ECONOMIC ANALYSIS AND MAPPING OF RICE VALUE CHAIN ACTORS IN KATSINA STATE, NIGERIA

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Abstract. The study was conducted to analyze the economic activities and map out the rice value chain actors in Katsina State. The rice value chain actors studied were farmers, processors and marketers. A total of 357 actors were sampled using multi-stage sampling technique. Primary data was utilized in the study. The data was collected using a structured questionnaire by trained enumerators and was analyzed using Farm Budgeting Techniques, Financial Benefit Cost Analysis as well as Value chain Mapping. The result of financial profitability analysis revealed that a typical rice farmer earned an average revenue and profit of ₦663,799.25/ha and ₦322,356/ha respectively. The rice processors earned total revenue of ₦16,560/bag of paddy from which ₦674.92/bag was the net profit whilst the rice traders earned revenue of ₦18,360/bag as well as a net financial profit of ₦800/bag. The analysis further revealed that farmers, processors and marketers generate revenue of ₦1.9, ₦1.04 and ₦1.05 for every one Naira invested respectively. The result on value chain mapping depicts that the study area was characterized by two different groups of rice value chain actors (micro level actors and meso level actors). The micro level actors include input dealers, farmers, collectors, processors etc. while the meso level actors include service providers, financial institutions and farmers' associations. The study recommends emphasis on effective shorter value chain to support profit enhancement among the actors, since longer value chain most often depicts smaller profit.
Keywords: *rice, value chain, profitability, farmers, processors, marketers*

Introduction

In Nigeria, the combination of many factors seemed to have caused structural increase in rice consumption resulting in excess demand over supply. The major reason for this increase in rice demand is because rice has changed from being an elitist to a staple food for many Nigerians (Obinna et al., 2020). Similarly, the rice value chain in Nigeria has been characterized as small-scale production, processing and marketing chains that usually involve large amounts of rudimentary practices with an underlying assumption that cost is relatively minimized and value chain profit is relatively maximized. This perception needs to be carefully reviewed as most smallholder rice value chain actors have limited available resources to enable successful expansion of their activities. Thus, the overall profitability in the rice value chain is often overestimated. This then causes a major drag on the yield potential as demonstrated with most research demonstration at various stages along the rice value chain (Emmanuel, 2021). Value chain analysis is a review of how rice gets from the producer to the consumer and how this can be improved to the benefit of the smallholder producers and other players in the value chain. The idea behind the value chain is to assist farmers with the vertical integration of their produce in the hope this will provide additional returns to the various actors along the chain (FMARD, 2020). The value

chain model presupposes that by understanding the relationships between the actors, it is possible for private and public agencies to identify points of intervention to increase efficiency by increasing total generated revenue through capital investment and also improve the competence of the actors by increasing their share of the total generated income for profit enhancement (Obinna et al., 2020).

As a result, increasing interventions through grants and social development programs from organizations such as Food and Agriculture Organization of the United Nations (FAO) International Fund for Agricultural Development (IFAD) and the World Bank, to small-scale rice value chain actors are aimed at sensitizing farmers with farming best practices and connecting the other actors within the rice value chain in the hopes of increasing quality and quantity of rice in Nigeria. In 2019, Nigeria partially closed its land borders with Benin, Togo, Niger, Cameroon, and Chad to curb the level of smuggled goods into the country, especially staple food commodities including rice. The closure of Nigeria's land borders was subsequently consolidated-with further restrictions on imports and exports through land borders. Such efforts have triggered the attentions of many researchers in mapping out the rice value chain actors as well as analyzing the current and future financial strengths of their enterprises (Uduji et al., 2019). However, the overall rice value chain in Katsina State has not been studied with regards to mapping and profitability analysis despite the fact that the State has areas with predominant rice value chain activities, and also the state government is committed towards improving the rice value chain in the State especially by implementing programs such as the agricultural restoration project which aims at promoting dry season irrigation-based farming in which rice is a key commodity. Other functions of the project include restoring abandoned cultivable land in the state and allocate it to active farmers, establishing large organic fertilizer plant for the production of organic fertilizer as one of the relevant inputs for boosting rice production in the state. Such initiatives have potentials of making the state among the leading rice producing states in the country (Musa and Maharazu, 2020). It is therefore in view of this that the study analyzed the following research objectives: (1) to estimate the financial profitability of the rice value chain actors; (2) to evaluate the financial strength and weakness of the rice value chain actors; and (3) to evaluate the financial strength and weakness of the rice value chain actors.

