COORDINATION AND PROFIT MARGINS IN RICE VALUE CHAIN IN NIGER STATE, NIGERIA

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ABSTRACT

The study examined rice value chain in Niger State to ascertain the extent of coordination and profit margins among actors. It determined the benefits accruing to actors and the supports received. Multistage and stratified random sampling techniques were used to select 315 input providers, farmers, collectors, processors, wholesalers and retailers from Agaie, Katcha and Lavun Local Government Areas of the State. Data were collected on socio-economic characteristics, access to value chain support services, value chain relationships, costs and returns as well as constraints faced by the actors. Descriptive statistics and budgetary techniques were used to analyze the data. Results revealed that the actors were in their economically active age (less than 60 years) and married with large household sizes. Vertical coordination was high among the actors but horizontal coordination was weak. All actors realized profits. Profit margin per bag was highest for wholesalers and retailers and lowest for processors. However, the processors earned the highest return on investment (4.63), followed by wholesalers (1.49), farmers (1.35), paddy collectors (1.29), retailers (1.27) and input providers (1.13). While coordination among the actors was strong, value chain support was weak. Therefore, it was concluded that even though there were positive profit margins and returns on investment, opportunities existed for increasing them by providing value chain support in the form of forming and strengthening clusters of actors, providing financial linkages, offering effective extension and advisory services, training actors on business management skills and contract negotiation, providing effective contract enforcement mechanisms, promoting central warehousing and establishing large-scale processing plants.

INTRODUCTION

Rice is commercially the second most important cereal after wheat, worldwide. It is also widely consumed and there is hardly any country where it is not utilized in one form or another. In Nigeria, not only is it widely consumed, but it has risen to a position of predominance among staple foods with consumption increasing at about 10% per annum since the 1970s (Akande, 1999). In fact, rice has become a food security commodity while also generating more income than any other cash crop for the Nigerian farmers who normally sell up to 80% of total production (USAID, 2009).

Notwithstanding the significance of rice in the Nigerian economy, domestic production of the commodity falls far short of the consumption, resulting in massive importation to bridge the gap. Until recently, rice constituted one of the most important Nigeria's agricultural import items, making the country the highest importer of the product in Africa, and the second highest in the world (NRDS, 2009). However, with the current economic recession, coupled with acute scarcity of foreign exchange, the Nigerian government has been compelled to drastically restrict importation of the commodity and is attempting import substitution in the sector.

One of the areas where increased rice production is being promoted is Niger State, which is already one of the major rice producing States. Efforts are currently being made to substantially raise rice production in the State by upgrading its value chain. Such efforts are spear-headed not just by the State government, but also donor-assisted projects such as Fadama III Additional Financing and International Fund for Agricultural Development (IFAD). To achieve this successfully, however, it is necessary to analyze the rice value chain to identify the existing actors, opportunities and the gaps. Only then would it be certain, what supports and interventions are required to promote the commodity's value chain and (thereby) increase its output in the State and perhaps nationally. The objectives of this study therefore are to:

i. identify the main actors, supporters and activities in rice value chain in Niger State
ii. describe the level of coordination among actors in the chain

iii. determine the profit margins of actors and
iv. identify constraints of the actors.

METHODOLOGY

Study area

The study was conducted in Niger State ($8^0 21'$-$11^0 30'$ N; $3^0 30'$-$7^0 20'$ E). It is bordered by the Nigerian State of Kaduna to the north east, the Federal Capital Territory to the south east, Zamfara State to the north, Kebbi State to the west, Kogi and Kwara States to the south and south west, respectively, and by the Republic of Benin to the North West. Average annual rainfall varies from 1,100 mm - 1,600 mm. Furthermore, with a land area of more than 8.6 million hectares (about 9.3% of the country's total), most (85%) of which is cultivable, and a low population density, the State holds great potentials for promoting food security and agricultural exports for Nigeria. This is further underscored by climate and soil characteristics which are said to be suitable for the production of most of Nigeria's crops and livestock. But the State decidedly has an advantage in rice production given its vast flood plains which are suitable for both irrigated and rainfed cultivation.

