

SUPPLEMENTARY MATERIALS

Transaction characteristics

The features of the transactions undertaken by the farmers in our sample are presented in Table 2. Contracts and spot transactions differ in terms of purchasers, the attributes of the transactions, the credit supplier and the payment flows. They are similar in terms of the inputs covered by the credit. The main differences between the two contracts are, first, who supplies the credit and hence the payment flows, and, to a much lesser extent, the different attributes of the transaction specified in the contract.

Table 2: Characteristics of transactions

	Spot Transaction	Marketing Contract	Production Contract
Number of observations	265	130	155
Types of actors			
Industrial miller (0 is artisanal miller)	4.15	100.00	100.00
Producer organisation (0 is individual farmer)	77.09	100.00	52.90
Transaction attributes			
Agreement is written	0.00	100.00	100.00
Price set at contract signature	0.00	100.00	48.39
Quantity (kilograms)	0.00	100.00	66.45
Quality (moisture and impurity rates)	0.00	100.00	76.77
Payment modality	0.00	43.85	28.39
Supply of inputs	0.00	0.00	78.06
Technical advice	0.00	0.00	8.39
Supplier of credit*			
CNCAS	53.21	100.00	0.00
Rice miller	1.89	0.00	100.00
No credit	44.15	0.00	0.00
Inputs covered by the credit			
Seed	99.29	94.62	94.84
Herbicide	97.87	90.77	97.42
Fertiliser	99.29	97.69	98.71
Water	87.94	91.54	96.77
Seasonal labour	0.00	0.00	1.32
Harvest	0.00	0.00	16.77
Threshing	0.00	0.00	19.35
Payment flows			
Miller to CNCAS	0.00	100.00	0.00
Miller to PO or farmer	100	0.00	0.00
No payment (reimbursement to miller only)	1.89	0.00	100.00

CNCAS is the national agricultural bank. N = 550 because 44 farms in the sample did not grow rice in the 2014 dry season. “*” means the variable was used in MCA

Shared livelihood characteristics: specialisation and intensive agricultural practices

The farms in our sample specialise in rice production: an average of 69.4% of their income comes from rice, and they have a limited number of activities (2.5 activities including rice). They are located farther away from rice millers who offer a production contract (39.6 km) than from millers who offer tripartite marketing contracts (12.3 km). This is because production contract millers are concentrated in the north of the department whereas tripartite marketing contract millers are spread out along the national road that crosses the department. A total of 89.5% of farmers are members of POs, and 54% of farmers are members

of POs that cannot obtain credit from CNCAS. Not all members of a PO grow rice every season: 90.49% of the members of POs that grew rice in the 2014 dry season actually grew rice. Some POs members grow rice individually, but this is rare. Furthermore, 10.5% of the farmers in the sample were not PO members. Table 3 lists farm livelihoods according to the marketing mode.

Table 3: Descriptive statistics on farm livelihoods per marketing mode for credit reimbursement

