theophrastus, <i>Hist.Pl.</i> , IV. iii.1-4	Lotus grows plentifully in Libya, especially in the area of Lotus-eaters, and it has many kinds. In Euesperides it was used as fuel. People can also make from it wine and wood. Its fruit was the main food supplied to the army of Ophellas for when they were marching to Carthage.	End 4 th cen. BC. (Ophellas rulers Cyrene c.308 BC)
B.2.5	Truffle and fungus	Athenaeus, <i>Deipnosophists</i> , I. 62 a	According to Theophrastus, a good quality of truffle and fungus grew at Cyrene where the soil is suitable.	End 2 nd / beginning 3 rd cen. AD.

I. C. Others

I. C. 1. Honey

N.	Ancient Sources	Context	Date
C.1.1	Aretaeus, <i>Treatment of Acute Diseases. Aret</i> , I. 7	Silphium of Cyrene with honey is one of the best medical treatment descriptions.	2 nd cen. AD?
C.1.2	Athenaeus, <i>Deipnosophists</i> , II. 47a	He reports the speech of Lycuse, who says that the Cyreneans lived longer, because they eat honey as they have plenty in their region.	End 2 nd / beginning 3 rd cen. AD
C.1.3	Athenaeus, <i>Deipnosophists</i> , I. 7c	He mentions that the Cyrenean philosopher, Aristoxenus, used to water the lettuce in his garden with honey and wine at night, then cut and ate them in the morning. This may reflect his life of luxury with an abundance of wine.	End 2 nd / beginning 3 rd cen. AD
C.1.4	Synesius, <i>Letter</i> , 148.	He states that honey is a local product, when he says that they gain it from their bees.	AD 408

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
C.1.5	Synesius, <i>Letter</i> , 148	The quality of Cyrenaica's honey is high although it is not equal to that of Hymettus (in Greece).	AD 408
C.1.6	Al-Idrisi (الإدريسي), (1100-1165: 311-313)	He reported that honey alongside other animal products was exported from Cyrenaica to Egypt.	AD 1100-1165
C.1.7	Al-Idrisi (الإدريسي), (1100-1165: 319)	He refers to amazing honey which was produced by the tribes that live in the mountains around Tolmeita.	AD 1100-1165
C.1.8	Abu al-Fida (ابوالفدا), (1850: 149)	He refers that the honey and Barley were exported from the port of Tolmeita to Alexandria.	AD 1273- 1331
C.1.9	Al-Aiashe (العياشي), (1661-63: 201)	He named some exported goods from Benghazi port. He says 'there are valleys of honey, ghee, animal fats and fat of sheep tails'. He mentions also that the prices of these items in Cyrenaica are the cheapest that he had ever seen. He also confirms that these products were shipped from the port of Benghazi to Tripoli and Djerba of Tunisia. These came from the fertile area known by al-Jabal al-Akhdar' (Cyrene and the area around).	AD 1661-1663
C.1.10	Beechey, F. W. and H. W. (1828-2: 399-401)	They reported the ancient sources and Arab references of the Cyrenaican honey, and also mentioned that the tribes which live in the valleys around Barce are still producing honey.	AD 1828
C.1.11	Hamilton, <i>Wandering in North Africa</i> (1856: XX)	He mentions that Arabs in Cyrenaica are still collecting the honey and they are sending it away to their friends as gifts	AD 1856

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

I. C. 2. Ivory

N.	Ancient Sources	Context	Date
C.2.1	Hermippus, <i>Comic. Test. Frag</i>	Large quantities of ivory were exported from Libya	5 th BC
C.2.2	Athenaeus, <i>Deipnosophists</i> , I, 27f	A considerable volume of ivory was exported from Libya.	End of 2 nd and beginning of 3 rd cen. AD
C.2.3	Hamilton, <i>Wandering in North Africa</i> (1856: 176, 177)	He reports that there are some commodities which were brought from Sahara such as ivory, gold, gems and slaves. These were brought in caravans from Waday to Aujila and then on to Ajdabia to reach its last station in Benghazi.	AD 1856

I. D. Domestic Animals.

I. D. 1. Sheep and Goats

N.	Ancient Sources	Context	Date
D.1.1	Homer, <i>Od</i> , IV. 85	He mentions that Odysseus visits Libya where lambs born with horns proliferate three times a year, and the individual rich or poor there have a lot of cheese, meat and good milk.	c. 9/ 8 cen. BC
D.1.2	Pindar, <i>Pyth</i> , IX. 7	He describes the land of Cyrene to be rich in sheep (πολυμήλου).	474 BC
D.1.3	Herodotus, IV.155	Apollo sends (Battus) to establish a colony in Libya, the sheep-feeding or sheep nurse (μηλοτρόφος).	Late 5 th cen. BC
D.1.4	Herodotus, IV.157	The priest of the Delphic temple describes Libya as a feeder of sheep to convince the founders group to go and stay there.	Late 5 th cen. BC
D.1.5	Herodotus, IV. 189	The Libyan women dress in a form similar to that of Athena. But they use goatskin leather, instead of the image of snakes, as strips to decorate the end of their robes.	Late 5 th cen. BC
D.1.6	Theophrastus, <i>Hist.Pl</i> , VI. iii. 1, 6	Theophrastus (<i>Hist.Pl</i> , VI, 3, 1) mentions that, during the winter, the sheep herds at Cyrenaica, in his time, were grazed in the southern steppe, where silphium grew.	2 nd half of the 4 th cen. BC
D.1.7	Pliny, <i>NH</i> , XIX.15	Silphium makes sheep sleepy and goats sneeze when they eat it.	1 st AD

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
D.1.8	Arrian, <i>Anab</i> , III. 28	Sheep are very fond of silphium. Therefore, the Cyrenians grazed these animals as far as possible from silphium or enclosed the area of this plant with a wall.	2 nd AD
D.1.9	Synesius, <i>Letter</i> , 148	In his time people sang for the strong ram, the ewe which is twin-bearing and the pastures. Also, they got milk from goats.	AD 408
D.1.10	Abu al-Fida (ابوالفدا), (1850:127)	Sheep were exported from the port of Ptolemais to Alexandria.	AD1273- 1331
D.1.11	Al-Idrisi (الإدريسي), (1100-1165: 311-319)	Wool was among other commodities which were exported from Cyrenaica to Egypt.	AD 1100-1165
D.1.12	Al-Aiashe (العياشي), <i>Aiashian Trip at 1661-63</i>	Different animal products brought from al-Jabal al-Akhdar were exported from the port of Benghazi. Animal fats and sheep tails are among the named items mentioned by this writer.	AD 1661/63
D.1.13	Beechey, F. W. and H. W. (1828-2: 429)	They mentioned that during the summer, herds of sheep and goats in addition to large numbers of cattle were covered the area of the sanctuary of Apollo at Cyrene and the mountain slip which faces it.	AD 1828
D.1.14	The French Consul Report of 1850 (Wright 1982: 22)	The report states that Cyrenaica exported wool to Italy.	AD 1850

I. D. 2. Cattle

N.	Ancient Sources	Context	Date
D.2.1	Herodotus, IV. 163	When Arcesilaus II left Cyrene and prepared his army to attack Cyrene from Samos, the priestess of Delphic advised him to go back home and be quiet and do other things. They warned him that if he did not listen, he and the best ox in the herd will be killed.	Late 5 th cen. BC
D.1.2	Herodotus, IV. 186	The women in Cyrene and Barce do not eat the meat of the cow.	Late 5 th cen. BC
D.1.3	Plutarch, <i>Cato the Younger</i> , 56	Cato drove with him many cattle to feed his military (10,000) men, during his march from Cyrene to the western part of Libya.	95-46 BC

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
D.1.4	Athenaeus, <i>Deipnosophists</i> , I. 27e	Cowhides and silphium stalk were the most important exported products from Cyrene.	End of 2 nd / beginning 3 rd cen. AD
D.1.5	Aelian, <i>Characteristics of Animals</i> , XIV. 11	He appreciates the great quantity of cattle herds which include wild cows and oxen. These were very swift to a degree that they exhausted horses during the hunt before catching them. He also mentioned some method of hunting these cattle.	AD 175-235
D.1.6	Synesius, <i>Letter</i> , 30	The great part of their wealth in Cyrenaica was due to their cattle, camels and horses.	c. AD 370- 413
D.1.7	Synesius, <i>Letter</i> , 148	People were asking the God blessings for men, cattle and harvests.	AD 408
D.1.8	Synesius, <i>Letter</i> , 148	He reports that people in Cyrenaica obtain milk from their cows.	AD 408
D.1.9	Al-Idrisi (الإدريسي), (1100-1165: 311)	He refers to a well-known manufacture of cowhides at a place which is probably Barce. According to him, it was famous in his time and also in the past.	AD 1099-1164
D.1.10	Al-Idrisi (الإدريسي), (1100-1165: 316)	He reported that ghee, alongside other animal products, was exported from Cyrenaica to Egypt.	AD 1099-1164
D.1.11	Al-Aiashe (العياشي), <i>Aiashian Trip at 1661-63</i>	According to Al-Aiashe, ghee was among the abundant animal products that were brought from al-Jabal al-Akhdar and exported from the port of Benghazi.	AD 1661/63
D.1.12	Hamilton, <i>Wandering in North Africa</i> (1886: 167)	During his journey from Cyrene to the west, he described a view in which he saw cattle herds. Unfortunately, he did not identify the area of this view, but it probably was somewhere around Barce.	AD 1856
D.1.13	Hamilton, <i>Wandering in North Africa</i> (1856: 82)	He provides a clear description of how Cyrenaicans use oxen in the process of threshing cereal. He witnesses an operation where they use six oxen for threshing cereals.	AD 1856

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

I. D. 3. Horses

N.	Ancient Sources	Context	Date
D.3.1	Sophocles, <i>Electra</i> , 701-708	He refers to a chariot competition that included 10 competitors, 2 among them from Cyrenaica (one specifically from Barce). (As for the other 8, each is from a different place).	c.496-406 BC
D.3.2	Pindar, <i>Pyth</i> , IV. 1-13	He devotes the fourth Pythia to the celebration of Arcesilas of Cyrene, who won the chariot race. He mentions also that Battus is the founder of the city of the fine chariots.	462 BC
D.3.3	Pindar, <i>Pyth</i> , IV. 59-67	Apollo granted a Cyrenaican charioteer all the glory in the chariot race.	462 BC
D.3.4	Pindar, <i>Pyth</i> , V. 40-53	The writer mentions a celebration of Arcesilaus' brother, the charioteer who returned to Libya after winning the Pythian games.	462 BC
D.3.5	Pindar, <i>Pyth</i> , IX. 1-4	He writes this Pythian to honour Telesicrates because he won in the Hoplite Race. He also describes him as a prosperous man who claimed the crowning victory in the horse-driving of Cyrene 'διωξίππου στεφάνωμα Κυράνας'.	474 BC
D.3.6	Herodotus, IV. 189	During his description of the Libyan tribes' habits, he mentions that Greeks learned from Libyans how to yoke four-horses to a chariot.	Late 5 th cen. BC
D.3.7	Aeneas Tacticus, XVI. 14-16	He reports the importance of horses in Cyrene, Barce and other Cyrenaican cities, and mentions the Cyrenaican armies use of numerous chariots in war.	Mid 4th cen. BC
D.3.8	Xenophon, <i>Cyr</i> , VI. 2. 8	During one of Cyrus's preparations for a war he asks Cyaxares to modify the chariots of the Medians, Trojans and Libyans to fit those which were structured, or invented, by him.	Mid 4th cen. BC
D.3.9	Xenophon, <i>Cyr</i> , VI. 1. 27-28	He identifies the number of the chariots and the required horses to draw them with, which were used by Cyreneans [in one of their wars].	Mid 4th cen. BC
D.3.10	Strabo, XVII. 21	Horses were one of the most important factors of Cyrene's prosperity. The writer talks about the period of Callimachus (the third cen. BC).	Late 1st cen. BC/ early 1st AD

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

N.	Ancient Sources	Context	Date
D.3.11	Strabo, XVII. 21	When he talks about the founder of Cyrene, he reports Callimachus' speech which says: 'Calliste is the old name for the island of Thera, the mother of my home of the good steeds'. He refers to the early Hellenistic period.	Late 1 st cen. BC/ early 1 st AD
D.3.12	Callimachus, <i>Aetia, The victory of Berenice</i> , III. Fr. 54. 3, 4	He celebrated the quadriga victory of Berenice II, the daughter of Magas of Cyrene, at the Nemean games. The victory of Berenice was the first apparently epinician (victory ode) written in honor of a woman.	c. 266 BC -221 BC
D.3.13	Polybius, V. 65. 5	He reported that the Libyans and the local (Greeks or Egyptians) cavalries were trained by Polycrates of Argos to contribute in the Rhapsia battle in 217 BC.	c. 200 - c. 118 BC
D.3.14	Diodorus Siculus, XVII. 49. (3)	Cyrene sent 300 cavalry horses and five of the most excellent four-horse chariots to Alexander in Egypt.	1 st cen. BC
D.3.15	Diodorus Siculus, XVIII. 19, 20.	When Thibron (324/23 BC) defeated the Cyreneans, he gained their properties from the port of Apollonia, including the treasures, and forced them to pay 500 <i>talents</i> of silver and give half of their own chariots.	1 st cen. BC
D.3.16	Strabo, XVII. 19	He mentions that breeding horses were monopolized by the Ptolemaic kings, and the colts proliferated by 100,000 every year. The writer does not mention Cyrenaica in this context but it is probably included because he appreciates its horses on other occasions	Late 1 st cen. BC/ early 1 st AD
D.3.17	Hyginus, <i>Astronomia</i> , II. 24	Berenice, the daughter of Magas, used to pay much attention to the breeding of horses and sending them to Olympia.	c. 64 BC – AD 17
D.3.18	Pausanias, VI. 8. 3	In 408 BC, Eubotas (Εὐβότας) of Cyrene won the chariot-race and running race in the Olympian games. The interesting point here is that a portrait statue had been made for him beforehand.	2 nd cen. AD
D.3.19	Pausanias, VI. 12. 7	Theochrestus of Cyrene and his father and grandfather won the Olympic and Isthmian games with four-horse chariots. He breeds horses according to the traditional Libyan method.	2 nd cen. AD
D.3.20	Pausanias, X. 15. 6	The Cyrenaean dedicated at Delphi a figure of Battus in a chariot; as he was the man who brought them in ships from Thera to Libya. The figure represents Cyrene and Battus in a chariot, and the Goddess Libya who was crowning Battus. Another dedication includes a chariot with an image of Ammon was mentioned by Pausanias (X. 13. 5).	2 nd cen. AD
D.3.21	Pausanias, VI. 18. 1	The Cyrenean Cratisthenes, the son of the Libyan runner Mnaseas, won a chariot race in the Olympian games in the fifth cen. BC.	2 nd cen. AD

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

	Ancient Sources	Context	Date
D.3.22	Oppian, <i>Cynegetica</i> , IV. 44-57	The writer appreciates the performance of Libyan horses for hunting beasts because they were swift and easy to ride.	2 nd cen. AD
D.3.23	Oppian, <i>Cynegetica</i> , I. 166-75	He mentions some tribes who live by breeding horses and they had good skills in horse-racing. The Libyans were among them.	2 nd cen. AD
D.3.24	Oppian, <i>Cynegetica</i> , I. 291-99	He reports that the Libyan horses including those from Cyrene are strong and good in completing a long course.	2 nd cen. AD
D.3.25	Oppian, <i>Cynegetica or the Chase</i> , II. 253	Libya is the horses pasture-land (ἵπποβότου Λιβύης)	2 nd cen. AD
D.3.26	Aelian, <i>Characteristics of Animals</i> , III. 2	According to him, Libyan horses are extremely swift and have great vigor to a degree that they never seem tired despite the little care they were receiving from the Libyans. He also mentions that the Libyan horses are slim but fit.	AD175-235
D.3.27	Aelian, <i>Characteristics of Animals</i> , XIV. 10	Libyan horses are small but they can run rapidly. They also are used in hunting the wild cattle.	AD 175-235
D.3.28	Athenaeus, <i>Deipnosophists</i> , I. 100f	He reports the speech of Lynceus of Samos (lived at the end of the 4 th and beginning of the 3 rd cen. BC), who mentions that the words silphium and horse dominated any discussion at Cyrene.	End of 2 nd / beginning 3 rd cen. AD.
D.3.29	Synesius, Letter, 6	A thief intends to buy the horse that was stolen from him.	c. AD 370- 413
D.3.30	Synesius, Letter, 14	The horse thief should be punished.	c. AD 370- 413
D.3.31	Synesius, Letter, 109	He named some animals that they sent out to pasture. Those were the asses, mules and horses.	c. AD 370- 413
D.3.32	Synesius, Letter, 30	Horses, cattle, camels were the main sources of their wealth in Cyrenaica.	c. AD 370- 413
D.3.32	Synesius, Letter, 40	He reports the usefulness of the horse in various activities.	c. AD 370- 413
D.3.33	Synesius, Letter, 132	He refers to using horses in warfare.	AD 405
D.3.34	Synesius, Letter, 133	The writer indicates that the horses in Cyrenaica were used as post-horses alongside other functions.	AD 405
D.3.35	Synesius, Letter, 104	He mentions the use of the horse in battles.	AD 401
D.3.36	Expositio Totius Mundi et Gentium, LXII	Horses and grain are essential Cyrenaican products.	Mid 4th cen. AD