Materials and Methods

Description of the study area

The study was conducted in Katsina State. The State covers an area of about 23,983 square kilometers with a projected population of 9,921,456 by 2021 (Ibukun, 2019; NPC, 2017). The State is located in the North-western part of the country and lies in between latitudes 110°03′ and 130°05′ N and longitudes 070°21' and 090°02′ east of Greenwich Meridian. It has two climatic seasons; rainy and dry seasons with a mean rainfall of 1300mm. The climate favours maize, rice, cowpea, groundnut, millet and guinea corn. Major livestock in the state include cattle, sheep, goats and poultry (Saleh and Oyinbo, 2017).

Sampling procedure

Multi-stage sampling technique would be employed for the study (*Table 1*). The first stage involved the purposive selection of four major rice producing Local Government Areas. The areas selected were Dutsin-Ma, Dandume, Funtua and Danja. The second stage was the random selection of three farming communities from each of the four sampled Local Government Areas to give a total of 12 farming communities. The third stage was the application of proportionate sampling to select appropriate number of respondents (rice farmers, processors and marketers) from the list of rice value chain actors for respective communities using the sample size recommended for each actor by Raosoft sample size calculator. The following expression of the proportionate sampling was used to select a total of 357 rice value chain actors.

$$n = \frac{X}{D} * N \qquad \text{Eq. (1)}$$

Where, n means sample size of jth rice actors selected per community; X mean number of jth rice actors in a farming community; D means total number of jth rice actors in all 12 farming communities; and N means recommended sample size by Raosoft sample size calculator. The proportionate distribution of the rice value chain actors is computed in *Table 1* that follows.

Table 1. *Sample size of rice value chain actors.*

S/N	LGA	Village selected	Population of farmers	Number selected	Population of processors	Number selected	Population of marketers	Number selected
1	Dutsin-Ma	Darawa	100	19	17	9	17	8
		Makera	95	18	0	0	15	6
		Shema	90	17	21	11	10	3
2	Dandume	Dantakari	85	15	0	0	12	4
		Dandume	110	20	21	11	13	5
		Mahuta	100	19	21	11	17	8
3	Danja	Jiba	65	12	0	0	19	9
		Dabai	70	13	21	11	13	5
		Danja	105	20	19	10	17	8
4	Funtua	Maska	100	19	17	9	11	3
		Maigamji	70	13	14	7	14	5
		Dukke	60	11	21	11	16	7
Total	4	12	1050	196	172	90	174	71

Data collection and analysis

Primary and secondary data were used for the study. The primary data was collected with the aid of three different set of structured questionnaires administered to the respective sampled rice value chain actors by trained enumerators. Data were collected on socio-economic variables, input and output data on rice production, processing and marketing, domestic market price of output per kg, quantity of output obtained by the actors per production period, cost of transportation, cost of various inputs used such as fertilizer, seed, land, labour, fuel, water, capital and agro-chemicals. Farm Budgeting Techniques, Financial Benefit Cost Analysis as well as Value chain Mapping were used in achieving objective (1), (2) and (3) of the study respectively.

Financial farm budgetary analysis

According to Olukosi and Erhabor (1988), the farm budget technique is a farm planning and budgeting tool used to determine the profitability of a given enterprise. The explicit form of the model chosen is given as follows (Eq. (2):

$$NFI = TR - (TVC + TFC) \quad \text{Eq. (2)}$$

Where, NFI means Net farm/marketing/processing income of jth rice value chain actor in Naira (₦). That is the differences between TR and TC; TR means Total revenue. This is computed by multiplying the total output by the unit price of the output (₦); TVC means Total variable costs. These are the costs that vary according to the expenditure incurred on variable inputs employed in the value chain such as the cost of labour, fertilizer, fuel, chemical, seeds, water, and firewood; as well as TFC means Total fixed cost. These are the costs incurred on fixed inputs used during the rice value chain activities such as the leasing value of land for tenant farmers, interest on loans, depreciation on implements such as hoe, trays, containers, tarpaulin, cutlasses, soaking tanks, pot/drum etc. (Ojo et al., 2011). The straight-line depreciation method as expressed below was used to estimate the depreciation cost of farm equipment and other implements (Eq. (3).

$$\text{Depreciation} = \frac{P-S}{N} \quad \text{Eq. (3)}$$

Where, P means initial market price of asset (₦); N means expected lifespan of the asset (₦); as well as S means salvage value of the asset (₦).