Sampling and data collection

A combination of multistage and stratified sampling techniques was used. Of the three agricultural zones in the State, Zone I was purposively selected because of the predominance of rice production there. The Zone consists of eight local government areas (LGAs), out of which three (Agaie, Katcha and Lavun) were randomly selected. From each selected LGA, three rice producing villages were randomly sampled from a sampling frame obtained from the Niger State Ministry of Agriculture. They include Ekagi, Loguma and Nami in Agaie LGA, Badeggi, Edotsu and Katcha in Katcha LGA and Busu, Danchitagi and Wuya Suman in Lavun LGA. The population of the value chain actors was stratified into rice input suppliers, producers (farmers), paddy collectors, processors, wholesalers and retailers. Five respondents each of the actors were then randomly sampled in each village giving a total of 270 respondents.

With the aid of questionnaires, primary data were collected from the selected chain actors on socio-economic characteristics, sources, quantities and prices of inputs, product sources, prices and quantities, packaging, storage and transport costs, tools and machinery costs, membership of associations, access to credit, value chain supporters, opportunities and gaps in the value chain as well as constraints.

Data analysis

Descriptive statistics were used to achieve objectives i, ii and iv while budgetary technique was used to achieve objective iii. Using the budgetary technique, the net income or profit of a particular actor was defined as:

$NI = TR - TVC - TFC$ (1)

Where:

NI = net income, TR = total revenue, TVC = total variable cost and TFC = total fixed cost.

Following USAID (2009), the net profit margin (PM) of an actor was defined as:

$PM = NI/Q$ (2)

Where Q = quantity of output of the actor (bags)

The return per naira invested was defined as:

$ROI = TR/TC$ (3)

Where: ROI = return on investment

RESULTS AND DISCUSSION

Socio-economic characteristics of rice value chain actors

Table 1 shows that all rice input providers, producers, collectors, processors and majority of wholesalers were male while majority of the retailers were female, suggesting a male dominated value chain in Niger State. It is also evident from the table that most of the actors were relatively young but quite experienced, married, and had large household sizes. There was also evidence of high level of illiteracy (above 40%) among the actors, with processors being the most educated and wholesalers with retailers being the least. In Niger State, as perhaps most of Nigeria, education tends to improve income

and access to finance. It is therefore, possible that the educated were more able to afford the relatively high investment requirements of rice processing.

Table 1: Distribution of rice value chain actors by socio-economic characteristics