Appendix: I. Direct and indirect historiographical indications of cultivated and wild products and animals

I. E. Different wild animals.

N.	Wild animals	Ancient Sources	Context	Date
E.1	Gazelle	Theophrastus, <i>Hist.Pl</i> , IV. iii. 5	Gazelle is one of the wild animals which live in the Libyan desert.	End 4 th cen. BC
		Diodorus Siculus, III. 50. 1	Gazelle and oxen live in the area which extends beyond Cyrene's southern border.	1 st cen. BC
E.2	Hare	Theophrastus, <i>Hist.Pl</i> , IV. iii. 5	Hare is one of the wild animals which live in the Libyan desert.	End 4 th cen. BC
E.3	locust	Synesius, <i>Letter</i> , 57.	Swarms of locust attack sometimes the fields and eat the fruits, trees and yields.	AD 412/413
E.4	Ostrich	Theophrastus, <i>Hist.Pl</i> , IV. iii. 5	Ostrich is one of the wild animals which live in the Libyan desert.	End 4 th cen. BC
		Synesius, <i>Letter</i> , 134	He mentions that ostrich was exported in his time from Cyrenaica.	c. AD 406

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions

II. A. The Spice Plants

II. A. 1. Cumin (κόμενον) (Fourth century BC)

Insc.	Date	Unit	Price	Notes	Reference
DMI 1	335 BC	Per unit	2 drachmas	Complete inscription	<i>IGCyr011400; SEG 9. 11</i>
DMI 2	335 BC	Per unit	6 drachmas	Complete and most detailed inscription	<i>IGCyr011600; SEG 9. 13</i>
DMI 8	2 nd half of the 4 th BC	Illegible	Missing	Incomplete inscription	<i>IGCyr012200; SEG 9. 20</i>
DMI 11	4 th BC	Per unit	3 drachmas	Incomplete inscription	<i>IGCyr012700; SEG 9. 25</i>

II. A. 2. Cumin (κόμενον) (Third/second centuries BC)

Insc.	Date	Unit	Price	Note	References
DMI 19	3 rd BC	Per unit	20 drachmas	1 st semester. Incomplete inscription	<i>IGCy013700; SEG 9. 35</i>
DMI 22	c. 220-180 BC	Per medimnos	7 drachmas	1 st semester Semi-complete inscription	<i>IGCyr014300; SEG 9. 37+41</i>
		Per medimnos	8 drachmas	2 nd semester.	
DMI 24	2 nd BC	Per medimnos	Illegible	1 st semester. Incomplete inscription	<i>IGCyr014500; SEG 9. 43</i>
		Per medimnos	Illegible	2 nd semester.	

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions

Insc.	Date	Unit	Price	Note	References
DMI 26	End of 3 rd / beginning of 2 nd BC	Per medimnos	Illegible	Incomplete inscription	<i>IGCyr014600; SEG 9. 44</i>
DMI 25	290-280 BC	Per unit	Illegible	1 st semester. Incomplete inscription	<i>IGCyr063900; SEG18.743</i>
DMI 27	2 nd BC	Not mention	Illegible	Incomplete inscription	<i>IGCyr107150</i>

II. B. Pulses and their by-products

II. B. 1. Pulses (ῥσπριω) (Fourth century BC)

Insc.	Date	Unit	Price	Notes	Reference
DMI 1	335 BC	Per unit	1 drachma 3 obols	Complete inscription	<i>IGCyr011400; SEG 9. 11</i>
DMI 3	335 BC	Per unit	1 drachma 3 obols	Completed inscription	<i>IGCyr011500; SEG 9. 12</i>
DMI 4	335 BC	Per unit	1 drachma 2 obols	Complete and most detailed inscription	<i>IGCyr011600; SEG 9. 13</i>
DMI 5	335 BC	Per unit	Illegible	Semi-complete inscription	<i>IGCyr011700; SEG 9. 14</i>
DMI 6	335 BC	Per unit	1 drachma 4 obols	Complete inscription	<i>IGCyr011800; SEG 9. 15</i>
DMI 7	2 nd half of the 4 th BC	Illegible	Illegible	Incomplete inscription	<i>IGCyr012100; SEG 9. 19</i>
DMI 8	2 nd half of the 4 th BC	Not mention	Illegible	Incomplete inscription	<i>IGCyr012200; SEG 9. 20</i>
DMI 10	4 th BC	Not mention	Illegible	Incomplete inscription	<i>IGCyr012500; SEG 9. 23</i>
DMI 11	4 th BC	Per unit	Illegible	Incomplete inscription	<i>IGCyr012700; SEG 9. 25</i>
DMI 14	4 th BC	Illegible	Illegible	Incomplete inscription	<i>IGCyr088100; SEG 9. 2051.</i>

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions

II. B. 2. Pulses (Third/second centuries BC)

Insc.	Date	Product	Unit/quantity	Price	Notes	Reference
DMI 22	c. 220-180 BC	Beans (κυάμοι)	Per medimnos	5 drachmas	1 st semester, Semi-complete inscription	<i>IGCyr014300; SEG 9. 37+41</i>
		Chick-peas (ἐρεβίνθοι)	Per medimnos	5 drachmas		
		Lentils (φακοί)	Per medimnos	7 drachmas		
		Other pulses (τὰ ἄλλα ὄσπρια)	Per medimnos	3 drachmas		
		Beans (κυάμοι)	Per medimnos	Illegible	2 nd semester	
		Chick-peas (ἐρεβίνθοι)	Per medimnos	Illegible		
		Lentils (φακοί)	Per medimnos	Illegible		
		Other pulses (τὰ ἄλλα ὄσπρια)	Per medimnos	3 drachmas		
DMI 23	2 nd BC	Beans (κυάμοι)	42,000 medimnoi	Not mentioned	1 st semester, Incomplete inscription	<i>IGCyr014400; SEG 9. 42</i>
		Chick-peas (ἐρεβίνθοι)	72,000 medimnoi	Not mentioned		
		Lentils (φακοί)	72,000 medimnoi	Not mentioned		
		Other pulses (τὰ ἄλλα ὄσπρια)	35,000 medimnoi	Not mentioned		
		Beans (κυάμοι)	Per medimnos	Illegible	2 nd semester	
		Chick-peas (ἐρεβίνθοι)	Per medimnos	Illegible		
		Lentils (φακοί)	Per medimnos	Illegible		
		Other pulses (τὰ ἄλλα ὄσπρια)	Per medimnos	Illegible		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and
ephebic inscriptions

Insc.	Date	Product	Unit/quantity	Price	Notes	Reference
DMI 24	2 nd BC	Beans (κυάμοι)	Per medimnos 300	Not mentioned	1 st semester, Incomplete inscription	<i>IGCyr014500; SEG 9. 43</i>
		Chick-peas (ἐρεβίνθοι)	Per medimnos 308	Not mentioned		
		Lentils (φακοί)	Per medimnos 204	Not mentioned		
		Other pulses (τάλλα ὄσπρια)	Per medimnos 200	Not mentioned		
		Beans (κυάμοι)	Per medimnos Illegible	Not mentioned	2 nd semester	
		Chick-peas (ἐρεβίνθοι)	Per medimnos Illegible	Not mentioned		
		Lentils (φακοί)	Per medimnos Illegible	Not mentioned		
		Other pulses (τάλλα ὄσπρια)	Per medimnos Illegible	Not mentioned		
DMI 26	End of 3 rd / beginning of 2 nd BC	Other pulses (τάλλα ὄσπρια)	Per medimnos	Illegible	Incomplete inscription	<i>IGCyr014600; SEG 9. 44</i>
DMI 25	290-280 BC	Peas (πίσσα)	Per unit	6 drachmas	1 st semester. Incomplete inscription	<i>IGCyr063900; SEG 18.743</i>
DMI 19	3 rd BC	Peas (πίσσα)	Per unit	24 drachmas	2 nd semester. Incomplete inscription	<i>IGCyr013700; SEG 9. 35</i>
		Other pulses (τάλλα ὄσπρια)	Per unit	Illegible		
DMI 20	2/3 BC	Beans (φασήλοι)	Illegible	Illegible	2 nd semester. Incomplete inscription	<i>IGCyr013800; SEG 9. 36</i>
		Chick-peas (ὀρόβοι)	Illegible	Illegible		
DMI 21	220 -180 B.C	Beans (κυάμοι)	Per medimnos	Illegible	1 st semester. Incomplete inscription	<i>IGCyr014200; SEG 9. 40</i>
		Chick-peas (ἐρεβίνθοι)	Per medimnos	Illegible		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and
ephebic inscriptions

Insc.	Date	Product	Unit	Price	Notes	Reference
DMI 27	2 nd BC	Beans (κυάμοι)	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr107150</i>
		Chick-peas (ἐρεβίνθοι)	Not mentioned	Illegible		
		Lentils (φακοί)	Not mentioned	Illegible		
		Other pulses (τὰ ἄλλα ὄσπρια)	Not mentioned	Illegible		
DMI 18	3 rd BC	Beans (κυάμοι)	Per medimnos	4 drachmas	1 st semester. Incomplete inscription	<i>IGCyr013400; SEG 9. 32</i>
		Chick-peas (ἐρεβίνθοι)	Per medimnos	12 drachmas		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and
ephebic inscriptions

II. C. Cereals (Wheat and Barley)

II. C. 1. Barley, wheat, and their by-products (Fourth century BC)

Insc.	Product	Date	Quantity/ Unit	Price	Notes	Reference
DMI 1	Barley (κριθαί)	335 BC	Per unit	1 drachma 1 obol	Complete inscription	<i>IGCyr011400; SEG 9. 11</i>
	Wheat (σπυροί)		Per unit	2 drachmas	Complete inscription	
	Cultivated hay (κάρφη ἡμέρα)		Per unit	10 drachmas	Complete inscription	
	Wild hay (ἄγρια)		Per unit	8 drachmas	Complete inscription	
	Straw (ἀχύρων)		Per net	8 drachmas	Complete inscription	
DMI 2	Barley (κριθαί)	4 th BC	Illegible	Missing	Incomplete inscription	<i>IGCyr009420; SEG 41.1690</i>
	Wheat (σπυροί)	4 th BC	Illegible	Missing	Incomplete inscription	
DMI 3	Barley (κριθαί)	335 BC	Per unit	1 drachma	Complete inscription	<i>IGCyr011500; SEG 9. 12</i>
	Wheat (σπυροί)		Per unit	2 drachmas		
	Cultivated hay (κάρφη ἡμέρα)		Per unit	10 drachmas		
	Wild hay (ἄγρια)		Per unit	8 drachmas		
	Straw (ἀχύρων)		Per net	7 drachmas		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and
ephebic inscriptions

Insc.	Product	Date	Quantity/ Unit	Price	Notes	Reference
DMI 4	Barley (κριθαί)	335 BC	Per unit	1 drachma 1 obols	Complete and most detailed inscription	<i>IGCyr011600; SEG 9. 13</i>
	Wheat (σπυροί)		Per unit	1 drachma 4 obols		
	Cultivated hay (κάρφη ήμέρά)		Per unit	12 drachmas		
	Wild hay (ἄγρια)		Per unit	8 drachmas		
	Straw (ἀχύρων)		Per unit	8 drachmas		
	Wheat flour (σπυραμινά)		Per unit	6 drachmas		
DMI 5	Barley (κριθαί)	335 BC	Not mentioned	Illegible	Semi-complete inscription	<i>IGCyr011700; SEG 9. 14</i>
	Wheat (σπυροί)		Not mentioned	Illegible		
	Cultivated hay (κάρφη ήμέρά)		Not mentioned	Illegible		
	Wild hay (ἄγρια)		Not mentioned	Illegible		
	Straw (ἀχύρων)		One net	6 drachmas		
DMI 6	Barley (κριθαί)	335 BC	Not mentioned	1 drachma 2 obols 1/2	Complete inscription	<i>IGCyr011800; SEG 9. 15</i>
	Wheat (σπυροί)		Not mentioned	1 drachma 2 obols 1/2		
	Cultivated hay (κάρφη ήμέρά)		Not mentioned	10 drachmas		
	Wild hay (ἄγρια)		Not mentioned	6 drachmas		
	Straw (ἀχύρων)		Per net	7 drachmas		
DMI 7	Barley (κριθαί)	2 nd half of the 4 th BC	Illegible	Not mentioned	Incomplete inscription	<i>IGCyr012100; SEG 9. 19</i>
	Wheat (σπυροί)		Illegible	Not mentioned		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions

Insc.	Product	Date	Quantity/ Unit	Price	Notes	Reference
DMI 8	Barley (κριθαι)	2 nd half of the 4 th BC	Not mentioned	1 drachma	Incomplete inscription	<i>IGCyr012200; SEG 9. 20</i>
	Wheat (σπυροι)		Not mentioned	Illegible		
	Cultivated hay (κάρφη ἡμέρα)		Not mentioned	Illegible		
	Wild hay (ἄγρια)		Not mentioned	Illegible		
	Straw (ἀχύρων)		Per net	6 drachmas		
DMI 9	Barley (κριθαι)	335 BC	Per unit	1 drachma 3 obols	Incomplete inscription	<i>IGCyr012400; SEG 9. 22</i>
	Wheat (σπυροι)		Per unit	Illegible		
DMI 10	Barley (κριθαι)	4 th BC	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr012500; SEG 9. 23</i>
	Wheat (σπυροι)		Not mentioned	3 drachmas	Incomplete inscription	
DMI 11	Barley (κριθαι)	4 th BC	Per unit	2 drachmas	Incomplete inscription	<i>IGCyr012700; SEG 9. 25</i>
	Wheat (σπυροι)		Per unit	Illegible		
DMI 12	Barley (κριθαι)	1 st half of the 4 th BC	Not mentioned	? +1/2 obol?	Incomplete inscription	<i>IGCyr013000; SEG 9. 28</i>
	Wheat (σπυροι)		Not mentioned	2 drachmas 2 obols 1/2		
	Cultivated hay (κάρφη ἡμέρα)		Not mentioned	10 drachmas		
	Wild hay (ἄγρια)		Not mentioned	6 drachmas		
	Straw (ἀχύρων)		Not mentioned	Illegible		
DMI 13	Barley (κριθαι)	4 th BC	Per unit	Illegible	Incomplete inscription	<i>IGCyr013100; SEG 9. 29</i>
	Wheat (σπυροι)		Per unit	3 drachmas		
DMI 14	Barley (κριθαι)	4 th BC	Per unit	Missing	Incomplete inscription	<i>IGCyr088100; SEG 48.2051.</i>
	Wheat (σπυροι)		Per unit	2 drachmas		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephobic inscriptions

Insc.	Product	Date	Quantity/ Unit	Price	Notes	Reference
DMI 15	Straw (ἀχύρων)	4 th BC	Per net	Illegible	Incomplete inscription	<i>IGCyr088200; SEG 9. 18.</i>
DMI 16	Cultivated hay (κάρφη ἡμέρα)	1st half of the 4 th BC	Per cartload	Missing	Incomplete inscription	<i>IGCyr088300; SEG 48.2053</i>
	Wild hay (ἄγρια)		Per cartload	4 drachmas		
DMI 17	Cultivated hay (κάρφη ἡμέρα)	1st half of the 4 th BC	Per cartload	Missing	Unpublished and Incomplete inscription	<i>IGCyr012910</i>
	Wild hay (ἄγριων)			Missing		

Note. Barley recorded before wheat in the seventeen inscriptions which indicated both products in the fourth cen. BC (17 inscriptions).