Financial benefits-cost analysis

The financial analysis is used to show at a glance the performance or success of a farm business or enterprise. The analysis can further be employed in determining the strength and weakness of a given enterprise as well as its potential ability to sustain its operations (Olukosi and Erhabor, 1988). To determine a financial profitability of an enterprise, various financial ratios and metric were employed. Such ratios and metric involve: the Benefit-Cost Ratio (BCR), Rate of Return on Investment (RRI), Net Income Ratio (NIR), Net Farm Income (NFI), Operating Ratio (OR) and Gross Margin (GM).

Benefit-Cost Ratio (BCR)

This is a financial ratio that measures the association between the costs incurred and the benefit derived by an enterprise. It is computed as the ratio of the value added for the Total revenue (TR) to the value added for the Total cost (Obasi et al., 2012). Hence, a value greater than unity is required for a firm to be more profitable and have positive net present value. This can be expressed as follows (Eq. (4):

$$BCR = \frac{TR}{TC} \quad \text{Eq. (4)}$$

Where, BCR means Benefit Cost Ratio; TR means Total Revenue (₦); and TC means Total Cost (₦).

Rate of Return on Investment (RRI)

This is a profitability ratio used to determine the effectiveness of a firm in generating profit. It is the performance measure used to evaluate the efficiency of firms or number of investments (Chidiebere, 2017). It is computed as the ratio of net farm income to the total cost incurred. A ratio greater than unity is preferred (Eq. (5).

$$\mathrm{RRI} = \frac{\mathrm{NFI}}{\mathrm{TC}} \times 100 \qquad \text{Eq. (5)}$$

Where, NFI means Net Farm Income (₦); and TC means Total Cost incurred (₦).

Net Incomre Ratio (NIR)

The net income ratio is the final value of profit left after all expenses or deductions owe by the enterprise have been executed. It is the ratio of net farm income to the total gross income of a firm (Tchale and Keyser, 2010). It is computed as follows (Eq. (6):

$$\mathrm{NIR} = \frac{\mathrm{NFI}}{\mathrm{GI}} \qquad \text{Eq. (6)}$$

Where, NFI means Net Farm Income (₦); and GI means Gross Income (₦).

Operating Ratio (OR)

The Operating Ratio is an indicator that specifically determines the extent to which the total variable costs were incurred by the firm during various production processes. A ratio less than one is often preferable for a firm. The OR is expressed as (Eq. (7):

$$\mathrm{OR} = \frac{\mathrm{TVC}}{\mathrm{GI}} \qquad \text{Eq. (7)}$$

Where, OR means Operating Ratio; TVC means Total Variable Cost (₦); and GI means Gross Income (₦).

Gross Margin (GM)

Gross Margin is a measure that shows what the total revenue would be after deducting the costs of variable inputs. It is most frequently used in small-scale or medium enterprises where fixed costs are most of the time negligible. A Gross Margin is useful for assessing the economic performance of an enterprise in a short-run (Tchale and Keyser, 2010). It is simply the difference between the total revenue and the total variable costs as shown in Eq. (8):

$$\mathrm{GM} = \mathrm{TR} - \mathrm{TVC} \qquad \text{Eq. (8)}$$

Where, GM means Gross Margin (N/ha); TR means Total revenue (N/ha); and TVC means Total variable cost (N/ha).

Value chain mapping

Value chain mapping was utilized to achieve objective (3). Value chain mapping enables the visualization of the flow of a product from producer to end consumer through various actors. It also helps to identify the different actors involved in rice value chain, and to understand their roles and linkages. An in-depth interview was conducted with key informants to map out the various rice value chain actors in the area.