	Spot transaction		Marketing contract		t-value (comparison with spot transactions)	Production contract		t-value (comparison with spot transactions)
	Mean	Std. Dev.	Mean	Std. Dev.		Mean	Std. Dev.	
Context								
Distance from miller offering a production contract (km)*	50.9	27.61	30.89	13.44	7.816***	28.12	12.82	9.6731***
Distance from miller offering a marketing contract (km)	14.0566	13.77527	12.13846	10.83241	1.3904*	8.690323	5.001711	4.6713***
Distance from the national road (km)	3.283019	5.528944	15.85385	11.3083	-14.8486***	19.78065	12.35948	-18.7657***
Perception of uncertainty*	0.7698113	0.5869751	1.186047	0.5557574	-6.7198***	1.090323	0.5389714	-5.5631***
Capital								
Ratio dependency (%)	0.6828317	0.1653873	0.6714556	0.1618983	0.6468	0.5712494	0.2060076	6.0826***
Household head has experience in rice growing (years)	17.52453	10.44794	19.07692	7.663075	-1.5066*	18.23871	8.793507	-0.7155
Household head is a women (%)	0.1283019	0.3350584	0.0153846	0.123553	3.7184***	0.0193548	0.1382153	4.34***
Household head has at least secondary education (%)	0.1018868	0.3030718	0.1076923	0.3111906	-0.1773	0.083871	0.2780927	0.6058
Ethnic group is Wolof (%)	0.6716981	0.4704839	0.7615385	0.4277913	-1.8363**	0.6451613	0.4800154	0.5536
Irrigated area (ha)	1.498491	1.584813	1.539308	0.9796512	-0.2694	2.710581	2.57918	-5.9657***
Total value of physical (non-land) assets (FCFA)	1 795 347	4 369 619	1 294 650	2 577 529	1.207	1 838 887	2 428 079	-0.1141
Number of ruminants	5.104411	9.67533	3.674884	5.56389	1.556*	5.150452	10.3643	-0.0458
Farmer belongs to a producer organisation (%)	0.9396226	0.2386353	1	0	-2.8829**	0.7419355	0.4389881	5.9775***
Farmer belongs to a producer organisation indebted to CNCAS (%)*	0.4679245	0.4999142	0	0	10.6652***	0.9870968	0.113223	-12.734***
Activities and specialisation								
Proportion of total income from rice (%)*	0.7076551	0.2648002	0.6381369	0.2561548	2.478***	0.7063439	0.2528296	0.0498
Rice (%)	1	0	1	0	.	1	0	.
Vegetables (%)	0.6339623	0.4826314	0.5	0.5019342	2.5581***	0.483871	0.5013597	3.0316***
Livestock breeding (%)	0.3320755	0.471849	0.3153846	0.4664664	0.3316	0.3483871	0.4780038	-0.3402
Trade (%)	0.290566	0.4548827	0.2923077	0.4565824	-0.0357	0.3483871	0.4780038	-1.2336
Wage labour (%)	0.2981132	0.458295	0.3230769	0.4694609	-0.5046	0.2516129	0.4353465	1.022
Income from solidarity (%)	0.0226415	0.1490392	0	0	1.731**	0.0322581	0.1772574	-0.5943
Number of activities including rice	2.777358	1.576177	3.146154	1.35893	-2.2834**	4.16129	1.932241	-7.9757***

Outcome								
Farm total income (FCFA/year)	1 304 557	2 263 936	1 671 616	2 021 714	-1.5655*	2 179 945	3 374 163	-3.1688***
Number of observations	265		130		155			

Credit uncertainty was measured using the Likert scale. CNCAS is the national agricultural bank. N = 550 because 44 farms in the sample did not grow rice in the 2014 dry season. “*” means the variable was used in MCA.

Farms in the Senegal River Valley use intensive rice growing practices and have high production costs. Among those who grew rice in the 2014 dry season (550 producers), 90.1% used certified seed, 99.8% used mechanised offset and 100% used water control. They also used large quantities of seed and fertiliser. However, 97.5% still harvested manually. The average rice production cost per hectare was 507,353 FCFA. The main costs were harvesting and threshing (28.32%), purchase of seeds, herbicides and fertilisers (26.91%), water (15.38%) and land preparation (14.95%). Other costs (11.34%) included seasonal labour for field preparation and sowing, and storage. Average profit from rice was 199,248 FCFA per hectare and 40.2 FCFA per kilogram. Table 4 lists the agricultural practices, production costs and benefits according to the mode of marketing.