II. C. 2. Wheat, Barley and their by-products (Third/second centuries BC)

Insc.	Product	Date	Quantity/Unit	Price	Notes	Reference
DMI 18	Wheat (στυροὶ)	3 rd BC	Per medimnos	8 drachmas	1 st semester	<i>IGCyr013400; SEG 9.32</i>
	Barley (κριθαί)		Not mentioned	Not mentioned	It may be missing or mentioned without unit	
DMI 19	Cultivated hay (κάρφη ἡμέρα)	3 rd BC	Per unit	Illegible	1 st semester	<i>IGCyr013700; SEG 9.35</i>
DMI 20	Wheat (στυροὶ or στυρῶν)	3 rd / 2 nd BC	Per medimnos	6 drachmas	1 st semester	<i>IGCyr013800; SEG 9.36</i>
	Barley (κριθαί)		Per medimnos	Illegible	1 st semester	
	Cultivated hay (κάρφη ἡμέρα)		Per cartload	65 drachmas	1 st semester	
	Wild hay (ἄγρια)		Illegible	Illegible	1 st semester	
	Straw (ἀχύρων)		Per net	20 drachmas	1 st semester	
DMI 21	Wheat (πυρῶν)	c. 220-180 BC	Per medimnos	Illegible	1 st semester. The form πυρῶν is the common usage in other regions	<i>IGCyr014200; SEG 9. 40</i>
			Per medimnos	Illegible	1 st semester	

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephobic inscriptions

Insc.	Product	Date	Quantity/Unit	Price	Notes	Reference
DMI 22	Wheat (πυρῶν)	c. 220-180 BC	Per medimnos	5 drachmas	1 st semester	<i>IGCyr014300; SEG 9. 37+41</i>
	Barley (κριθαι)		Per medimnos	2.5 drachmas	1 st semester	
	Cultivated hay (κάρφη ἡμέρά)		Per cartload	Illegible	1 st semester	
	Wild hay (ἄγρια)		Per cartload	Illegible	1 st semester	
	Straw (ἀχύρων)		Per net	Illegible	1 st semester	
	Wheat (πυρῶν)		Per medimnos	Illegible	2 nd semester	
	Barley (κριθαι)		Per medimnos	Illegible	2 nd semester	
	Cultivated hay (κάρφη ἡμέρά)		Per cartload	40 drachmas	2 nd semester	
	Wild hay (ἄγρια)		Per cartload	20 drachmas	2 nd semester	
Straw (ἀχύρων)		Per net	10 drachmas	2 nd semester		
DMI 23	Wheat (σπυροῖ)	2 nd BC	42000 medimnoi	Not mentioned	It indicates the quantities gathered in the 1 st semester	<i>IGCyr014400; SEG 9. 42</i>
	Barley (κριθαι)		24000 medimnoi	Not mentioned	It indicates the quantities gathered in the 1 st semester	
	Wheat (σπυροῖ)		Illegible	Not mentioned	2 nd semester	
	Barley (κριθαι)		Illegible	Not mentioned	2 nd semester	
DMI 24	Wheat (σπυροῖ)	2 nd BC	308 medimnoi	Not mentioned	It indicates the quantities gathered in the 1 st semester	<i>IGCyr014500; SEG 9. 43</i>
	Barley (κριθαι)		108 medimnoi	Not mentioned	1 st semester.	
	Cultivated hay (κάρφη ἡμέρά)		Per cartload	Illegible	1 st semester	
	Wild hay (ἄγρια)		Per cartload	Illegible	1 st semester	
	Straw (ἀχύρων)		Per net	Illegible	1 st semester	
	Wheat (σπυροῖ)		Not mentioned	Illegible	2 nd semester	
	Barley (κριθαι)		Not mentioned	Illegible	2 nd semester	
	Cultivated hay (κάρφη ἡμέρά)		Per cartload	Illegible	2 nd semester	
	Wild hay (ἄγρια)		Per cartload	Illegible	2 nd semester	
Straw (ἀχύρων)		Per net	Illegible	2 nd semester		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and
ephebic inscriptions

Insc.	Product	Date	Quantity/Unit	Price	Notes	Reference
DMI 25	Wheat (σπυροῖ)	290-280 BC	Per unit	9 drachmas	The most ancient inscription is divided into semesters. 1 st semester	<i>IGCyr063900; SEG 18. 743</i>
	Barley (κριθαῖ)		Per unit	Illegible	1 st semester	
	Cultivated hay (κάρφη ἡμέρα)		Per unit	32 drachmas	1 st semester	
	Wild hay (ἄγρια)		Per unit	20 drachmas	1 st semester	
	Straw (ἀχύρων)		Per net	Illegible	1 st semester	

Note. All inscriptions recorded wheat before barley unlike the inscriptions of the fourth cen. BC (8 inscriptions).

II. D. Fruits and their products

II. D. 1. Figs (σῦκα) (Fourth century BC)

Insc.	Date	Unit	Price	Notes	Reference
DMI 1	335 BC	One unit	1 drachmas	Complete inscription	<i>IGCyr011400; SEG 9. 11</i>
DMI 3	335 BC	Per unit	4 obols	Complete inscription	<i>IGCyr011500; SEG 9. 12</i>
DMI 4	335 BC	Per unit	4 obols	Complete and most detailed inscription	<i>IGCyr011600; SEG 9. 13</i>
DMI 5	335 BC	Not mentioned	Illegible	Semi-complete inscription	<i>IGCyr011700; SEG 9. 14</i>
DMI 6	335 BC	Not mentioned	4 obols	Complete inscription	<i>IGCyr011800; SEG 9. 15</i>
DMI 10	4 th BC	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr012500; SEG 9. 23</i>

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions

II. D. 2. Figs (σύκων) (Second/third centuries BC)

Insc.	Date	Unit	Price	Notes	Reference
DMI 31	3 rd BC	Illegible	Illegible	Incomplete inscription	<i>IGCyr013500; SEG 9. 33</i>
DMI 19	3 rd BC	Per unit	Illegible	1 st semester, incomplete inscription	<i>IGCyr013700; SEG 9. 35</i>
DMI 22	c. 220-180 BC	Per talent	Illegible	1 st semester, Incomplete inscription	<i>IGCyr014300; SEG 9. 37+41</i>
		Per talent	6 drachmas	2 nd semester, incomplete inscription	
DMI 24	2 nd BC	Per talent		1 st semester: complete record of products, lack of some units and prices	<i>IGCyr014500; SEG 9. 43</i>
		Not mentioned	Illegible	2 nd semester	
DMI 26	End 3 rd / beginning 2 nd BC	Per talent	Illegible	Probably from the 1 st semester. Incomplete inscription	<i>IGCyr014600; SEG 9. 44</i>

Note: August and September are the harvest time of figs in Cyrenaica. Why were figs recorded in the two semesters? Some production was probably traded in dried form.

II. D. 3. Almonds (ἀμυγδαλαί) (Third/second centuries BC)

Insc.	Date	Product	Unit	Price	Notes	Reference
DMI 18	3 rd BC	Almonds with soft shells (ἀμυσγελαῖν μαλακᾶν)	Per medimnos	Illegible	1 st semester, incomplete inscription	<i>IGCyr013400; SEG 9. 32</i>
		Almonds with hard shells (ἀμυσγελαῖν σκληρᾶν)	Per medimnos	Illegible		
DMI 31	3 rd BC	Almonds with soft shells (ἀμυσγελαῖν μαλακᾶν)	Illegible	Illegible	It is probably from 2 nd semester. Incomplete inscription	<i>IGCyr013500; SEG 9. 33</i>
DMI 19	3 rd BC	Almonds (ἀμυσγελαῖν)	Per unit	Illegible	1 st semester, incomplete inscription	<i>IGCyr013700; SEG 9. 35</i>
DMI 20	3/2 nd	Almonds with soft shells (ἀμυσγελαῖν μαλακᾶν)	Per medimnos	64 drachmas	1 st semester, incomplete inscription	<i>IGCyr013800; SEG 9. 36</i>
		Almonds with hard shells (σκληρᾶν)	Per medimnos	Illegible		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephobic inscriptions

Insc.	Date	Product	Unit	Price	Notes	Reference
DMI 22	c. 220- 180 BC	Almonds with soft shells (ἀμυσγελαῖν μαλακᾶν)	Per medimnos	15 drachmas	1 st semester, semi-complete inscription	<i>IGCyr014300; SEG 9. 37+41</i>
		Almonds with hard shells (ἀμυσγελαῖν σκληρᾶν)	Per medimnos	Illegible		
		Almonds with soft shells (ἀμυσγελαῖν μαλακᾶν)	Per medimnos	15 drachmas	2 nd semester, semi-complete inscription	
		Almonds with hard shells (σκληρᾶν)	Per medimnos	6 drachmas		
DMI 24	2 nd BC	Almonds with soft shells (ἀμυσγελαῖν μαλακᾶν)	Per medimnos	Illegible	1 st semester, incomplete inscription	<i>IGCyr014500; SEG 9. 43</i>
		Almonds with hard shells (ἀμυσγελαῖν σκληρᾶν)	Per medimnos	Illegible		
		Almonds with soft shells (ἀμυσγελαῖν μαλακᾶν)	Per medimnos	Illegible	2 nd semester, incomplete inscription	
		Almonds with hard shells (ἀμυσγελαῖν σκληρᾶν)	Per medimnos	Illegible		
DMI 26	End 3 rd beginning 2 nd BC	Almonds with soft shells (ἀμυσγελαῖν μαλακᾶν)	Per medimnos	Illegible	Incomplete inscription	<i>IGCyr014600; SEG 9. 44</i>
		Almonds with hard shells (ἀμυσγελαῖν σκληρᾶν)	Per medimnos	Illegible		
DMI 27	2 nd BC	Almonds with soft shells (ἀμυσγελαῖν μαλακᾶν)	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr107150</i>
		Almonds with hard shells (ἀμυσγελαῖν σκληρᾶν)	Not mentioned	Illegible		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions

II. D. 4. Olives and olive oil (Fourth century BC)

Insc.	Date	Product.	Unit	Price	Notes	Reference
DMI 1	335 BC	Olives (ἐλαῖαι)	Per unit	1 drachma 1 obol	Complete inscription	<i>IGCyr011400; SEG 9. 11</i>
		Olive oil (ἔλαιον)	Per unit	10 drachmas		
DMI 3	335 BC	Olives (ἐλαῖαι)	Per unit	1 drachma	Complete inscription	<i>IGCyr011500; SEG 9. 12</i>
		Olive oil (ἔλαιον)	Per unit	8 drachmas		
DMI 4	335 BC	Olives (ἐλαῖαι)	Per unit	1 drachma	Complete and most detailed inscription	<i>IGCyr011600; SEG 9. 13</i>
		Olive oil (ἔλαιον)	Per unit	8 drachmas		
DMI 5	335 BC	Olives/oil (ἐλαι)	Not mentioned	Illegible	Semi-complete inscription	<i>IGCyr011700 SEG 9. 14</i>
DMI 6	335 BC	Olives (ἐλαῖαι)	Not mentioned	4 obols	Complete inscription	<i>IGCyr011800; SEG 9. 15</i>
		Olive oil (ἔλαιον)	Not mentioned	10 drachmas	Complete inscription	

Insc.	Date	Product.	Unit	Price	Notes	Reference
DMI 10	4 th BC	Olives (ἐλαῖαι)	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr012500; SEG 9. 23</i>
		Olive oil (ἔλαιον)	Not mentioned	Illegible		
DMI 28	4 th BC	Olive oil (ἔλαιον)	Per unit	Illegible	Incomplete inscription	<i>IGCyr012800; SEG 9. 26</i>
DMI 30	4 th BC	Olive oil (ἔλαιον)	Missing	Missing	Incomplete inscription	<i>IGCyr013200; SEG 9. 30</i>
DMI 15	4 th BC	Olive oil (ἔλαιον)	Per unit	9 drachmas	Incomplete inscription	<i>IGCyr088200; SEG 9.18</i>
		Olives (ἐλαῖαι)	Per unit	Illegible		

Note: Olives were recorded ahead of oil in the fourth century BC, while oil was mentioned first in the third/second centuries BC.

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions

II. D. 5. Olive and olive oil (3rd/2nd BC)

Insc.	Date	Product	Unit	Price	Notes	References
DMI 19	3 rd BC	Olive oil (ἔλαιον)	Per unit	Illegible	2 nd semester, incomplete inscription	<i>IGCyr013700; SEG 9. 35</i>
DMI 20	2/3 rd BC	Olive oil (ἔλαιον)	Per smireus (σμιρέυς)	33 drachmas	1 st semester, incomplete inscription	<i>IGCyr013800; SEG 9. 36</i>
		Olives (ἐλαῖαι)	Per unit	Illegible		
		Olive oil (ἔλαιον)	Illegible	Illegible	2 nd semester	
		Olives (ἐλαῖαι)	Illegible	7 drachmas		
DMI 32	2 nd half of the 3 rd / 1 st half of 2 nd BC	Olive oil (ἐλαίω)	Per smireus (σμιρέυς)	7 drachmas	Incomplet inscription	<i>IGCyr014100; SEG 9. 39</i>
		Olives (ἐλαῖαν)	Per smireus (σμιρέυς)	2 drachmas		
DMI 22	c. 220-180 BC	Olive oil (ἐλαίω)	Per smireus (σμιρέυς)	Illegible	1 st semester, semi-complete inscription	<i>IGCyr014300; SEG 9. 37+41</i>
		Olive oil (ἐλαίω)	Per smireus (σμιρέυς)	8 drachmas	2 nd semester	
DMI 26	End of 3 rd / beginning of 2 nd BC	Olive oil (ἐλαίω)	Per smireus (σμιρέυς)	Illegible	Probably from 1 st semester, Incomplete inscription	<i>IGCyr014600; SEG 9. 44</i>
DMI 27	2 nd BC	Olive oil (ἐλαίω)	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr107150</i>

Note: Olive oil was recorded at the end of the lists of the fourth century BC after olives, while it changed to be in the middle of the third/second centuries BC lists.

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and
ephebic inscriptions

II. D. 6. Grapes and its products (Fourth century BC)

Insc.	Date	Product	Unit	Price	Notes	References
DMI 1	335 BC	Grapes (σταφυλά), under-guarantee, early (ψυθία)	Per unit	3 drachmas	Complete inscription	<i>IGCyr011400; SEG 9. 11</i>
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Per unit	2 drachmas 2,5 obols	It may be missing or deliberately omitting the unit.	
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Per unit	2 drachmas 2,5 obols		
		Grapes (σταφυλά), without guarantee, black (μέλαινα)	Per unit	2 drachmas		
		Raisins (σταφίς)	One	2 drachmas		
DMI 3	335 BC	Grapes (σταφυλά), under-guarantee, early (ψυθία)	Per unit	5 drachmas	Complete inscription	<i>IGCyr011500; SEG 9. 12</i>
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Per unit	4 drachmas		
		Grapes (σταφυλά) without guarantee, early (ψυθία)	Per unit	4 drachmas		
		Grapes (σταφυλά), without guarantee black (μέλαινα)	Per unit	3 drachmas		
		Raisins (σταφίς)	Per unit	1 drachma		
DMI 4	335 BC	Grapes (σταφυλά), under-guarantee, early (ψυθία)	Per unit	5 drachmas	Complete and most detailed inscription	<i>IGCyr011600; SEG 9. 13</i>
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Per unit	4 drachmas		
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Per unit	4 drachmas		
		Grapes (σταφυλά), without guarantee, black (μέλαινα)	Per unit	3 drachmas 2,5 obols		
		Raisins (σταφίς)	Per unit	1 drachma 1 obol		
DMI 5	335 BC	Grapes (σταφυλά), under-guarantee, early (ψυθία)	Not mentioned	Illegible	Semi-complete inscriptio	<i>IGCyr011700; SEG 9. 14</i>
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Not mentioned	4 drachmas		
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Not mentioned	Illegible		
		Grapes (σταφυλά), without guarantee, black (μέλαινα)	Not mentioned	Illegible		
		Raisins (σταφίς)	Not mentioned	4 obols		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions

Insc.	Date	Product	Unit	Price	Notes	References
DMI 6	335 BC	Grapes (σταφυλά), under-guarantee, early (ψυθία)	Not mentioned	4 drachmas	Complete inscription	<i>IGCyr011800; SEG 9. 15</i>
		Grapes (σταφυλά), under -guarantee, black (μέλαινα)	Not mentioned	3 drachmas		
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Not mentioned	3 drachmas		
		Grapes (σταφυλά), without guarantee, black (μέλαινα)	Not mentioned	2 drachmas 2,5 obols		
		Raisins (σταφίς)	Not mentioned	1 drachma		
DMI 7	2 nd half of the 4 th BC	Grapes (σταφυλά), under-guarantee, early (ψυθία)	Not mentioned	6 drachmas	Incomplete inscription	<i>IGCyr012100; SEG 9. 19</i>
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Not mentioned	Illegible		
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Not mentioned	Illegible		
DMI 8	2 nd half of the 4 th BC	Grapes (σταφυλά), under-guarantee, early (ψυθία)	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr012200; SEG 9. 20</i>
DMI 10	4 th BC	Raisins σταφίς	Not mentioned	1 drachma 2,5 obols	Incomplete inscription	<i>IGCyr012500; SEG 9. 23</i>
DMI 28	4 th BC	Grapes (σταφυλά), under-guarantee, early (ψυθία)	Per unit	Illegible	Incomplete inscription	<i>IGCyr012800; SEG 9. 26</i>
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Per unit	Illegible		
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Per unit	Illegible		
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Per unit	Illegible		
DMI 29	c. 1 st half of the 4 th BC	Grapes (σταφυλά), under-guarantee, early (ψυθία)	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr012900; SEG 9. 27</i>
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Not mentioned	Illegible		
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Not mentioned	Illegible		
		Grapes(σταφυλά), without guarantee black (μέλαινα)	Not mentioned	Illegible		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and
ephebic inscriptions

Insc.	Date	Product	Unit	Price	Notes	References
DMI 12	1 st half of the 4 th BC	Grapes (σταφυλά), under guarantee, early (ψυθία)	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr013000; SEG 9. 28</i>
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Not mentioned	Illegible		
		Grapes (σταφυλά), under -guarantee, black (μέλαινα)	Not mentioned	Illegible		
DMI 13	4 th BC	Raisins (σταφίς)	Per unit	3 drachmas 2 obols	Incomplete inscription	<i>IGCyr013100; SEG 9. 29</i>
		Grapes (σταφυλά), under -guarantee, early (ψυθία)	Per unit	8 drachmas		
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Per unit	Illegible		
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Per unit	Illegible		
DMI 30	4 th BC	Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr013200; SEG 9. 30</i>
		Grapes(σταφυλά), without guarantee, black (μέλαινα)	Not mentioned	Illegible		
DMI 14	4 th BC	Raisins (σταφίς)	Per unit	Illegible	Incomplete inscription	<i>IGCyr088100; SEG 48.2051</i>
		Grapes (σταφυλά), under-uarantee, early (ψυθία)	Per unit	Missing		
DMI 15	4 th BC	Grapes (σταφυλά), under -guarantee, early (ψυθία)	Illegible	Illegible	Incomplete inscription	<i>IGCyr088200; SEG 9. 18</i>
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Per unit	3,5 drachmas		
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Illegible	Illegible		
		Grapes (σταφυλά), without guarantee, black (μέλαινα)	Illegible	Illegible		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephobic inscriptions

Insc.	Date	Product	Unit	Price	Notes	References
DMI 16	1 st half of the 4 th BC	Grapes (σταφυλὰ), under-guarantee, early (ψυθία)	Missing	Illegible	Incomplete inscription	<i>IGCyr088300</i> ; <i>SEG</i> 48.2053
		Grapes (σταφυλὰ), without guarantee, early (ψυθία)	Missing	Illegible		
		Grapes (σταφυλὰ), under-guarantee, black (μέλαινα)	Missing	Illegible		
		Grapes (σταφυλὰ), without guarantee, black (μέλαινα)	Per unit	3 drachmas		
DMI 17	1 st half of the 4 th BC	Grapes (σταφυλὰ), without guarantee, early (ψυθία)	Per unit	Missing	Unpublished and Incomplete	<i>IGCyr012910</i>
		Grapes (σταφυλὰ), without guarantee, black (μέλαινα)	Per unit	Missing		

II. D. 7. Grape and its products (Third/second centuries BC)

Insc.	Date	Product	Unit	Price	Notes	Reference
DMI 18	3 rd BC	Raisins (σταφίδω)	Not mentioned	Missing	1 st semester, incomplete inscription	<i>IGCyr013400</i> ; <i>SEG</i> 9. 32
DMI 31	3 rd BC	Wine (οἶνος)	Illegible	Illegible	Incomplete inscription	<i>IGCyr013500</i> ; <i>SEG</i> 9. 33
		Grapes (σταφυλὰ), under-guarantee	Illegible	Illegible		
		Grapes (σταφυλὰ), without guarantee	Illegible	Illegible		
DMI 19	3 rd BC	Raisins (σταφίς)	Per unit	20 drachmas	1 st semester, incomplete inscription	<i>IGCyr013700</i> ; <i>SEG</i> 9. 35
		Grapes (σταφυλὰ), under-guarantee, early (ψυθία)	Per unit	Illegible	2 nd semester	
		Grapes (σταφυλὰ), under-guarantee, black (μέλαινα)	Per unit	Illegible		
		Grapes (σταφυλὰ), without guarantee, black (μέλαινα)	Per unit	Illegible		
		Grapes (σταφυλὰ), without guarantee, black (μέλαινα)	Per unit	Illegible		
		Wine (οἶνω)	Per smireus (σμιρεῦς)	40 drachmas	σμιρεῦς is a local measurement of wine and oil	

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephobic inscriptions

Insc.	Date	Product	Unit	Price	Notes	Reference
DMI 20	3 rd /2 nd BC	Wine (οἶνω)	Per smireus (σμιρεὺς)	Illegible	1 st semester, incomplete inscription	<i>IGCyr</i> 013800; <i>SEG</i> 9. 36
DMI 22	c.220-180 BC	Wine (οἶνω)	Per smireus (σμιρεὺς)	Illegible	1 st semester	<i>IGCyr</i> 014300; <i>SEG</i> 9. 37+41
		Raisins (σταφίδος)	Per talent	Illegible	1 st semester	
		Wine (οἶνω)	Per smireus (σμιρεὺς)	7 drachmas	2 nd semester, incomplete inscription semester	
		Raisins (σταφίδος)	Per talent	7 drachmas	2 nd semester	
DMI 24	2 nd BC	Wine (οἶνω)	Per smireus (σμιρεὺς)	Illegible	1 st semester, complete record of products, lack of some units and prices.	<i>IGCyr</i> 014500; <i>SEG</i> 9. 43
		Raisins (σταφίδος)	Per talent	Illegible		
		Wine (οἶνω)	Per smireus (σμιρεὺς)		2 nd semester, complete record of products, lack of some units	
		Raisins (σταφίδος)	Not mentioned Probably talent	Illegible		
DMI 26	End of the 3 rd / beginning of 2 nd BC	Wine (οἶνω)	Per smireus (σμιρεὺς)	Illegible	Probably from 1 st semester.	<i>IGCyr</i> 014600; <i>SEG</i> 9. 44
DMI 27	2 nd BC	Wine (οἶνω)	Not mentioned	Illegible	Incomplete inscription	<i>IGCyr</i> 107150

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and
ephebic inscriptions

Insc.	Date	Product	Unit	Price	Notes	Reference
DMI 25	290-280 BC	Wine (οἶνω)	Per smireus (σμιρεὺς)	40 drachmas	1 st semester, the most ancient record that is divided into semesters. The earliest inscription recorded wine. Incomplete inscription	<i>IGCyr063900</i> ; <i>SEG</i> 18.743
		Raisins (σταφίς)	Per unit	Illegible		
		Grapes (σταφυλά), under-guarantee, early (ψυθία)	Per unit	Illegible		
		Grapes (σταφυλά), under-guarantee, black (μέλαινα)	Per unit	Illegible		
		Grapes (σταφυλά), without guarantee, early (ψυθία)	Per unit	Illegible		
		Grapes (σταφυλά), without guarantee, black (μέλαινα)	Per unit	Illegible		

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephebic inscriptions

II. E. Epigraphic evidence of the ephebate at Cyrenaica based on *IGCyr* and *IRCyr* projects.

II. E. 1. Ephebes (ἔφηβοι) or Triakatiarches (τριακάτιοι) at Cyrenaica

The word forms	Number	location	Date	References
τριακάτιοις	0	Cyrene	345 BC	<i>IGCyr</i> 084000
τριακάτιων	0	Probably Cyrene	330-300 BC	<i>IGCyr</i> 113900
τριακάτιοι	9	Cyrene	Beginning of 2 nd cen. BC	<i>IGCyr</i> 015200
τριακάτιοις	12	Cyrene	End 2 nd / Beginning 1 st cen. BC	<i>IGCyr</i> 104000
τριακάτιοις	0	Cyrene	2 nd cen. BC	<i>IGCyr</i> 103900
οἱ ἔφηβεύσαντες	Incomplete list, 45?	Ptolemais	4-3 BC	<i>IRCyr</i> .P.251
ἔφηβοι	14	Ptolemais	2 nd half of 1 st cen. BC or first half of 1 st cen. AD	<i>GVCyr</i> 035
τριακάτιοι	0	Cyrene	1 st cen. BC/ 1 st cen. AD	<i>IRCyr</i> .C.452 (UN)
ἔφηβοι	60	Cyrene	AD 161-169	<i>IRCyr</i> .C.115
ἔφηβοι	60	Cyrene	AD 172-175	<i>IRCyr</i> .C.126.1
ἔφηβοι	60	Cyrene	AD 223-224	<i>IRCyr</i> .C.133

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and ephobic inscriptions

II. E. 2. Director of epebes (ἐφηβαρχος; τριακατίαρχος and ἀρχεφίβος)

The word forms	Number	Location	Date	References
λοχαγοὶ πελταστῶν συμμερῖται τοῖς τριακατίοις	20, assuming 10 of these were leaders of epebes?	Cyrene	345 BC	<i>IGCyr</i> 084000
τριακατίαρχαι	17	Cyrene	345 BC	<i>IGCyr</i> 084000
τριακατιαρχέντας	4	Cyrene	Beginning of 2 nd cen. BC	<i>IGCyr</i> 015200
	3 leaders of epebes, 2 leaders of elderly and 1 cavalry commander	Cyrene	2 nd cen. BC	<i>IGCyr</i> 103900
	One with reliefs on two faces: on the front, a figure driving a quadriga, on the left face, a boy leading a horse	Cyrene	1 st cen. BC	<i>IRCyr.C.</i> 698
τριακατιαρχέντας	4	Cyrene	1 st cen. BC	<i>IRCyr.C.</i> 447
ἐφηβαρχούντων	3	Ptolemais	4-3 BC.	<i>IRCyr.P.</i> 251
ἐφηβαρχούντων	2	Ptolemais	1 st cen. BC / 1 st cen. AD	<i>IRCyr.P.</i> 252 (UN)
ἐφηβάρχουντων	2 or more	Ptolemais	1 st cen. BC. - ?	<i>IRCyr.P.</i> 253 (UN)
ἐφηβαρχούντων	2 or more	Ptolemais	1 st cen. BC- 1 st cen. AD	<i>IRCyr.P.</i> 254 (UN)
τριακατίαρχαι	2 or more	Cyrene	Augustan	<i>IRCyr.C.</i> 450 (UN)
τριακατίαρχαι	2 or more	Cyrene	1 cen. BC/1 st cen. AD	<i>IRCyr.C.</i> 451
τριακατιαρχέντας	3/4? With relief of a horse's head on the reverse face.	Cyrene	3-28 AD	<i>IRCyr.C.</i> 114
ἐφήβαρχος	1	Ptolemais	2 nd cen. AD	<i>IRCyr.P.</i> 217
ἐφήβαρχοι	1	Ptolemais	AD 128-138	<i>IRCyr.P.</i> 56
ἐφηβαρχος; τριακατίαρχας	1 complete list. Using ἐφηβαρχος first may to identify the term τριακατίαρχας. This may indication that the latter were not known in this century.	Cyrene	AD 161-169	<i>IRCyr.C.</i> 115

Appendix II: Tables of the recorded products in the *demiourgoi* inscriptions in the 4th, 3rd and 2nd centuries BC and epehebic inscriptions

The word forms	Number	Location	Date	References
ἐφηβαρχέντων	2	Cyrene	AD 172-175	<i>IRCyr.C.126.1</i>
ἀρχεφήβου	1	Cyrene	2-3 cen. AD	<i>IRCyr.C.549</i>
ἐφηβαρχούντων	3 (complete list)	Cyrene	AD 223-224	<i>IRCyr.C.133</i>

Note: The director of the epehebes at Athena known by Kosemtes (κοσμητής) in Greek period (Miller 1991:140-145)

II. E. 3. Commander of cavalry (ἀπορτυάζων, *aporutiazon*) attested in epehebic inscriptions.

The word forms	Number with a note	location	Date	References
ἀπορτυάζοντα	1 cavalry commander with 4 names of directors of epehebes and 4 gymnasiarchs and 9 epehebes	Cyrene	Beginning of 2 nd cen. BC.	<i>IGCyr015200</i>
ἀπορτυάζοντα	1 cavalry commander with 5 names of gymnasiarchs and unidentified number of epehebes	Cyrene	2 nd cen. BC	<i>IGCyr103900</i>
ἀπορτυάζοντα	1 cavalry commander with 4 names of gymnasiarchs and 12 of epehebes	Cyrene	End of 2 nd or beginning of 1 st cen. BC	<i>IGCyr104000</i>
ἀπορτυάζοντα	1 cavalry commander with 4 names of directors of epehebes, about 3/4 gymnasiarchs.	Cyrene	1 st cen. BC	<i>IRCyr. C.447</i>
ἀπορτυάζοντα	1 with 4 names of directors of epehebes, about 3/4 gymnasiarchs and list of about 78 epehebes name. Also, a relief of a horse's head on the reverse face.	Cyrene	AD 3-28	<i>IRCyr.C.114</i>
ἐπαρχος	1, he was also ἀγωνοθέτης president of games	Ptolemais	2 nd /3 rd cen. AD	<i>IRCyr.P.318.</i>

Note: the teaching staff number and organisation of *IRCyr. C. 447* and *IRCyr.C.114* is quite similar to those of *IGCyr015200*.

Appendix III: Published and New industrial features connected to wine production in Cyrenaica

III. A. Collection of previous data on industrial features connected to wine production in Cyrenaica

Site	Amph. 1 (H; MR)	Amph. kiln	Press	Tread. Fl.	Vat	Collec. Vat	Dolia	Date	References
Euesperides	✓	✓						Hellenistic	Buzaian and Lloyd 1996; Göransson 2007.
Bernice		✓			18			Mid Roman	Lloyd 1977: 143-4, 146-8, 214
Hadrianopolis		✓							Jones and Little 1971: 53-67
Teucheira	✓	✓	✓	✓	8	2		Mid Roman	Bentaher 1994; Buzaian 2000; Wilson 2001
Teucheira				✓	3	✓		c. 3 rd cen. AD	Wilson 2001
Ptolemais (the Colonnaded Palace)					3			Early/mid Roman	Kraeling 1962: 136; Wilson 2001.
Ptolemais					7			?	Zelazowski 2012: 141, 142,152.
Ptolemais (Kraeling's villa)					6			Mid Roman	Kraeling 1962: 136; Wilson 2001
Apollonia	✓	✓			11			?	Wilson 200; Buzaian 2000
Noat 1 (West of Apollonia)			✓	✓	15		23	Mid Roman	Hesein 2014: 218
Cape of Phycus (el- Mamluh) (West of Apollonia)	✓	4						Mid Roman	Hesein 2014: 178, 268
Mahel Mael	✓	3	✓					Mid Roman	Hesein 2014: 178, 269

Appendix III: Published and New industrial features connected to wine production in Cyrenaica

Site	Amph. 1 (H; MR)	Amph. kiln	Press	Tread. Fl.	Vat	Collec. Vat	Dolia	Date	References
Aptouchou (el-Hanya)	✓	3						Mid Roman	Hesein 2014: 115, 178
Balagrae (al-Beida)			3		3			Early/mid Roman	(Buzaian and Bentaher 2006; Bentaher and Buzaian 2010)
Balagrae (al-Beida)			2		✓			?	Never been reported
Gasrin el-Giamel, (al-Beida)			4		16			c. 4 th cen. AD	Catani 1976; 1978; 1998; Stucchi 1975: 423, 523, 531, 547; Wilson 2002
Erythron (Lathrun)	✓								Mazou and Capelli (2011:73-6)
Limnias (Lamluda)			✓	✓			20	Late Roman	Antonelli (2014: 71-2); Buzaian (2009)
Wadi Senab in Wadi el-Kuf (15 km Southwest of al-Beida)			✓					AD 4 th cen. AD?	Gambini (1974-75: 277-86)

Appendix III: Published and New industrial features connected to wine production in Cyrenaica

III. B. Collection of [unpublished] data on industrial features connected to wine production in Cyrenaica

Site	Amphora 1	Amphora kiln	Press	Tread.Fl.	Vat	Collec. Vat	Dolia	Date
Teucheira	✓			✓	5			Mid Roman; Roman?
Siret Wardama, (southwest of Cyrene)				✓		2		Roman?
Artamis				✓				Roman?
Caf al-Mdas, north of Cyrene				✓		2		Roman?
Satllonah, south of al-Beida 8 km				✓		2		Roman?
Ijnan Ibrahim (north of al-Beida)			✓				9	Roman?
Zawiet Tert, east of Cyrene			✓					Roman?
Al-Athrun (west of the Western Church)			✓					Roman?
Al-Athrun				✓		✓		Roman?
Sidi Sharaf, east of Cyrene.)			✓	✓				Roman?
Balagrae (al-Beida)			✓					Early/Mid Roman
Got Giaras in Wadi el-Kuf (16 km southwest of al-Beida)			✓					Roman?
Qasr al-Hammam West of al-Hnia					3			Roman?