Characteristic	Distribution	Input providers	Producers	Paddy collectors	Wholesalers	Processors	Retailers
		Freq (%)	Freq (%)	Freq (%)	Freq (%)	Freq (%)	Freq (%)
Gender	Male	45 (100)*	45 (100)	45 (100)	30 (66.7)	45 (100)	12(26.7)
	Female	0 (0.0)	0 (0.0)	0 (0.0)	15 (33.3)	0 (0.0)	33(73.3)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)
Age (years)	≤ 30	4 (8.9)	2 (4.4)	5 (11.1)	5 (11.1)	2 (4.4)	6 (13.3)
	31-60	39 (86.7)	37 (82.2)	39 (86.7)	37 (82.2)	40 (88.9)	37(82.2)
	> 60	2 (4.4)	6 (13.3)	1 (2.2)	3 (6.7)	3 (6.7)	2 (4.4)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)
	Mean	31.1	35.8	35.9	41.9	34.0	37.6
Marital status	Married	42(93.3)	43(95.6)	42(93.3)	43(95.6)	45(100)	37(82.2)
	Single	3(6.7)	2(4.4)	3(6.7)	2(4.4)	0 (0.0)	8(17.8)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)
Household size	≤ 10	25 (55.6)	21 (46.7)	20 (44.4)	7 (15.6)	21 (46.7)	21(46.7)
	11-20	20 (44.4)	21 (46.7)	23 (51.1)	32 (71.1)	24 (53.3)	19(42.2)
	>20	0 (0.0)	3 (6.7)	2 (4.4)	6 (13.3)	0 (0.0)	5 (11.1))
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)
Education	Primary	10 (22.2)	14 (31.1)	5 (11.1)	5 (11.1)	15 (33.3)	5 (11.1)
	Secondary	9 (20.0)	6 (13.3)	13 (28.9)	7 (15.6)	8 (17.8)	8 (17.8)
	Tertiary	8 (17.8)	6 (13.3)	5 (11.1)	6 (13.3)	8 (17.8)	5 (11.1)
	No formal	18 (40)	19 (42.2)	22 (48.9)	27 (60)	14 (31.1)	27(60.0)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)
Experience	≤ 10	25 (55.6)	21(46.7)	20 (44.4)	7 (15.6)	21 (46.7)	21(46.7)
	11-20	20 (44.4)	21(46.7)	23 (51.1)	32 (71.1)	24 (53.3)	19(42.2)
	>20	0 (0.0)	3 (6.7)	2 (4.4)	6 (13.3)	0 (0.0)	5 (11.1)
	Total	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)	45 (100)

Source: Survey data, 2012

Organization and coordination in rice value chain

The main actors in the rice value chain are the input providers, rice producers, paddy collectors, processors, wholesalers and retailers. It can be seen in Table 2 that input providers handled mainly fertilizer and herbicides and to a lesser extent, insecticides and improved seeds. Similarly, fertilizer and herbicides were the main inputs demanded by rice farmers. But greater proportion (almost 58%) of the farmers seemed to buy improved seeds than available providers (22%). Compared to the other inputs therefore, access to improved seeds is relatively difficult for rice farmers who have to travel longer distances to buy the input.

Table 2 also shows that while family labour input was more popular among the farmers, labour hiring was also quite prevalent (64%) perhaps because mechanization (practiced by only 13%) was low. Majority of the farmers stored their products at home and sold directly to wholesalers and paddy collectors. However, almost half (47%) of them had not received extension advice on rice farming or post-harvest handling. It is also evident that most of the farmers and input providers rely only on their personal savings for financing their activities. This is an indication that many farmers (and input providers) are still left outside the net, notwithstanding the efforts of government (through the Niger State Agricultural and Mechanization Authority) and donor-assisted projects to promote rice value chain in the State.

Table 2: Value chain activities of input providers and paddy rice producers

Actor	Activity	Frequency	%
Input providers	**Inputs handled**		
	Fertilizers	38	84.4
	Herbicides	39	86.7
	Insecticides	10	22.2
	Improved seeds	10	22.2
	Cooperative		
	Member	18	40.0
	Non-member	27	60.0
	Source of finance		
	Personal savings	33	73.3
	Cooperatives	18	40.0
	Bank		
Producers/Farmers	**Inputs bought**		
	Fertilizers	40	88.9
	Herbicides	35	80.0
	Pesticides	10	22.2
	Improved seeds	26	57.8
	Production method		
	Entirely manual	37	82.2
	Partly mechanized	5	11.1
	Labour use		35.6
	Family	36	80.0
	Hired	29	64.4
	Paddy storage		
	At home	38	84.4
	Rented store	7	15.6
	Paddy sale		
	Paddy collector	24	53.3
	Processor	13	28.9
	Wholesaler	33	73.3
	Retailer	11	24.4
	Consumer	5	13.3
	Extension visit		
	Visited	24	53.3
	Not visited	21	46.7
	Cooperative		
	Member	18	40.0
	Non-member	27	60.0
	Source of finance		
	Personal savings	31	68.9
	Cooperatives	14	31.1
	Banks	10	22.2