Results and Discussion

Financial profitability analysis for farmers per hectare

It is obvious that in a production process, costs are incurred in producing an output and returns are earned from the sale of such output. The profitability of rice production in the study area was computed and the result is presented in *Table 2*. The result in *Table 2* indicates that about 89% of the total cost was consumed by the variable inputs which include fertilizer, chemical, seed, water, transportation and labour. This translates the importance of these inputs in rice production processes hence any careless use of the inputs can greatly affect the farmers' productivity. However, only 11% of the total cost was consumed by fixed inputs which were from depreciation costs and rent of land charges. Fixed inputs are usually used for more than one production periods and thus their costs mostly occupy smaller portion of the total cost and that is one of the reasons they are negligible in some instances. The table also shows that a typical rice farmer earned an average revenue and profit of ₦663,799.25 and ₦322,356/ha respectively. This implies that rice production is highly profitable in the rice value chain of the study area. The findings agreed with that of Amaechina and Eboh (2017) who revealed that farmers in Anambara state earned an average profit of ₦89,662 per hectare.

***Table 2**. Costs and returns of the farmers (₦/ha).*

Production variable	Average quantity	Unit price (₦)	Average amount (₦)	Percentage contribution (%)
A. Variable cost				
Fertilizer	161.971	540.00	87,464.34	28.8
Chemical	3.572	5,500.00	19,647.15	6.5
Seed	76.423	180.00	13,756.21	4.5
Spray charges	3.572	996.83	3,560.69	1.2
Water charges	1 ha	12,000.00	12,000.00	4.0
Labour (man-days)	106.969	1,500.00	160,453.47	52.8
Transportation	55	125.06	6,878.43	2.3
B. Total variable cost (TVC)			303,760.29	89.0 of TC
C. Fixed cost				
Depreciation costs on:				
Machineries	-	-	1,037.28	2.8
Farm tools	-	-	856.21	2.2
Rent on land	1 ha	35,789.47	35,789.47	95.0
D. Total fixed cost (TFC)			37,682.96	11.0 of TC
E. Total cost (TC) = TVC + TFC =			341,443.25	
F. Total revenue (TR)			663,799.25	
G. NFI = TR-TC =			322,356.00	

Financial profitability analysis of processors per 85kg bag of paddy

The financial profitability analysis for the rice processors in the area was similarly computed per 85kg bag of paddy using farm budgeting techniques. The 85kg bag of paddy is equivalent to 18 mudus of milled rice and 1 mudu equals 2.5kg. Therefore, 2.5kg by 18 gives 45kg. The result is presented in *Table 3*. The analysis in *Table 3* reveals how the rice processors in the area used both variable and fixed inputs to earn a profit by processing paddy and selling it as milled rice. The result shows that a rice processor incurred a total variable cost of ₦13,907.08; about 87.5% of the total cost of processing one bag of 85kg of paddy. Cost of paddy and sources of energy which include gas, petrol and diesel were the most important variable factors as they consumed about 95.2% of the total variable costs. The result further shows that a rice processor earned total revenue of ₦16,560 by processing and selling a bag of paddy. However, the revenue was not only from the processing fee or selling of the output, but also from the selling of some rice by-products such as rice bran and rice husk which are used as livestock feed, bedding materials for poultries, fuel and a source of manure for farmers. Thus, a rice processor can earn up to ₦674.92 per bag of paddy as a net profit. This implies that the rice processing in the area is profitable. The findings corroborate the work of Chidiebere (2017) in Ebonyi state, where a rice processor earned about ₦1,980 per ton of paddy.

Table 3*. Costs and returns of the processors per 85kg bag of paddy.*

Operation variable	Average quantity	Unit price (₦)	Average amount (₦)	Percentage contribution (%)
A. Variable cost	1	12,569.08	12,569.08	90.4
Cost of paddy/bag	750	0.493	370	2.6
Water (ltr)	3.59	186	668	4.8
Energy source (ltr)	1.2	250	300	2.2
Labour (man-days)				
B. Total variable cost (TVC)			13907.08	87.5 of TC
C. Fixed cost				56.3
Depreciation on capital inputs:				
Machineries	-	-	260	40.6
Equipment	-	-	100	15.6
Repair and maintenance	-	-	280	43.7
D. Total fixed cost (TFC)			640	4.03 of TC
E. Total cost (TC) = TVC + TFC =			15885.08	
F. Total revenue (TR)			16,560	
G. NFI = TR-TC =			674.92	