Appendix IV: Measurements, Currency and Numbers used in the research

IV.A. Dry product measurements:

Unit	Greek or Latin name	Equal	Equivalent in modern
<i>Talent</i> (Greek)	τάλαντον	About a <i>medimnos</i>	Attic <i>talent</i> (c. 27.40kg)
<i>Medimnos</i> (Greek)	μέδιμνος	48 <i>choinikes</i> (χοϊνικες)	c.27.40 kg
<i>Modius</i> (Roman)	Modius	1/6 part of a <i>medimnos</i>	c.4.5 kg (27.40 ÷ 6), See: Cicero (<i>Verrem</i> II. 3.116.) 90,000 <i>medimnoi</i> equals 540,000 <i>modii</i> . This can be calculated as following: 90,000 <i>medimnoi</i> × 27 kg = 2,430,000 and 540,000 <i>modii</i> × 4.5 = 2,430,000. (Both equal 2,430 tonnes).

IV.B. Liquids measurements:

Unit	Greek or Latin name	Equal	Equivalent in modern measurement
<i>Smireus</i> (Greek)	σμιρεύς	Has not identified yet	A Cyrenaican Hellenistic unit. <i>Smireus</i> (σμιρεύς) is probably a local name of a local amphora or a name of animal skin used for carrying wine and oil (For archaeological evidence of using animal skins for wine see Brun (2003: 100, 101).
<i>ceramia</i> (Greek)	κεράμια (single is κεράμον)	An amphora	It used for carrying liquids. c. 75 litres as I have suggested in chapter IV above based on evidence from Lamluda
Metreta (Latin)	Metreta (μετρητής)	9 gallons in each (9 × 4.54609 L)	c.40 L

Appendix IV: Measurements, Currency and Numbers used in the research

IV.C. Currency:

Unit	Greek/Latin name	Equivalent
Talent (Greek)	τάλαντον	60 minai (6,000 drachmas)
Mina (Greek)	μνᾶ	100 drachmas
Drachma (Greek)	δραχμή	6 obols
Obol (Greek)	ὀβολός	1/6th part of a δραχμή or 4 tetartemorions
denarius (Roman)	dēnārius	Between 6.81- 3.41. grams (267 BC- AD 274)

IV.D. Numbers used in the inscription DMI 23 and others:

Greek letter	Common numeral value	Cyrenaican numeral value	Note	Reference
β (beta)	2	2	According to the <i>glyph</i> numeral system.	
δ (delta)	4	4	According to the <i>glyph</i> numeral system.	
γ (gamma)	3	3	According to the <i>glyph</i> numeral system.	
ζ (zeta)	7	7	According to the <i>glyph</i> numeral system.	
ϣ (sampi)	900 according to the <i>alphabetic</i> numeral system.	1,000 according to the <i>acrophonic</i> numeral system	This letter is used to represent number 900 in different Greek regions before the classic period. But in Cyrenaica, it is used to represent number 1000 and its use continued to 2 nd cen. BC.	Profs. G. Shipley and C. Dobias-Lalou (pers. comm.); <i>IGCyr</i> 014100, 014300, 014400, 014500
χ (chi)	1,000 from χ(είλιοι) according to the <i>acrophonic</i> numeral system	600 according to the <i>glyph</i> numeral system.	The letter χ is used at Cyrenaica to represent currency in the archaic and classical period. It used for 20 drachmas and 1000 mines. χ is also used for 600 in the <i>demiourgoi</i> inscriptions for products' quantity.	Prof. C. Dobias-Lalou (pers.comm.); <i>IGCyr</i> 014400

Appendix IV: Measurements, Currency and Numbers used in the research

Greek letter	Common numeral value	Cyrenaican numeral value	Note	Reference
μ (mu)	10,000 according to the <i>acrophonic</i> numeral system	The same value of other regions.	From μύριοι or μυριάδες equivalents to ten thousand (singular is ἡ μῶριάς, ἄδος).	

Bibliography

Ancient Sources:

Abu al-Fida (ابو الفدا) (1850) *Taqueem al-buldan* (تقويم البلدان) (in Arabic). Available at:
<http://ia902508.us.archive.org/31/items/taqwym-albuldan/taqwym-albudan.pdf>,

last accessed on 13th December 2017.

Advanced Papyrological Information System (APIS). Available at:

<http://papyri.info/>; <http://papyri.info/ddbdp/o.bu.njem.4>,

last accessed on 30th May 2018.

Aelian. *Characteristics of Animals*, III. 2; XIV. 10). Available at:

<https://archive.org/details/L446AelianCharacteristicsOfAnimalsI15> ;

<https://archive.org/details/L449AelianCharacteristicsOfAnimalsIII1217>,

last accessed on 11 October 2016.

Aeschylus. *Suppliant Women*. Available at:

[http://perseus.uchicago.edu/perseus-](http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=GreekFeb2011&query=Aesch.%20Supp.%20291&geti)

[cgi/citequery3.pl?dbname=GreekFeb2011&query=Aesch.%20Supp.%20291&getid=0](http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=GreekFeb2011&query=Aesch.%20Supp.%20291&getid=0),

last accessed on 2nd June 2017.

Al-Aiashe. Abo Salem (العياشي) (2006). *Aiashian Trip* (الرحلة العياشية) 1661-63. Vol.1.

Available in a pdf (in Arabic) at:

https://archive.org/details/1111111_392,

last accessed on 2nd February 2016.

Al-Idrisi (الإدريسي) (1099-1164). *Kitab Nuzhat Al Mushtaq fi Ikhtiraq Al Afaaq* (كتاب

نزهة المشتاق في اختراق الافاق) Vol. 1, (in Arabic). Available at:

<https://ia600204.us.archive.org/13/items/nuzht-almushtaq/nuzht-almushtaq.pdf>,

last accessed on 10th March 2017.

Anthologia Graeca. Available at:

<https://cramberepetita.com/tag/anthologia-graeca/>,

last accessed on 26 May 2018.

Apicius. *Cookery and Dining in Imperial Roman*. Available at:

kitchenproject.com/history/apicius/Apicius.pdf,

last accessed on 2nd January 2016.

Areteus. *Treatment of Acute Diseases*. Available at: [Perseus Under Philologic: Aret.](#)

[CA](#),

last accessed on 6th January 2016.

- Aristides. *Παναθηναϊκός in Lipsiae, libraria Weidmannia*. W. Dindorf and G. Reimer, the University of California: 1829.
- Aristophanes. *Knights*. Available at:
<http://perseus.uchicago.edu/perseuscgi/citequery3.pl?dbname=GreekFeb2011&query=Ar.%20Eq.&getid=0>,
 last accessed on 10th January 2017.
- Aristophanes. *Peace*. Available at: <http://perseus.uchicago.edu/perseuscgi/citequery3.pl?dbname=GreekFeb2011&query=Ar.%20Pax&getid=1>,
 last accessed on 10th March 2017.
- Aristophanes. *Plutus*. Available at:
<http://perseus.uchicago.edu/perseuscgi/citequery3.pl?dbname=GreekFeb2011&query=Ar.%20Plut.&getid=1>,
 last accessed on 10th January 2017.
- Aristotle. *Athenian Constitution*. Available at: <http://perseus.uchicago.edu/perseuscgi/citequery3.pl?dbname=GreekFeb2011&getid=1&query=Arist.%20Ath.%20Pol.%207>,
 last accessed on 12th April 2016.
- Arrian. *The Anabasis of Alexander*. Available at:
<https://ia800205.us.archive.org/34/items/cu31924026460752/cu31924026460752.pdf>,
 last accessed on 17th March 2016.
- Athenaeus. *The Deipnosophists*. Translation by Charles Burton Gulick (1927-1941). London, W. Heinemann.
- Athenaeus. *The Learned Banqueters*. Books I- III. 106e. Translated by S. Douglas Olson (2006). Cambridge Mass; London: Harvard U.P., 11.
- Attic inscriptions online*. Available at: <https://www.atticinscriptions.com/>;
<https://www.atticinscriptions.com/inscription/RO/26>
 last accessed on 15th May 2018.
- Caesar. Julius. *The Civil War*. New edition by Jonathan Prag (2005), Barnes & Noble Library of Essential Reading.
- Callimachus. *Aetia, the Victory of Berenice II*. Book III. Available at:
<http://dcc.dickinson.edu/callimachus-aetia/book-3/victory-berenice>,
 last accessed on 1st October 2016.

- Cicero. *pro Lege Manilia (De Imperio Cn. Pompei)*. Available at:
<http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=LatinAugust2012&query=Cic.%20Man.&getid=1>,
 last accessed on 17th December 2017.
- Cicero. *Verrem*. Available at: <http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=LatinAugust2012&getid=1&query=Cic.%20Ver.%202.3.116>,
 last accessed on 17th December 2017.
- Claudii Ptolemaei. *Geographia*, IV. Available at:
http://www.wilbourhall.org/pdfs/ptolemy/Claudii_Ptolemaei_GeographiaVOL_I.pdf,
 last accessed on 18th December 2017.
- Demosthenes. *Orationes*. Available at: [Perseus Under Philologic: Dem. 20.40](#),
 last accessed on 15th December 2015.
- Diodorus of Sicily. *The Bibliotheca Historica*. Books iii. Translated by C. H. Oldfather (1967). Loeb Classical Library. William Heinemann LTD, Cambridge.
- Diodorus of Sicily. *The Bibliotheca Historica*. Book xiii. Available at:
<http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=GreekFeb2011&getid=0&query=Diod.%20Sic.%2013.82.1>,
 last accessed on 13th April 2017.
- Dobias-Lalou, Catherine. *Inscriptions of Greek Cyrenaica in collaboration with Alice Bencivenni, Hugues Berthelot, with help from Simona Antolini, Silvia Maria Marengo, and Emilio Rosamilia; Dobias-Lalou, Catherine. Greek Verse Inscriptions of Cyrenaica in collaboration with Alice Bencivenni, with help from Joyce M. Reynolds and Charlotte Roueché*. Bologna: CRR-MM, Alma Mater Studiorum Università di Bologna, 2017. ISBN 9788898010684,
<http://doi.org/10.6092/UNIBO/IGCYRGVCYR>.
- Expositio Totius Mundi et Gentium*. Introduction, texte critique. Traduction, notes et commentaire, par Jean Rougé, Paris: Éditions du Cerf (1966).
- Euripides. *Helen*. Available at: [Perseus Under Philologic: Eur. Hel. 167](#),
 last accessed on 20th January 2016.
- Hermippus. *Comic Testimonia and Fragments*. Available at:
<https://www.loebclassics.com/search?defaultView=loebSearch&pageSize=10&q=ivory&sort=relevance&t1=author.hermippus>,
 last accessed on 3rd January 2016.

- Herodotus. *The Histories*, Books iii-iv. Translated by A. D. Godley (1950). Loeb Classical Library. William Heinemann LTD, Cambridge.
- Herodotus. *The Histories*. Available at: [Perseus Under Philologic: Hdt. 2.96](#), last accessed on 20th January 2016.
- Hesiod. *Shield of Heracles*. Available at: <http://perseus.uchicago.edu/perseus/cgi/citequery3.pl?dbname=GreekFeb2011&query=Hes.%20Sc.%20300&getid=0>, last accessed on 16th June 2017.
- Homer. *The Odyssey*, IV. Translated by Robert Fagles (2004), London: Penguin.
- Hyginus. *Astronomica 2, Fables 2.18-43*. Available at: [Classical E-Text: HYGINUS, ASTRONOMICA 2 - Theoi ...](#), last accessed on 2nd August 2016.
- Inscriptiones Craecae*, I-XIV. Berlin, 1903. Available at: <http://pom.bbaw.de/ig/search?qString=II&Suche=Suche>, last accessed on 15th August 2017.
- Inscriptiones Graecae*, IG II² 1672. The inscription of Eleusis. Available at: <https://epigraphy.packhum.org/text/3897>, last accessed on 14th May 2018.
- Inscriptiones Creticae*. Available at: <http://anemi.lib.uoc.gr/metadata/2/2/0/metadata-203-0000001.tkl>, last accessed on 10th November 2017.
- Josephus, Flavius. *Against Apion, II*. Available at: [Perseus Under Philologic: Joseph. Ap. 2.33](#), last accessed on 3rd February 2016.
- Marcianus of Heraclea. *Marciani Periplus, Menippi Periplus fragmentum quod Artemidori nomine ferebatur, Periplus qui Stadiasmus magni maris inscribi solet fragmentum. Graece et latine, edidit, addita Doddvelli dissertatione, scripturis codicum, Hoeschelii, Hudsoni, aliorum et suis notis S.F. Guil. Hoffman*. Lipsiae, C.L. Fritschii, 1841. Available at: [Marciani Periplus: Menippi periplus fragmentum quod ...](#), last accessed on 1st May 2017.
- Oppian. *Cyngeteica or the Chase in Colluthus Tryphiodorus*. Available at: [Oppian, Colluthus, Tryphiodorus, with an English translation by A.W. ...](#), last accessed on 20th May 2017.
- Pausanias. *Description of Greece* Book VI. Translated by: W.H.S. Jones (1935). Loeb Classical Library. Harvard University Press, London.

- Pausanias. *Description of Greece*. Available at: <http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=GreekFeb2011&query=Paus.%208.15.3&getid=0>, last accessed on 11th January 2016.
- Pindar. *The Odes of Pindar*. Translated by J. Sandys. (1915). Available at: <https://ryanfb.github.io/loebolus-data/L056.pdf>, last accessed on 10th October 2016.
- Plato. *Critias*. Available at: <http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=GreekFeb2011&query=Pl.%20Criti.%20115b&getid=0>, last accessed on 12th January 2016.
- Pliny. *Natural History*. Libri iii-vii. Translated by: H. Rackham(1969). Loeb Classical Library. William Heinemann LTD, Cambridge.
- Polemon Periegetae or Polemon of Athens. *Polemonis Periegetae Fragmenta collegit: digessit, notis auxit L. Preller. Sumtibus Guilielmi Engelmanni*. Available at: <https://babel.hathitrust.org/cgi/pt?id=loc.ark:/13960/t4sj2pv56;view=1up;seq=66>, last assessed on 12th January 2017.
- Plutarch. *Cato the Younger*. Available at: <http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A2008.01.0014%3Achapter%3D56>, last accessed on 17th December 2017.
- Plutarch. *Pompey*. Available at: <http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A2008.01.0058%3Achapter%3D25%3Asection%3D1>, last accessed on 17th December 2017.
- Polybius. *Histories*, V. Available at: <http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=GreekFeb2011&query=Polyb.&getid=1>, last accessed on 10th September 2016.
- Procopius. *On Buildings*. Translated by: H. B. Dewing (1940). Loeb Classical Library. William Heinemann LTD, Cambridge.
- Pseudo-Skylax. *Periplous the Circumnavigation of the Inhabited World*. Translated by G. Shipley (2011). Bristol Phoenix Press: Exeter.
- Quintus Horatius Flaccus. *Carmina*. Available at: <http://data.perseus.org/citations/urn:cts:latinLit:phi0893.phi001.perseus-eng1:1.1>, last accessed on 16th February 2016.