Source: Survey data, 2012

Table 3 shows that majority of all value chain actors used mainly family labour but hiring was high among retailers, processors and wholesalers suggesting the high employment creation potential of rice value chain activities. With the exception of wholesalers, most of the other actors stored their products at home. Group or central storage of products was conspicuously absent in the entire value

chain suggesting limited cooperation among actors on this activity. Furthermore, only few of the actors indicated in the table have received extension, training or advisory services on their activities. It does seem therefore, that even the limited extension services available have focused mainly on farmers, ignoring other participants and pointing to a production rather than value chain-oriented bias. It is also indicated in the table that cooperation seems to be strong among retailers and to a lesser extent, wholesalers. Nonetheless, most of the value chain actors still rely on personal savings for finance.

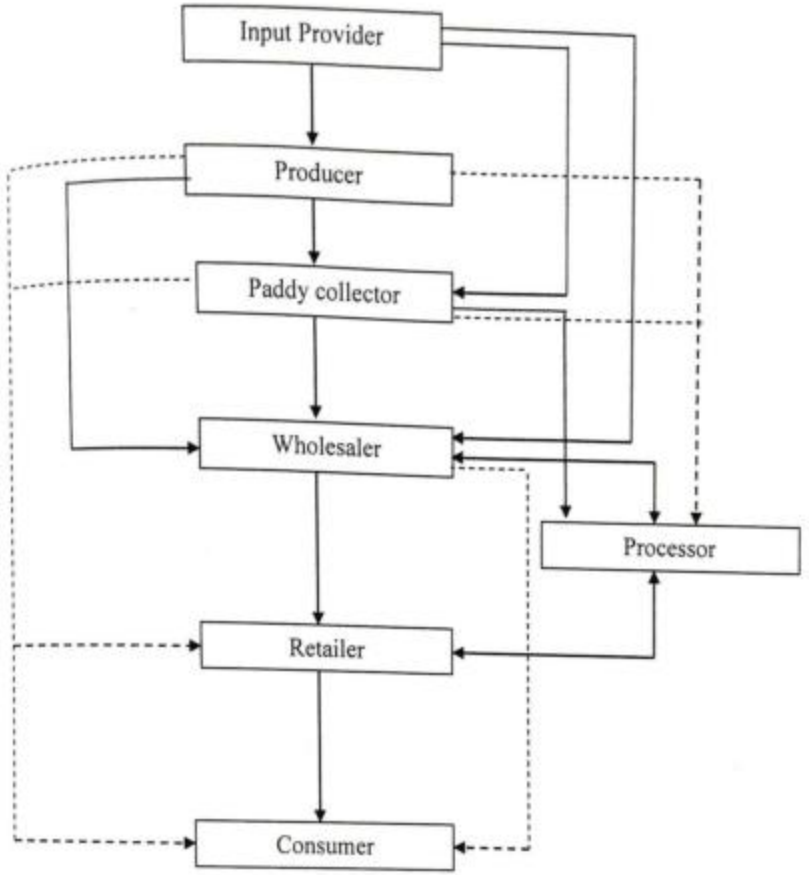
Table 3: Value chain activities of paddy collectors, processors, wholesalers and retailers

	Paddy collector		Processor		Wholesaler		Retailer	
Activity	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Labour use								
Family	35	77.8	34	75.6	31	68.9	21	46.7
Hired	7	15.6	21	46.7	20	44.4	24	53.3
Storage								
At home	45	100	45	100	10	22.2	34	75.6
Rented store	0	0.0	0	0.0	35	77.8	6	13.3
Own market store	0	0.0	0	0.0	0	0.0	5	11.1
Sale								
Paddy collector	0	0.0	0	0.0	0	0.0	0	0.0
Processor	13	28.9	0	0.0	22	48.9	0	0.0
Wholesaler	15	33.3	5	11.1	37	82.2	0	0.0
Retailer	4	8.9	31	68.9	34	75.6	27	60.0
Consumer	2	4.4	40	88.9	4	8.9	45	100
Extension/advisory support								
Received	14	31.1	0	0.0	6	13.3	2	4.4
Not received	31	68.9	45	100	39	86.7	42	93.3
Cooperative								
Member	8	17.8	20	44.4	27	60.0	15	33.3
Non-member	37	82.2	25	55.6	18	40.0	30	66.7
Sources of finance								
Personal savings	42	93.3	45	100	45	100	25	55.6
Cooperatives	10	22.2	0	0.0	0	0.0	7	15.6
Banks	0	0.0	0	0.0	0	0.0	13	28.9