Table 4: Rice practices, production costs and profit per marketing mode used for reimbursement of the credit

	Spot transaction		Marketing contract		t-value (comparison with spot transactions)	Production contract		t-value (comparison with spot transactions)
	Mean	Std. Dev.	Mean	Std. Dev.		Mean	Std. Dev.	
Agricultural practices								
Area cropped under rice (ha)	1.319358	1.427521	1.342385	0.8468151	-0.1698	2.178387	2.22839	-4.8121***
Mechanised offset (%)	0.9924528	0.0867098	0.9923077	0.0877058	0.0156	1	0	-1.0831
Water control (%)	1	0	1	0		1	0	
Manual harvest (%)	0.973384	0.1612651	1	0	-1.8733**	0.9548387	0.2083309	1.0167
Use of certified seed (%)	0.8301887	0.3761774	0.9689922	0.1740144	-3.9864***	0.9548387	0.2083309	-3.7976***
Seeds (kg/ha)	132.9557	32.59655	129.824	37.71674	0.8511	131.8112	28.95528	0.3616
Herbicides (FCFA/ha)	22 662	10 654	23 988	8 705	-1	25 727	9 391	-2.9693***
Fertilisers-1846 (kg/ha)	96.19395	48.60363	106.2407	33.70487	-2.1128**	101.466	31.66787	-1.2084
Urea fertiliser (kg/ha)	293.8894	88.2196	305.0854	75.35114	-1.2381	294.6563	50.29173	-0.0992
Production costs (FCFA/ha)								
Total production cost per hectare	503 617.40	97 914.97	508 317.50	109 864.20	-0.43	519 333.90	83 759.01	-1.6721**
Land preparation	76 773.33	16 750.70	74 327.16	8 680.46	1.5585*	77 007.78	11 413.16	-0.15
Seeds, herbicides, and fertilisers	134 789.90	31 686.94	133 770.50	28 920.04	0.31	142 195.60	22 331.74	-2.5587***
Water control	73 442.36	31 886.05	74 995.67	22 028.69	-0.50	89 210.13	20 506.88	-5.5191***
Harvesting and threshing	146 189.30	38 964.03	137 064.10	38 715.05	2.1833**	147 025.80	29 917.62	-0.23
Financing	17 211.88	16 781.96	32 108.77	8 767.67	-9.4642***	375.28	3 295.75	12.3451***
Other production costs	55 973.64	54 397.48	53 860.41	53 677.12	0.36	63 519.29	50 215.37	-1.409*
Profit (FCFA)								
Profit per hectare	210 662	139 692	219 925	131 165	-0.6317	162 391	110 856	3.6772***
Profit per kilogram	44.30107	26.07305	44.94906	19.97519	-0.2496	29.22497	22.35399	6.0195***
Number of observations	265		130			155		

Farms used different modes of funding: 73.01% relied on credit. The two main types of credit were bank credit (46.04% of farms) and production contracts (26.14%). Interlinked transactions with small-scale traders were very rare (0.85%). A total of 19.7% of farms used no credit but relied entirely on self-finance. Finally, 7.34% of surveyed farms did not grow rice in the 2014 dry season. None of the farms combined a bank loan and a production contract.

Farms often combine one type of credit with self-financing (Table 5). Seeds, herbicides, fertilisers, and water represent 42.3% of the average cost per hectare, and are not self-produced, one reason being that farmers use certified seeds. In contrast, harvesting and threshing are often paid for in-kind, and family members often prepare the land. As a result, the challenge for rice growing is financing seeds, herbicides, fertilisers, water and sometimes land preparation.

Table 5: Distribution of farms per mode of funding and per item of expenditure (N=550)

	Bank	Self-funding	Production contract	No payment	Interlinked transaction	Total	
Land preparation (%)		34.76	16.58	7.63	40.64	0.18	100
Seeds, herbicides, and fertilisers (%)		48.84	21.75	28.52	0	0.89	100
Water (%)		44.56	10.52	27.63	6.42	0.71	100
Harvesting & threshing (%)		2.32	93.58	5.7	0.36	0	100
Other (%)		0	93.89	0.44	5.24	0.44	100
Number of observations				N=550			

N = 550 because 44 farms from the sample did not grow rice in the 2014 dry season. "Bank" groups farmers who reimbursed the bank credit through a spot transaction or a marketing contract". "Self-funding" groups in-kind and in-cash payments. "No payment" groups inputs not used (such as when the farmer does not prepare the land at all) and inputs that are free of charge (such as when the farm obtains water free of charge from an agribusiness).