- Sallust. *Bellum Iugurthinum*. Translated by W. C. Summers (1902). Cambridge, University Press.
- Sophocles. *Electra*. Available at: <http://perseus.uchicago.edu/perseus/cgi/citequery3.pl?dbname=GreekFeb2011&getid=1&query=Soph.%20El.%20680>, last accessed on 20th March 2017.
- Stephani Byzantii Ethnorum Quae Supersunt*. (ed.) A. Meineke, (1849). Available at: https://books.google.co.uk/books?id=sZs-AAAACAAJ&printsec=frontcover&redir_esc=y#v=onepage&q&f=false, last accessed on 2nd May 2017.
- Supplementum Epigraphicum Graecum* (1938) (Inscriptions of Cirenaica). Vol. IX, Lugduni Batavorum; Other volumes. Available at: [Supplementum Epigraphicum Graecum \[SEG\] - PHI Greek Inscrip.](#), last accessed on 20th July 2016.
- Synesius. *The Letters of Synesius of Cyrene*. Also available at: [Synesius' texts - Livius](#) or http://www.livius.org/su-sz/synesius/synesius_letters.html, last accessed on 27th May 2016.
- Strabo. *The Geography of Strabo*, Book 17. Translated by H. L. Jones (1949). Loeb Classical Library. William Heinemann LTD, Cambridge.
- Tacticus. *Poliorcétique Enée le Tacticien; texte établi par Alphonse Dain*. Traduit et annoté par Anne-Marie Bon (1967). Belles Lettres, Paris.
- The Digest or Pandects of Justinian*. Available at: <http://www.thelatinlibrary.com/justinian/digest19.shtml>, last accessed on 10th April 2016.
- Thucydides. *The Peloponnesian War*. Book IV. Available at: <http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.01.0200>, last accessed on 4th November 2016.
- Theophrastus. *Enquiry into Plants and minor works on odours and weather signs*. Translated by A. F. Hort (1966), Loeb Classical Library, William Heinemann, Harvard University.
- Xenophon. *Cyropaed*. Book VI. Available at: <http://perseus.uchicago.edu/perseus/cgi/citequery3.pl?dbname=GreekFeb2011&query=Xen.%20Cyr.&getid=1>, last accessed on 7th October 2016.

Secondary Sources:

- Abdussaid, A., Abdulnabi, W., Guider, R., Hasson, A. and Elmzini, A. (1984). *Research Project in the National Park of Al-Kuf* (in Arabic). The Arab Centre for the Studies of Dry Zones and Arid Lands: Damascus.
- Akram, F., Milad, I. S., Abdulkarim, A. A. and Ganem, M. (2008). 'Wool characteristics of Libyan Barbary sheep in north-eastern Libya: I. fiber diameter and staple length'. *Livestock Research for Rural Development* 20 (8), Article 118: pp 4. Available at: <http://www.lrrd.org/lrrd20/8/akra20118.htm>, last accessed on 15th August 2016.
- Allan, J. A., McLachlan, K. S. and Penrose, E. T. (1973). *Libya: Agriculture and Economic Development*. London: Frank Cass.
- Alston, R. (2004). 'The economic history of the Late Antique East'. *Ancient West and East* 3.1: 124-36.
- Amemiya, T. (2007). *Economy and Economics of Ancient Greece*. London and New York: Routledge.
- Applebaum, S. (1979). *Jews and Greeks in Ancient Cyrenaica*. E. J. Brill, Leiden.
- Archibald, Z. H., Davies, J. K and Gabrielsen, V. (eds.). (2005). *Making, Moving and Managing: the New World of Ancient Economies, 323-31BC*. Oxford: Oxbow Books.
- Asciutti, Valentina (2004). *The Silphium Plant: Analysis of Ancient Sources*. Durham theses, Durham University. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk/3166/>, Last accessed on 3rd January 2016.
- Attiya, B. Stucchi, S., Bacchielli, L. Luni, M., Gambini, W. and Purcaro, V. (1974-1975). 'Prima escursione nello Uadi Senab e nel Got Giaras'. *Libya Antiqua*, 11-12: 251-96.
- Austin, M. M. (2006). *The Hellenistic World from Alexander to the Roman Conquest: a Selection of Ancient Sources in Translation*. 2nd edition, Cambridge: Cambridge University Press.
- Bailey, D. M. (1985). 'The lamps of Sidi Khrebish, Benghazi (Berenice): imported and local products'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Papers I, BAR International Series 236: 195-204.

- Barker, G. W. W. (1979). 'Economic life at Berenice'. In J. A. Lloyd (ed.) *Excavations at Sidi Khrebish Benghazi (Berenice)*. Vol. 2 (Supplements to Libya Antiqua 5), Tripoli: 1-49.
- Barker, G. W. W. (1985). 'Agricultural organisation in classical Cyrenaica: the potential of subsistence and survey data'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Papers I, BAR International Series 236: 121-34.
- Barker, G., Gilbertson, D. D., Hunt, C. O. and Mattingly, D. (1996). 'Romano-Libyan agriculture: integrated models'. In G. Barker, (ed.), *Farming the Desert: the UNESCO Libyan Valleys Archaeological Survey*. Volume One: United Nations Educational Scientific and Cultural Organization: 265-90.
- Bates, O. (1914). *The Eastern Libyans*. London: Macmillan and Co., Ltd.
- Beechey, F. W. and Beechey, H. W. (1828). *Proceedings of the Expedition to Explore the Northern Coast of Africa, from Tripoli Eastward*. London.
- Ben Lazreg, N. and Mattingly, D. (eds) (1992). Leptiminus (Lamta): a Roman Port City in Tunisia. Report no.1. *Journal of Roman Archaeology*, Supplementary Series: Portsmouth.
- Bennett, P., Wilson, A. Buzaian, A. Hamilton, K., Thorpe, D., Robertson, D. and Zimi, E. (2000). 'Euesperides (Benghazi): preliminary report on the spring 2000 season'. *Libyan Studies* 31: 121-43.
- Bentaher, F. and Buzaian, A. (2010). 'Roman wine production in Cyrenaica; new evidence from Balagrae (al-Beida)'. In M. Luni (ed.), *Cirene e la Cirenaica nell'antichità*. Monografie di Archeologia Libica - XXX 'L'ERMA' di BRETSCHNEIDER: 31-5.
- Boardman, J. (1966). *Excavations at Tocrá, 1963-1965: The Archaic Deposits I*. (British School at Athens, Supplementary Volume 4), Thames and Hudson. London.
- Boardman, J. (1998). *Early Greek Vase Painting: 11th to 6th Centuries B.C.* New York: Thames and Hudson.
- Boardman, J. and Hayes, J. (1973). *Excavations at Tocrá 1963 - 1965. The Archaic Deposits II and Later Deposits*. (British School at Athens, Supplementary Volume 10), Thames and Hudson. London.
- Bonanno, A. (1979). 'Sculpture and terracotta'. In J. A. Lloyd (ed.), *Excavations at Sidi Khrebish Benghazi (Berenice)*. Vol. 2. (Supplements to Libya Antiqua 5), Tripoli: 65-90.

- Brandt, J. R. (2012). *Greek and Roman Festivals: Content, Meaning, and Practice*. Oxford: Oxford University Press.
- Bresson, A. (2011). 'Grain from Cyrene'. In Z. H. Archibald (ed.), *The Economies of Hellenistic Societies, Third to first Centuries BC*. Oxford: Oxford University Press: 66-95.
- Bresson, A. (2016). *The Making of the Ancient Greek Economy: Institutions, Markets, and Growth in the City States*. Princeton: Princeton University Press.
- Brun, J.-P. (2003). *Le vin et l'huile dans la Méditerranée antique: viticulture, oléiculture et procédés de transformation*. Editions Errance: Paris.
- Brun, J.-P. (2004). *Archéologie du vin et de l'huile dans l'Empire romain*. Editions Errance, Paris.
- Bugh, G. H. (1988). *The Horsemen of Athens*. Guildford: Princeton University Press.
- Burn, L. M. (1994). 'Hellenistic terracotta figures of Cyrenaica: Greek influence and local inspirations'. *Libyan Studies* 25: 147-58.
- Buru, M. M. (1960). *A geographical study of the eastern Jebel Akhdar, Cyrenaica*. Thesis submitted for Master of letters in The University of Durham - October 1960. Available at: http://etheses.dur.ac.uk/9679/1/9679_6472.PDF, last accessed on 20th May 2018.
- Buru, M. M. (1965). *El-Marj Plain: A Geographical Study*. Thesis submitted for the degree of Doctor of Philosophy in The University of Durham - October 1965. Available at: etheses.dur.ac.uk/10277/1/10277_7071.PDF, last accessed on 17th May 2014.
- Buttrey, T. V. (1994). 'Coins and coinage at Euesperides', *Libyan Studies* 25: 137-45.
- Buttrey, T. V. (1997). 'The coins'. In D. White (ed.), *The Extramural Sanctuary of Demeter and Persephone at Cyrene, Libya*, Final Reports 6, University Michigan Monograph 97: 1-66.
- Buzaian, A. M. (2000). 'Excavations at Tocra (1985-1992)'. *Libyan Studies* 31: 59-102.
- Buzaian, A. M. (2009). 'A forgotten press building at Lamluda'. *Libyan Studies* 40: 47-54.
- Buzaian, A. and Lloyd, J. A. (1996). 'Early Urbanism in Cyrenaica: New Evidence from Euesperides. (Benghazi)'. *Libyan Studies* 27: 129-52

- Buzaian, A. and Bentaher, F. (2002). 'Preliminary report on two seasons of excavations at Balagrae (al-Beida)'. *Libyan Studies* 33: 125-31.
- Buzaian, A. and Bentaher, F. (2006). 'Excavations at Balagrae (al-Beida) 2001-2003'. In E. Fabbriotti and O. Menozzi (eds.), *Cirenaica: studi, scavi da città e scoperte. Parte I: Nuovi dati da città territorio*. BAR International Series 1488: 153-62.
- Caltabiano, M. C. (1998). 'Berenice II. Il ruolo di una Basilissa rivelato dalle sue monete, in La Cirenaica in età antica'. In E. Catani and S. Marengo (eds.), *La Cirenaica in età antica, Atti del convegno Internazionale di studi. Macerata, 18 - 20 Maggio 1995*. Istituti Editoriali e Poligrafici Internazionali, Piza - Roma: 97-112.
- Camperio, M. (1881). 'Una gita in Cirenaica'. *L'esploratore*, anni V e VI (1881 e 1882): fasc. 8-9-10-11
- Carter. T. H. (1963). 'Reconnaissance in Cyrenaica'. *Expedition*, 5.4: 18-27. Available at: Il - Penn Museum, last accessed on 12th November 2016.
- Caputo, G. (1940). 'Una basilica cristiana in Tolemaida'. In *Comunicazione presentate al Convegno Nazionale di Storia dell'Architettura 1938*, Roma: 159-62.
- Caputo, G. (1954). 'La protezione dei monumenti di Tolemaide negli anni 1935-1942'. *Quaderni di archeologia della Libia* 3: 33-66.
- Caputo, G. and Goodchild, R. (1955). 'Diocletian's Price-Edict at Ptolemais (Cyrenaica)'. *Journal of Roman Studies*. Vol. 45, Parts 1 and 2: 106-15.
- Catani, E. (1976). 'I frantoi della fattoria bizantina di El-Beida. *Quaderni di archeologia della Libia* 8: 435-48.
- Catani, E. (1978). 'Pavimento con iscrizione musiva cristiana da El-Beida (Cyrenaica)'. In L. Gasperini (ed.), *Scritti storico-epigrafici in memoria di Marcello Zamblli*, Rome: 69-85.
- Catani, E. (1985). 'La coltura della vite e la produzione di vino nella Cirenaica Greca e Romana: le fonti storiche e l'arte figurative antica'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Papers I, BAR International Series 236: 145-64.
- Catani, E. (1998). 'Fasi edilizie e tecniche murarie della fattoria paleo-bizantina di Siret el Giamel nella chora Cirenea'. In E. Catani and S. Marengo (eds.), *La Cirenaica in età antica, Atti del convegno Internazionale di studi. Macerata, 18 - 20 Maggio 1995*. Istituti Editoriali e Poligrafici Internazionali, Piza - Roma: 113-35.
- Chamoux, F. (1985). 'Du silphion'. In G. Barker, J. A. Lloyd and J. Reynolds (eds.), *Cyrenaica in antiquity*. BAR (British archaeological reports) International Series 236, Oxford: 165-72.

- Chamoux, F. (1988). 'Les comptes des démiurges à Cyrène'. In *Comptes et inventaires dans la cité grecque. Actes du colloque de Neuchâtel en l'honneur de J. Tréheux*, Neuchâtel: 143-54.
- Chatterton, B. and Chatterton, L. (1984). 'Medicago in Romano-Libyan and modern and its positive role in modern drayfarming'. *Libyan Studies* 15: 157-60.
- Constantinou, M. (2014). *Demeter in Hellenistic Poetry: Religion and Poetics*. Available at:
<https://www.era.lib.ed.ac.uk/bitstream/handle/1842/9943/Constantinou2014.pdf?squence=2&isAllowed=y>,
 last accessed on 13th January 201.
- Coster, C. H. (1968). 'The economic position of Cyrenaica in Classical times'. In *Late Roman Studies*. Cambridge, Mass. Harvard University Press: 104-44.
- Crabtree, P. and Monge, J. (1987). 'The faunal remains from the Sanctuary of Demeter and Persephone at Cyrene, Libya'. *Museum Applied Science Center for Archaeology* 4, No. 3: 139-43.
- Crabtree, P. (1990). 'Animal bones'. In D. White (ed.), *The Extramural Sanctuary of Demeter and Persephone at Cyrene, Libya*, Final Report Volume 4. University Museum Monograph 67. University Museum, University of Pennsylvania, Philadelphia for the Libyan Department of Antiquities.
- Crawford, D. (1973). 'Garlic-growing and agricultural specialization in Graeco-Roman Egypt'. *Bulletin périodique de la Fondation Egyptologique Reine Elisabeth* 84, (96): 350-63.
- Christidis, A. F. (2007). *A History of Ancient Greek: From the Beginnings to Late Antiquity*, Cambridge: Cambridge University Press.
- Cuff, D. B. (2010). *The Auxilia in Roman Britain and the Two Germanies from Augustus to Caracalla: Family, Religion and Romanization*. Available at:
[The auxilia in Roman Britain and the Two Germanies from A](#),
 last accessed on 2nd October 2016.
- Davidson, A. (1999). *The Oxford Companion to Food*. Oxford: Oxford University Press.
- Davies, J. K. (1998). 'Ancient economies: models and muddles'. In H. Parkins and C. Smith (eds.), *Trade, Traders, and the Ancient City*. London: Routledge.
- Davies, J. K. (2005). 'The economic consequences of Hellenistic palaces'. In Z. H. Archibald, J. K. Davies and V. Gabrielsen (eds.), *Making, Moving and Managing: The New World of Ancient Economies 323-31 BC*. Oxford: Oxbow Books: 117-35.

- Della Cella, P. (1822). *Viaggio da Tripoli di Barberia alle frontiere occidentali dell'Egitto*. Genova.
- De Martino, G. (1912). *Tripoli, Cirene e Cartagine*. Bologne.
- Dennis, G. (1970). 'On recent excavations in the Greek cemeteries of the Cyrenaica'. In *Trans. Royal Society Literature*. Second Series IX: 177-79.
- Dobias-Lalou, C. (1985). 'Le vocabulaire de produits agricoles en Cyrénaïque'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Papers I, BAR International Series 236: 173-82.
- Dobias-Lalou, C. (1993). 'Les dépenses engagées par les démiurges de Cyrène pour les cultes'. *Révue des Études Grecques* 106: 24-38.
- Dodge, H. (1992). *Marble in Antiquity: Collected Papers of W.B. Ward-Perkins*. Archaeological Monographs of the British School at Rome, London.
- Domżalski, K. (2012). 'At the crossroads of trade routes: terra sigillata, red slip wares and related fine pottery from the Polish excavations in Ptolemais (2002-2009)'. In J. Żelazowski (ed.), *Ptolemais in Cyrenaica: Studies in Memory of Tomasz Mickocki*. Institute of Archaeology, University of Warsaw. Warsaw: 319-45.
- Doyel, W. W. and Maguire, F. J. (1964). 'Ground-water resources of the Bengasi area Cyrenaica, United Kingdom of Libya'. *Geological survey water-supply paper 1757-B*. Prepared under the auspices of the United States Operations Mission to Libya, the United States Corps of Engineers, and the Government of Libya. UNITED States Government Printing Office, Washington: 1-18.
Available at: pubs.usgs.gov/wsp/1757b/report.pdf,
last accessed on 15th May 2014).
- Dubois, L. (2000). 'Hippolytos and Lysippos; remarks on some compounded in Ἴππο-, -ππιος'. In S. Hornblower and E. Matthews (eds.), *Greek Personal Names: Their Value as Evidence*. Proceedings of the British Academy 104, Oxford University Press: 41- 52.
- Dunstan, W. E. (2010). *Ancient Rome*. London: Rowman and Littlefield.
- Elrashedy, F. (1985). 'Attic imported pottery in classical Cyrenaica'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Paper I, BAR International Series 236: 205-17.
- Engels, D. W. (1990). *Roman Corinth: An Alternative Model for the Classical City*. Chicago, London: University of Chicago.