Source: Survey data, 2012

The flow of products indicated in the value chain map in Figure 1 reveals that input providers sell mainly production inputs to producers and packaging and storage inputs to paddy collectors and wholesalers. The input providers maintain close relationship with producers, sometimes providing inputs on credit and getting paid after harvest. Input providers coordinate among themselves by sharing market information. In addition, a few of them (40%) are organized into cooperatives through which they enjoy shared benefits that promote their trade.

The typical producer (farmer) mainly sells paddy to collectors and wholesalers, but also (less frequently) to retailers or consumers. His relationship with processors is mainly in milling rice meant for home consumption. Some of the farmers however, coordinate among themselves by belonging to cooperatives which increased access to information, credit (28% of members) and inputs (15.6%), allowing them to increase farm sizes (22.2%) and output (26.7%).



Key: ——→ Strong linkage
- - - - → Weak Linkage

Figure 1: Rice value chain map in Niger State

Results revealed that paddy collectors sold mainly to wholesalers and on a smaller scale to processors, retailers and consumers. They share information with and some (33%) purchased paddy from fellow collectors. The wholesaler bought mainly from the producer and paddy collector and sold directly to retailer and processor. A major proportion (56%) did some rice milling using mainly the facilities of processors before selling to retailers and consumers. Sometimes the wholesalers coordinated among themselves by sharing information, selling (or buying) from each other and especially through cooperatives. In fact, they were the most organized actors.

The retailers are the most important group responsible for selling rice directly to consumers mostly in milled form (80%) but sometimes as paddy (26%). They normally buy paddy which they take to processors for milling before selling. While some retailers sell their product exactly as procured or milled, most clean their rice to upgrade its quality before disposal. It is in this cleaning operation that many hands were hired. Again, group membership was weak among this category. But some of those who were members indicated that they benefitted through sharing market information, obtaining credit and engaging in rotating savings.

In summary, it can be stated that vertical coordination between the actors seems to be strong while horizontal coordination (among actors at the same level of the chain) was weak as can be seen from the poor organization of actors into groups. Furthermore, the level of value chain support is still

low as revealed by low access to external finance, extension/advisory services, lack of marketing support, absence of support in organizing them into groups and universally high transportation costs.

Profit margins of rice value chain actors

The costs and returns structure of value chain actors shown in Table 4 reveals that variable (operation) costs dominated the expenses with purchase of products traded looming large. This suggests low level of fixed capital investment required for participating in rice value chain activities except processing which requires acquisition of the relatively expensive milling machines as can be seen from the relatively high depreciation cost of processors. Input providers incurred the highest total costs but also earned the highest revenue. The total revenue earned by processors was the second highest. Similarly, the processors received the highest absolute profit, followed by input providers and then wholesalers. Strikingly, the farmers obtained the lowest profit among all actors. However, in terms of profit margin – when the profits were weighted by the quantity of rice sold – the situation changed, with wholesalers earning by far the highest and the processors the lowest. This follows that the high absolute profit obtained by the processors is attributable to the relatively large number of bags handled. It was not possible to compute the profit margin of input providers as defined because of the heterogeneity of the items sold.

The relative profitability of value chain activities was further revealed through the returns per naira invested by each actor category. Table 4 shows that processors earned the most while input providers earned the least. Therefore, ultimately, the financial performance of the processors was the best among all actors. But as stated earlier, processing also required the highest initial fixed capital investment.