- Fantham, E. (1995). *Women in the Classical World: Image and Text*. Oxford: Oxford University Press
- FAO. (Food and Agriculture Organization of the United Nations) (1969). *Development of Tribal Lands and Settlements Project*. Volume I, Rome.
- Finley, M. I. (1985). *The Ancient Economy*. 2nd edition, London: Hogarth Press.
- Finley, M. I. (1999). *The Ancient Economy*. Updated edition by Ian Morris, London: University of California Press.
- Finley, M. I. and Pleket, H. W. (1976). *The Olympic Games: The First Thousand Years*. London: Chatto and Windus.
- Fischer-Bovet, C. (2014). *Army and Society in Ptolemaic Egypt*. Cambridge: University Press.
- Fitzgerald, A. (1926). *The Letters of Synesius of Cyrene*. Oxford University Press. London.
- Foxhall, L. and Forbes, H. A. (1982). 'Sitometreio: The role of grain as a staple food in classical Antiquity'. *Chiron* 12: 41-90.
- Fraser, P. M. (1958). 'Inscriptions from Cyrene'. *Berytus* XII: 101-28.
- Fraser, P. M. and Matthews, E. (1987). *A Lexicon of Greek Personal Names*, Vol. 1. Oxford, Clarendon Press.
- Fraser P. M., Matthews E., Osborne M. J., and Byrne S. G (1994). *A Lexicon of Greek Personal Names*, Vol. 2. Oxford, Clarendon Press.
- Fraser, P. M. and Matthews, E. (1997). *A Lexicon of Greek Personal Names*, Vol. 3A. Oxford, Clarendon Press.
- Fraser, P. M. and Matthews, E. (2000). *A Lexicon of Greek Personal Names*, Vol. 3B. Oxford, Clarendon Press.
- Fulford, M. G. (1989). 'To east and west: the Mediterranean trade of Cyrenaica and Tripolitania in antiquity'. *Libyan Studies* 20: 169-91.
- Gambini, V. (1974-1975). 'Due impianti per frantoi'. *Libya Antiqua* 11-12: 277-86.
- Gardiner, A. (1961). *Egypt of the Pharaohs: an introduction*. Oxford: Clarendon Press.
- Garnsey, P. (1988). *Famine and Food Supply in the Graeco-Roman World Responses to Risk and Crisis*. Cambridge: Cambridge University Press.

- Gasperini, L. (1967). 'Le epigrafi'. In S. Stucchi, *Cirene 1957-1966: Un decennio di attività della missione archeologica italiana a Cirene*. Tripoli: 165-89.
- Gemmill, C. L. (1966). 'Silphium'. *Bulletin of the History of Medicine* 40: 295-313.
- Gibbins, D. (2001). 'Shipwrecks and Hellenistic trade'. In Z. Archibald, J. Davies, V. Gabrielsen and G. Oliver (eds.), *Hellenistic Economies*. London and New York.
- Goodchild, R. G. (1964). 'The fountain of the Maenads at Ptolemais'. *Libya Antiqua* 1: 121-6.
- Goodchild, R. G. and Reynolds, J. M. (1962). 'Some military inscriptions from Cyrenaica'. *Papers of the British School at Rome* 30: 37-46.
- Göransson, K. (2007). *The Transport Amphorae from Euesperides: The Maritime Trade of a Cyrenaican City 400- 250 BC*. Acta Archaeologica Lundensia, Series in 4°. No. 25. Almqvist & Wiksell International. Lunds Universitet.
- Greene, K. (2000). 'Technological innovation and economic progress in the ancient world: M. I. Finley reconsidered'. *Economic History Review* 53: 29-59
- Greene, K. (1986). *The Archaeology of the Roman Economy*. London: Batsford.
- Gregory, J. W. (1916). 'Cyrenaica', *The Geographical Journal* 47, No. 5: 321-42.
- Hamilton, J. (1856). *Wanderings in North Africa*. London.
- Haimann, G. (1882). *La Cirenaica*. Hoepli, Milan.
- Harrison, R. M. (1985a). 'The Joining of Cyrenaica to Greece'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Paper I. BAR (British archaeological reports) International Series 236, Oxford: 357-64.
- Harrison, R. M. (1985b). 'The Building Materials of Churches in Cyrenaica'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Paper I. BAR (British archaeological reports) International Series 236, Oxford: 231-35.
- Hegazy, A. K., Boulos, L. Kabieli, H. F. and Sharashy, O. S. (2011). 'Vegetation and species altitudinal distribution in al-Jabal al-Akhdar landscape, Libya'. *Pak. J. Bot.*, 43(4): 1885-98. Available at: [http://www.pakbs.org/pjbot/PDFs/43\(4\)/PJB43\(4\)1885.pdf](http://www.pakbs.org/pjbot/PDFs/43(4)/PJB43(4)1885.pdf), last accessed on 20th May 2014.

- Hesein, M. (2014). *Bridging the Eastern and Western Mediterranean: The Roman Harbour Sits in the Cost of Cyrenaica, North-Eastern Libya*. Unpublished Ph.D. Thesis, University of Leicester.
- Hopkins, K. (1978). 'Economic growth in towns in Classical antiquity'. In P. Abrams and E. Wrigley (eds.), *Towns in Societies*, Cambridge: 35- 79.
- Hopkins, K. (1980). 'Taxes and trade in the Roman empire (200 B.C. – A.D. 400)'. *Journal of Roman Studies* 70: 101-25.
- Hopkins, K. (1983). 'Introduction'. In P. Garnsey, K. Hopkins, and C. Whittaker (eds.), *Trade in the ancient economy*. London: Chatto and Windus: 9-25.
- Hopkins, K. (2002). 'Roman, taxes, rent and trade'. In W. Scheidel and S. Von Reden (eds.), *The Ancient Economy*. Edinburgh: Edinburgh University Press: 223-30.
- Humphrey, J. H. (1986). *Roman Circuses: Arenas for Chariot Racing*. London, Batsford.
- Hunt, C., Elrishi, H. and Hassan, A. (2002). 'Reconnaissance investigation of the palynology of Holocene wadi in Cyrenaica, Libya'. *Libyan Studies* 33: 1-8.
- Hyslop, C. G. C. and Applebaum, S. (1945). *Cyrene and Ancient Cyrenaica*. Tripoli, Government Press.
- Isager, S. and Skydsgaard, J. E. (1992). *Ancient Greek Agriculture*. London: Routledge.
- James, P. (2005). 'Archaic Greek colonies in Libya: historical vs archaeological chronologies'. *Libyan Studies* 36: 1-19. Available at: [Archaic Greek colonies in Libya - Centuries of Darkness](#), last accessed on 12 November 2016.
- Janick, J. (2005). 'The Origins of Fruits, Fruit Growing, and Fruit Breeding'. In J. Janick (ed.), *Plant Breeding Reviews*, volume 25: 255-320. Available at: <https://hort.purdue.edu/newcrop/origins%20of%20fruits.pdf>, last accessed on 21st April 2016.
- Johnson, D. L. (1973). *Jabal al-Akhdar, Cyrenaica: An Historical Geography of Settlement and Livelihood*. Department of Geography Research, Paper No. 148. Chicago, University of Chicago Press.
- Jones, A. H. M. (1971). *The Cities of the Eastern Roman Provinces*. Oxford: Clarendon Press.
- Jones, G. D. B. and Little, J. H. (1971). 'Hadrianopolis'. *Libya Antiqua* 8: 53-67.
- Jones, G. D. B. (1985). 'Beginnings and endings in Cyrenaican cities'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Papers I, BAR International Series 236, Oxford: 27-41.

- Kaczmarek, C. (2015). *A Name and a Place: Settlement and Land Use Patterns, Identity Expression and Social Strategies in Hellenistic and Roman Thessaly*. Leicester: Unpublished Ph.D. Thesis, University of Leicester.
- Kane, S. (1985). 'Sculpture from the Cyrene Demeter Sanctuary in its Mediterranean context'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Paper I. BAR International Series 236, Oxford: 237-48.
- Kane, S. (2003). 'Heroized riders from the Wadi bel Gadir sanctuary of Demeter and Persephone at Cyrene'. *Quaderni di archeologia della Libya* 18: 27-34.
- Kenrick, P. M. (1985a). Excavations at Sidi Khrebish Benghazi (Berenice) Vol. 3.2: *The fine pottery from Berenice* (Supplements to Libya Antiqua 5), Tripoli.
- Kenrick, P. M. (1985b). 'Patterns of trade in fine pottery at Berenice'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Papers I, BAR (British archaeological reports) International Series 236, Oxford: 249-57.
- Kenrick, P. M. (2013). *Cyrenaica (Libya Archaeological Guides)*. Silphium Press.
- Kingsley, B. M (1986) 'Harpalos in the Megarid (333-331 B.C.) and the Grain Shipments from Cyrene', *Zeitschrift für Papyrologie und Epigraphik* Bd. 66:165-177.
- Kingsley, S. (2001). 'The economic impact of the Palestine wine trade in late antiquity'. In S. Kingsley and M. Decker (eds.) *Economy and exchange in the East Mediterranean during late antiquity*, Oxbow Books. Oxford: 44-68.
- Kennell, N. M. (2009), 'The Greek ephebate in the Roman period'. *The International Journal of the History of Sport* 26: 323-42.
- Kocybala, A. (1999). *The Extramural Sanctuary of Demeter and Persephone at Cyrene: The Corinthian Pottery*. Final Reports, volume 7: The University Museum, University of Pennsylvania, Philadelphia: 118-47.
- Kraeling, C. H. (1962). *Ptolemais, City of the Libyan Pentapolis*. The University of Chicago Oriental Institute Publications 90. Chicago, The University of Chicago Press.
- Kroeller, E. (1960). *Nazaret of Agriculture and Forests, Statistic Section: Agricultural Statistics for Cyrenaica 1954-1958*, Provincial Government of Cyrenaica, Benghazi.
- Lamboglia, N. (1961). 'Problemi tecnici e cronologici dello scavo sottomarino al Grand Gongloué'. *Estratto dalla Rivista di Studi Liguri*, volume 27: 138-54.

- Lariel, N. (2015). *Challenges in the Sustainability of Libyan agriculture: Opportunity for the Libyan seed system*. Available at:
[Lariel_colostate_0053A_13235.pdf - DSpace Home - Colorad](#),
 Last accessed on 31st May 2016
- Laronde, A. (1987) *Cyrène et la Libye hellénistique. 'Libykai Historiai': de l'époque républicaine au principat d'Auguste*. Études d'Antiquités africaines. Paris, Éditions du Centre de la Recherche Scientifique.
- Laronde, A. (1994). 'Le territoire de Taucheira'. *Libyan Studies* 25: 23-9.
- Leake, B. E. (2011). *The Life and Work of Professor J. W. Gregory FRS (1864–1932): Geologist, Writer and Explorer*. Geological Society Memoir 34, London.
- Lloyd, J. A., and Lewis, P. R., (1976-77). 'Water Supply and urban population in Roman Cyrenaica'. *Libyan Studies* 8: 35-40.
- Le Quellec, Jean-Loïc, (2012). 'Rock Art, Scripts and Proto-Scripts in Africa: The Libyco-Berber Example'. *African History* 2: 1-29.
- Lindbladh, E. and Lyttkens, C. H. (2002), 'Habit Versus Choice: The Process of Decision-Making in Health-Related Behaviour', *Social Science and Medicine*, 55: 451–465.
- Lo Cascio, E. (2006). 'The role of the state in the Roman economy: making use of the New Institutional Economics'. In B. F. Bang, M. Ikeguchi and H. Ziche (eds.), *Ancient Economies, Modern Methodologies: Archaeology, Comparative History, Models and Institutions*: 215-234.
- Lüderitz, G. and Reynolds, G. (1983). *Corpus jüdischer Zeugnisse aus der Cyrenaika*. L. Reichert, Wiesbaden.
- Lyttkens, C. H. (2013). *Economic Analysis of Institutional Change in Ancient Greece. Politics, Taxation and Rational Behaviour*. Abingdon: Routledge.
- Malkin, I. (1994). *Myth and Territory in the Spartan Mediterranean*. Cambridge: Cambridge University.
- Marengo, S. and Paci, G. (1998). 'Nuovi frammenti dei conti dei Damiurghi'. In E. Catani and S. Marengo (eds.), *La Cirenaica in età antica. Atti del convegno Internazionale di studi. Macerata, 18 - 20 Maggio 1995*. Istituti Editoriali e Poligrafici Internazionali, Piza - Roma: 373-92.
- Marshall, E. (1997). 'The ideology and reception: reading symbols of Roman Cyrene'. In H. M. Parkins (ed.), *Roman Urbanism: Beyond the Consumer City*. London: Routledge: 173- 209.

- Marini, S., De Faucamberge, E. and Katab, M. N., (2010). 'Discover of a rock art site in Cyrenaica (Libya): Kaf Tahr'. *Academic Journal: L'Anthropologie*. April-May, Vol. 114, 2: 275- 287.
- Mattingly, D. J. (1984). Review Article: S. Gsell, *Etudes sur L'Afrique Antique: Scripta Varia* (1981). *Libyan Studies* 15: 165-7.
- Mattingly, D. J. (1995). *Tripolitania*. London: Batsford.
- Mattingly, D. J. (1996). 'Olive presses in Roman Africa: technical evolution or stagnation?'. In M. Khanoussi, P. Ruggeri and C. Vismara (eds.), *L'Africa Romana. Atti del XI convegno di studio, Cartagine, 15-18 dicembre 1994*. Vol. 2: 577-95.
- Mattingly, D. J. (1997). 'Beyond belief? Drawing a line beneath the consumer city'. In H. M. Parkins (ed.), *Roman Urbanism: Beyond the Consumer City*, London, Routledge: 205-213.
- Mattingly, D. J. (2011). 'Calculating plough-zone demographics'. In A. Bowman and A. Wilson (eds.), *Settlement, Urbanization, and Population*, Oxford: Oxford University Press: 77-96.
- Mattingly, D. J. and Salmon J. B (eds.), (2001). *Economies Beyond Agriculture in the Classical World*. London: Routledge.
- Mattingly, D. J. and Sterry, M. (2013). 'The first towns in the central Sahara'. *Antiquity* 87 (336): 503-18.
- Mazou, L. and Capelli, C. (2011). 'A local production of Mid Roman 1 amphorae at Latrun, Cyrenaica'. *Libyan Studies* 42: 73-6.
- McLean, B. H. (2002). *An introduction to Greek Epigraphy of the Hellenistic and Roman Periods from Alexander the Great down to the Reign of Constantine (323 B.C.-A.D. 337)*. Ann Arbor, Michigan: University of Michigan Press.
- Meikle, S., (1995). 'Modernism, economics and the ancient economy'. In *Proceedings of the Cambridge Philological Society*, Cambridge: Cambridge University Press, 41: 174-91.
- Meikle, S., (2002). 'Modernism, economics, and the ancient economy. In W. Scheidel and S.Von Reden, (eds.), *The Ancient Economy*, Edinburgh: Edinburgh University Press.
- Menzio, O., Antonelli, S., Cinalli, A, Mancini, M. (2014). 'Lamluda: from the excavation to the archaeometric analysis'. *Libyan Studies* 45: 65-83.
- Merrills, A. (2004). *Vandals, Romans and Berbers: New Perspectives on Late Antique North Africa*. Ashgate Publishing.