Table 4: Average costs and returns per actor in the rice value chain (₦)

Tem	Input provider	Producer	Paddy collector	Processor	Wholesaler	Retailer
Variable cost						
Cost of product purchase	2,104,093.33	0	285,695.67	0	461,722.22	345,165.78
Transportation cost	28,488.89	0	3,166.56	0	36,122.22	4,072.44
Tax (levy)	2,402.22	0	0.00	1,646.67	1,937.78	1,180.00
Land preparation	0	12,431.13	0	0	0	0
Cost of inputs	0.00	66,676.67	7,617.56	0	0	0
Cost of labour	6,855.56	12,522.87	3,712.22	6,630.00	4,114.44	3,404.56
Operation/ Maintenance	0	0	0	202,204.44	0	0
Others	0	0	0	0	14342.22	4773.333
Total variable cost	2,141,840.00	91,630.67	300,191.90	210,481.11	518,238.89	358,596.11
Fixed costs						
Rent	1,042.22	2,515.56	270.00	1,400.00	0.00	384.44
Depreciation	3,955.67	1,846.89	89.33	26,045.71	1,488.89	1,466.67
Total Fixed Cost	4,997.89	4,362.22	359.33	27,445.71	1,488.89	1,862.22
Total cost	2,146,837.89	95,992.88	300,551.20	237,926.82	519,727.78	360,458.33
Returns						
Output (bag)*	NA	32.78	78	5,668.44	96	61.40
Total revenue	2,426,515.56	130,001.11	388,035.60	1,101,269.87	774,808.89	457,490.00
Net income (profit)	279,677.67	34,088.22	87,484.40	863,343.05	255,081.11	97,031.67
Profit margin	NA	1,039.91	1,121.59	152.31	2,657.09	1,580.32
Return on investment	1.13	1.35	1.29	4.63	1.49	1.27

*1 bag of paddy = 80kg

Source: Survey data

Rice value chain constraints

As should be expected, Table 5 shows that constraints varied among actors. Many farmers (producers) and paddy collectors reported default or failed buy-back arrangement as a major constraint. In the case of the farmers, the failed buy-back arrangement occurred in the survey year when the only existing large-scale processor in the area failed to honour an arrangement made with the local farmers to acquire their paddy as a result of disagreement over the sizes of bags in which rice was to be sold. This failure resulted mainly because the farmers and this buyer had different understanding regarding the size of bag that was to be used. On the other hand, some paddy collectors in the area indicated that farmers default by selling their product to other buyers or demanding prices higher than agreed. These are indications of poor contract negotiation and enforcement mechanisms.

Instability in rice prices was also reported by many farmers and retailers as a major challenge.

This is obviously attributable to the seasonal nature of rice production in the area and poor storage facilities. As reported earlier, storage is normally restricted to the limited facilities available at home instead of warehouses. Many of the actors also complained of high transportation cost which for obvious reasons seems to be a universal phenomenon in Nigeria. Furthermore, majority of the rice processors identified high fuel cost and maintenance cost as major constraints. Most of them operated petrol-powered small-scale millers which seem to be more reliable than electric powered given the non-availability or instability of electric power supply in the area. The petrol machines however, were more costly to run.

Furthermore, inadequate access to finance as well as extension or advisory services seems to be widespread among all actor categories. Earlier results presented in the paper indicated that actors relied mostly on personal savings, with a few accessing loans from their cooperatives. Availability of bank loans and other formal finance is conspicuously absent among the actors. It is not surprising therefore, that they all operated on small-scale (see quantities of output handled in Table 4) and could not enjoy economies of scale. Furthermore, provision of extension and advisory services which is supposed to be spear-headed by the Niger State Agricultural and Mechanization Development Authority (NAMDA) is almost non-existent. Although donor-assisted agencies such as the Fadama III Additional Financing offers some services, these are usually limited and farmer-centered.

Table 5: Constraints among rice value chain actors

Constraints	Input provider		Rice Producer		Paddy collector		Processor		Wholesaler		Retailer	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Default/failed buy-back arrangement	0	0.0	39	86.7	20	44.4	0	0.0	0	0.0	0.	0.0
Price fluctuation	0	0.0	36	80.0	0	0.0	0	0.0	0	0.0	22	48.9
Low patronage	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	27	60.0
High transport cost	36	80.0	0	0.0	11	24.4	0	0.0	18	40.0	20	48.9
High milling cost	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	19	42.2
Insufficient finance	25	55.56	10	22.2	8	17.8	45	100	0	0.0	25	55.6
Poor rice quality	0	0.0	0	0.0	23	51.1	0	0.0	32	71.1	0	0.0
High fuel cost	0	0.0	0	0.0	0	0.0	30	66.7	0	0.0	0	0.0
High maintenance cost	0	0.0	0	0.0	0	0.0	27	60	0	0.0	0	0.0
Frequent breakdown	0	0.0	0	0.0	0	0.0	39	86.7	0	0.0	0	0.0
Poor access to extension	45	100	18	40.0	45	100	45	100	45	100	45	100

Source: Survey data, 2012

CONCLUSION

The rice value chain actors identified in the area include rice input providers, producers (farmers), paddy collectors, processors, wholesalers and retailers, who were active (less than 60 years old) with large household sizes. In undertaking the various value chain activities, the vertical coordination between the actors seems to be strong while horizontal coordination (at the same level of the value chain) was weak. Nevertheless, participation in the rice value chain was profitable among all actors, both in absolute and

relative terms, with processors obtaining the highest return on investment. However, the study revealed low level of value chain support as could be seen in extremely limited access to external finance as well as extension/advisory services, lack of marketing support, limited support in organizing actors into groups, high transportation and processing costs, absence of central warehousing as well as almost non-existence of contract negotiation and enforcement support. Thus it appears that opportunities exist for improving the financial attractiveness of the value chain activities and (thereby) increasing rice production.

RECOMMENDATIONS

To achieve the desired improvement in the rice value chain in Niger State, it is recommended that the following chain support activities be seriously pursued:

i. Value chain actors should be actively organized into their various economic interest groups or clusters for them to help themselves and receive support easily. The Fadama III Additional Financing is currently doing this by organizing rice farmers into clusters but this is on a limited scale. The State government needs to buy into this for its sustainable expansion (to other actors and across the State)

ii. There is the need to increase access to finance to enable actors expand their activities. The importance of credit in promoting rice value chain has been well documented (Onoja and Herbert, 2011). Therefore, the actors, after forming groups or clusters as suggested above will have to be deliberately linked by the relevant State agencies to institutional financing mechanisms such as the Nigerian Incentive Based Risk Sharing System of Agricultural Lending (NIRSAL), Small and Medium Enterprises Financing Scheme, Bank of Agriculture, Nigerian Agricultural Insurance Corporation (NAIC), commercial banks etc. This type of linkage would normally involve the State providing guarantee in support of actors to lenders.

iii. There is need to provide effective extension and business advisory services as demanded by value chain actors. New ways of reaching the actors other than the T & V system still operated by NAMDA are required.

iv. Value chain actors require adequate training in business management skills and contract negotiation, while there is need for government to develop appropriate mechanisms for contract enforcement which is cumbersome under the current Nigerian legal system.

v. Through the clusters and in partnership with private investors, the State government could promote establishment of central warehouses for rice storage in the area. This, along with provision of adequate market information could help in stabilizing prices and incomes, preserve product quality and even encourage centralization of processing and marketing.

vi. Given the central role of Niger State in the rice economy of Nigeria, there is need for government to engage private investors to establish modern large-scale rice processing plants that could process export quality rice.

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