- Micke, W. C. (1969). *Almond Production Manual*. University of California: Division of Agricultural and Natural Resources.
- Mitchell, B. M. (1966). 'Cyrene and Persia'. *Journal of Hellenic Studies* 86: 99-113.
- Mohamed, F. A. and Reynolds, J. M. (1994). 'An inscribed stone from the Sanctuary of Demeter and Kore in the Wadi Belgadir at Cyrene: cult, corn and Roman revenues'. *Libyan Studies* 25: 211-218.
- Morley, N. (2007). *Trade in Classical Antiquity*. Cambridge: Cambridge University Press.
- Morris, I. (2004). 'Economic growth in ancient Greece'. *Journal of Institutional and Theoretical Economics* 160: 709-42.
- Morris, I. and Weingast, B. R. (2004). 'Views and comments on institutions, economics, and the ancient Mediterranean world: introduction'. *Journal of Institutional and Theoretical Economics* 160: 702-708.
- Munzi, M., Felici, F., Cifani, G., Cirelli, E., Gaudiosi, E., Lucarini, G. and Matug, J. (2004). 'A topographic research sample in the territory of Lepcis Magna: Silin'. *Libyan Studies* 35: 11-67.
- Muszyńska, M. (2012). 'Figural marble and limestone sculptures from the Polish excavation in Ptolemais'. In J. Zelazowski (ed.), *Ptolemais in Cyrenaica: Studies in Memory of Tomasz Mickocki*. Institute of Archaeology, University of Warsaw. Warsaw: 293- 317.
- Oliverio, G. (1933a). *Documenti Antichi dell'Africa Italiana, Fasc.1, Cirenaica*. Bergamo.
- Oliverio, G. (1933b). 'I Conti dei Demiurgi'. *Documenti Antichi dell'Africa Italiana, I*. 2: 85-194.
- Oliverio, G. (1933c). 'La stele dei nuovi comandamenti e dei cereali'. *Documenti Antichi dell'Africa Italiana II*. 1. Bergamo.
- Oliverio, G. Pugliese-Carratelli, G. and Morelli, D. (1961/62). 'Supplemento Epigrafico Cirenaico'. *Annuario della Scuola Italiana di Archeologia di Atene* 39-40: 219-37.
- Pacho, J. (1827). *Relation d'un voyage dans la Marmarique, la Cyrénaïque, et les oasis d'Audjehah et de Maradeh*. Firmin didot: Paris.
- Pando, J. C. (1940). *The Life and Times of Synesius of Cyrene as Revealed in His Works*. Catholic University of America Patristic Studies. Vol. 63. Washington, D.C.: Catholic University of America Press.

- Parkins, H. M. (1997). 'The Consumer city' domesticated? The Roman city in elite economic strategies'. In H. M. Parkins (ed.), *Roman Urbanism: Beyond the Consumer City*, London: Routledge: 11- 38.
- Pedley, J. G. (1979). 'The history of the city'. In J. H. Humphrey (ed.), *Apollonia, the port of Cyrene: excavations by the University of Michigan 1965-1967*, (Supplements to *Libya Antiqua* 4), Tripoli: 11-28.
- Pelling, R. and al Hassy, S. (1979). 'The macroscopic plant remains from Euesperides (Benghazi): an interim report'. *Libyan Studies* 28: 1-4
- Pesce, G. (1950). *Il Palazzo delle Colonne in Tolemaide di Cirenaica*. Monografie di Archeologia Libica 4. Roma.
- Purcaro, P. (1976). 'Le rotte antiche tra la Grecia e la Cirenaica e gli itinerari marittimi e terrestri lungo le coste cirenaiche e della Grande Sirte,'. *Quaderni di archeologia della Libya* 8: 285-352.
- Rathbone, D. and Von Reden, S. (2015), 'Mediterranean grain prices in classical antiquity' In R. J. Van der Spek, J. L. van Zanden, and E. S. van Leeuwen, (eds.), *A History of Market Performance from Ancient Babylonia to the Modern World*. London: Routledge:149-235.
- Recaldin, J. (2011). *What was the main Purpose of the Ephebeia: To become a citizen, a rite of manhood or a preparation for warfare?* Unpublished MA. Dissertation. University of Leicester. Available at:
[Jonathan Recaldin | University of Leicester - Academia.edu](http://JonathanRecaldin|UniversityofLeicester-Academia.edu),
last accessed on 6th March 2016.
- Reynolds, J. M. (1959). 'The Jewish revolt of AD 115 in Cyrenaica'. *Proceedings of the Cambridge Philological Society* 185: 24-8.
- Reynolds, J. M. (1971). 'Two equites Romani at Balagrae in Cyrenaica'. *Libya Antiqua* 8: 43-5.
- Reynolds, J. M. (1976). 'A civic decree from Tocra in Cyrenaica'. *Archaeologia Classica* 25-26: 622-30.
- Reynolds, J. M. (1996). 'Ephebic inscriptions at Tocra and Tolmeita in Cyrenaica'. *Libya Antiqua*, new series 2: 37-44.
- Reynolds, J. M. (1998). 'The Ephebic Inscriptions of Teucheira'. In E. Catani and S. Marengo (eds.). *La Cirenaica in eta Antica. Atti del convegno Internazionale di studi. Macerata, 18 - 20 Maggio 1995*. Istituti Editoriali e Poligrafici Internazionali, Piza - Roma: 475-84.

- Reynolds, J. M. (2000). 'Boundary stone from near Benghazi' In *Epigraphai, Miscellanea epigrafica in onore di lidio Gasparini (Tivoli- Roma)*: 833-39.
- Reynolds, J. M. and Goobchild, R. G. (1965). 'The city lands of Apollonia in Cyrenaica'. *Libya Antiqua* 2: 103-8.
- Richards, R (2011). *Colonization of Cyrene: Historiographic Perspective*. Available at: www.wou.edu/history/files/2015/08/robertrichards1.pdf, last accessed on 6th January 2016.
- Riley, J. A. (1979). 'The coarse pottery from Berenice'. In J. A. Lloyd (ed.), *Excavations at Sidi Khrebish Benghazi (Berenice)*. Vol. 2, (Supplements to *Libya Antiqua* 5), Tripoli: 91-467.
- Riley, J. A. (1976-1977 [1983]). 'Excavation of a kiln site at Tocra, Libya in August 1974'. *Libya Antiqua* 13-14: 235-63.
- Robinson, E. S. G. (1927). *Catalogue of the Greek Coins of Cyrenaica*. London, British Museum/ Oxford University Press.
- Robinson, Jancis (2015). *The Oxford Companion to Wine*. Oxford: University Press.
- Rosamilia, E. (2017). 'The Introduction of Bronze Standard in Cyrenaica: Evidence from the *damiergoi* accounts'. *Zeitschrift für Papyrologie und Epigraphik* 201: 139-54.
- Rostovtzeff, M. (1941). *The Social and Economic History of the Hellenistic World*. Oxford: Clarendon press.
- Rostovtzeff, M. (1957). *The Social and Economic History of the Roman Empire*. 2nd ed., revised by P. M. Fraser, Oxford: Clarendon Press.
- Rowe, A. (1956). *Cyrenaican Expedition of the University of Manchester, 1952*. Manchester: University Press.
- Saller, R. (2002). 'Framing the debate over growth in the ancient economy'. In J. Manning and I. Morris (eds.), *The Ancient Economy: Evidence and Models*. Edinburgh. Edinburgh University Press: 223- 238.
- Schaus, G. (1985). 'The evidence for Laonians in Cyrenaica in the archaic period'. In G. Barker, J. Lloyd and J. Reynolds (eds.), *Cyrenaica in Antiquity*. Society for Libyan Studies Occasional Paper I, BAR International Series 236, Oxford: 395-403.
- Scheidel, W. (2002). *The Ancient Economy*. Edinburgh: University Press.
- Scheidel, W. (2012). *The Cambridge Companion to the Roman Economy*. Cambridge: Cambridge University Press.

- Scheidel, W and Von Reden, S. (eds.), (2002). *The Ancient Economy*. Edinburgh: Edinburgh University Press.
- Scheidel, W. Morris, M. and Saller. R. (eds.), (2007). *The Cambridge Economic History of the Greco-Roman World*. Cambridge: Cambridge University Press.
- Smallwood, E. M. (1976). *The Jews Under Roman Rule from Pompey to Diocletian*. Leiden.
- Soricelli, G. (1987). 'Tripolitatnian Sigillata: North African or Campanian?'. *Libyan Studies* 18: 73-88.
- Stewart, D. R., (2007). *Landscape Change and Regional Variation in an Early 'Provincial' Setting: the Rural Peloponnese at the Late Hellenistic to Roman Transition*. Leicester: Unpublished Ph.D. Thesis, University of Leicester.
- Stirling, L.M., Mattingly, D. J. and Ben Lazreg, N. (2001). *Leptiminus (Lamta): Report no. 2. The East Baths, Cemeteries, Kilns, Venus Mosaic, Site Museum and other studies*. Journal of Roman Archaeology, Suppl. 40.
- Stone, D. Mattingly, D. and Ben Lazreg, N. (2011). *Leptiminus (Lamta), Report no. 3: The field Survey*. Journal of Roman archaeology. Supplementary series Journal of Roman archaeology, Supplementary Series 87: Portsmouth, Rhode Island.
- Stroud, R. S. (1998). The Athenian Grain-Tax law of 374/3 BC. *Hesperia* 32, Princeton,
- Stucchi, S. (1975). *Architettura Cirenaica*. Monografie di archeologia Libica 9. Roma, 'L'Erma' di Bretschneider.
- Tarn, W. W. (1927). *Hellenistic civilisation*. London: Edward Arnold and CO.
- Tod, M. N. (1948). *A Selection of Greek Historical Inscriptions*. Vol. 2, Oxford, Clarendon Press.
- Van der Veen, M., Grant, A. and Barker, G., Gilbertson, D., (1996). 'Romano-Libyan agriculture: crops and animals'. In G. Barker (ed.), *Farming the Desert: the UNESCO Libyan Valleys Archaeological Survey*. Volume 1: United Nations Educational Scientific and Cultural Organization: 227- 265.
- Vickers, M. J. and Bazama, A. (1971). 'A fifth century BC tomb in Cyrenaica', *Libya Antiqua*: 8 69-84.
- Vickers, M. J. and Reynolds, J. M. (1971). 'Cyrenaica, 1962-72' *Archaeological Report*. 18 (1971 - 1972): 27- 47.
- Ward-Perkins, J. B. (1943). 'Christian antiquities of the Cyrenaican Pentapolis'. *Bulletin de la Société d'Archéologie Copte* 9: 123-39.

- Ward-Perkins, J. B. (1976). 'The Christian architecture of Apollonia'. In J. Humphrey (ed.), *Apollonia, the Port of Cyrene. Excavations by the University of Michigan 1965-1967* (Supplements to *Libya Antiqua* 4), Tripoli: 267-92.
- Ward-Perkins, J. B. (1980). 'Nicomedia and the Marble'. *Papers of the British School at Rome* 48: 23-69.
- Ward-Perkins, J. B. (1981). *Roman Imperial Architecture*. Harmondsworth: Penguin.
- Ward-Perkins, B. (2001). 'Specialisation, trade and prosperity: an overview of the economy of the late eastern Mediterranean'. In S. Kingsley and M. Decker (eds.) *Economy and exchange in the East Mediterranean during Late Antiquity*, Oxbow Books. Oxford: 167-78.
- Ward-Perkins, J. B. Little, J. H. and Mattingly, D. J. with a contribution by Gibson, S. C., (1986). 'Town houses at Ptolemais: a summary report of survey and excavation work in 1971, 1978-1979'. *Libyan Studies* 17: 109-53.
- Ward-Perkins, J. B., Goodchild, R. G., and Reynolds, J. M. (2003). *Christian Monuments of Cyrenaica*. London.
- Wartenberg, U. and Kagan, J. (2016). 'Silphium, jerboas, genets and the coinage of Cyrene'. In M. Asolati (ed.), *Le Monete di Cirene e della Cirenaica nel Mediterraneo, Problemi e prospettive. Atti del V Congresso Internazionale di Numismatica e di Storia Monetaria Padova, 17-19 marzo 2016*:43-56.
- Weber, M. (1968). *Economy and Society*. Vol. III, New York: Bedminster Press.
- Weber, M. (1976). *The Agrarian Sociology of Ancient Civilizations*. Translated by R. I. Frank, London: NLB.
- Weber, T. M. and Berger, F. (2016). 'The western chôra and necropolis of Ptolemais'. *Libya Antiqua*, new series, 9. Pisa – Roma: 23-40.
- Webley, D. (1979). 'Plant remains'. In J. A. Lloyd (ed.), *Excavations at Sidi Khrebish Benghazi (Berenice)*, vol. 2, (Supplements to *Libya Antiqua* 5), Tripoli: 31.
- White, D. (1981). 'Cyrene's sanctuary of Demeter and Persephone; A Summary of a Decade of Excavation'. *American Journal of Archaeology* 85: 13-30.
- White, D. (1987). 'Demeter Libyssa, her Cyrenean cult in light of the recent excavations'. *Quaderni di archeologia della Libia* 12: 67–84.
- White, D. (1984: 21). *The extramural sanctuary of Demeter and Persephone at Cyrene, Libya: Final reports. Vol 1. Background and introduction to the excavation*. The University Museum, University of Pennsylvania, Philadelphia.

- Wilford, J. N. (1993). *Ancient Greek Shipwreck Found; Cargo Was Fine Wine*. The New York Times.
- Wilson, A. (2001). 'Urban Economies of late Antique Cyrenaica'. In S. Kingsley and M. Decker (eds.), *Economy and Exchange in the East Mediterranean during Late Antiquity*. Oxbow Books. Oxford: 28-43.
- Wilson, A. (2002). 'Urban production in the Roman world: the view from North Africa'. *Papers of the British School at Rome* 70: 231-73.
- Wilson, A. (2004). 'Cyrenaica and the late antique economy'. *Ancient West and East* 3.1: 143-54.
- Wilson, A. (2006). 'New light on a Greek city: archaeology and history at Euesperides'. In E. Fabbricotti and O. Menozzi (eds.), *Cirenaica: studi, scavi e scoperte Atti del X Convegno di Archeologia Cirenaica Chieti 24-26 Novembre 2003*: 141-52.
- Wilson, A. (2011). 'City sizes and urbanization in the Roman Empire'. In A. Bowman and A. Wilson (eds.), *Settlement, Urbanization, and Population*, Oxford: Oxford University Press: 161-95.
- Wilson, A., Bennett, P., Buzaian, A., Ebbinghaus, S., Hamilton, K., Kattenberg, A. and Zimi, E. (1999). 'Urbanism and economy at Euesperides (Benghazi): preliminary report on the 1999 season'. *Libyan Studies* 30: 147-68.
- Wilson, A., Bennett, P., Buzaian, A., Fell, V., Göransson, K., Green, C., Hall, C., Helm, R., Kattenberg, A., Swift, K. and Zimi, E. (2001). 'Euesperides (Benghazi): preliminary report on the spring 2001 season'. *Libyan Studies* 32: 155-77.
- Wilson, A. and Tébar Megías, E. (2008). 'Purple dye production at Hellenistic Euesperides (Benghazi, Libya)'. In Napoli, J. (eds.). *Ressources et activités maritimes des peuples de l'antiquité. Actes du colloque international de Boulogne-sur-Mer (12-14 Mai 2005)*. Boulogne-sur-sur-Mer: 231-238.
- Wright, G. R. H. (1963). 'Excavations at Tocra incorporating archaeological evidence of a community of the Diaspora'. *Palestine Exploration Quarterly* 95: 22-64.
- Wright, J. (1982). *Libya: A Modern History*. Baltimore.
- Whittaker, C. R. (1990). 'The consumer city revisited: the vicus and the city'. *Journal of Roman Studies* 3: 110-18.
- Whittaker, C. R. (1995). 'Do theories of the ancient city matter?', in T. Cornell and K. Lomas (eds.), *Urban Society in Roman Italy*. University College London, UCL Press Limited: 9-26.

- Woolmer, M. (2008). *The Athenian Mercantile Community: A Reappraisal of the Social, Political and Legal Status of Inter-regional Merchants during the fourth century*. Thesis, Cardiff: Unpublished Ph.D. Thesis, University of Cardiff.
- Żelazowski, J. (2012). 'General remarks on Polish excavations in Ptolemais'. In J. Żelazowski (ed.), *Ptolemais in Cyrenaica: Studies in Memory of Tomasz Mickocki*. Institute of Archaeology, University of Warsaw. Warsaw: 121-56.
- Zeppa, G. (2007). *The Science and Technology of Wine Making*. Available at: <https://www.dairyscience.info/index.php/science-and-technology-of-wine/124-the-science-and-technology-of-wine-making.html>,
Last accessed on 29th March 2017.