Financial profitability analysis of marketers per 85kg bag of paddy (18 mudu of milled rice)

The financial profitability analysis for the rice marketers in the area was as well computed per 85kg bag of paddy using farm budgeting techniques. The 85kg bag of paddy is equivalent to 18 mudus of milled rice and 1 mudu equals 2.5kg. Therefore, 2.5kg by 18 gives 45kg.The result is shown in *Table 4*. The result for the costs and returns analysis for the rice marketers in *Table 4* was computed on the basis of 18 mudus. This was done in order to have homogenous quantity of the output among the actors along the rice value chain in the area so as to perfectly compare their profitability. The result in the Table shows that the cost of the milled rice to the marketers was ₦16,560 which consumed up to 96.7% of the total variable cost. This implies that the cost of the milled rice is continuously increasing because value is progressively added to the product as it passes the different stages along the rice value chain. The analysis further reveals that the traders incurred a total cost of ₦17,560 and earned revenue of ₦18,360 as well as a net profit of ₦800 for marketing every 18 mudus of milled rice

(45kg). The higher revenue was possibly due to limited number of fixed inputs required in rice marketing. This indicates that rice marketing is a profitable venture in the area. The findings are in line with that of Toluwase et al. (2019) in Ado Ekiti Local government area of Ekiti state where it was found that a rice marketer earned a net profit of ₦750.00 per 50kg bag of milled rice.

***Table 4**. Costs and returns of the marketers per bag of paddy (18 mudu of milled rice).*

Operation variable	Average quantity	Unit price (₦)	Average amount (₦)	Percentage contribution (%)
A. Variable cost				
Cost of milled rice/kg	45	368	16,560	96.7
Transportation/kg	45	5.78	260	1.5
Labour (man-days)	1.5	206.67	310	1.8
B. Total variable cost (TVC)			17,130	97.6 of TC
C. Fixed cost				
Depreciation on capital inputs	-	-	280	65.1
Tax/kg	45	3.33	150	34.9
D. Total fixed cost (TFC)			430	2.4 of TC
E. Total cost (TC) = TVC + TFC =			17,560	
F. Total revenue (TR)			18,360	
G. NFI = TR-TC =			800	

Financial Benefit-Cost analysis

The financial benefit cost analysis was employed to reveal the economic performance or success of the rice value chain actors studied (farmers, processors and marketers). The potential ability of these enterprises to sustain their operations can also be determined from this analysis. This was done by computing various financial ratios which include: Benefit-Cost Ratio (BCR), Rate of Return on Investment (RRI), Net Income Ratio (NIR), Operating Ratio (OR) and Gross Margin (GM). The result of the analysis is presented in *Table 5*. The result in *Table 5* shows that the farmers had a benefit cost ratio of ₦1.9 which means every one naira invested by the farmers, generated a revenue of 1.9 naira. This implies that the rice farmers have a positive net present value because a ratio greater than unity was obtained. The value of the rate of return on investment (RRI) shows that the farmers earned 94 kobo as a net profit for every one naira invested. This indicates that the rice farming enterprise in the area is effectively functioning in generating profit. As for the net income ratio (NIR), the value shows that for every one naira income earned by the farmers, the income generates a net profit of 90 kobo. This signifies that even though a ratio less than unity is required, the value of the net profit is considerably strong. However, in the case of operating ratio (OR), the value obtained shows that for every one naira income earned by the farmers, was as a result of spending 84 kobo from the variable inputs. This indicates that the cost of variable inputs incurred by the farmers is high because the lower the operating ratio the better the operational activities of a given enterprise. Thus, despite the profitability level of the farmers, there is the need to adopt costs minimization strategies so as to strengthen the sustainability of the rice farming activities in the area.

***Table 5**. Financial rations and metric of the rice value chain actors.*

Actor	Ratio				
	BCR	RRI	NIR	OR	GM (₦)
Farmers	1.90	0.94	0.90	0.84	6,546.17
Processors	1.04	0.04	0.25	5.24	2,652.92
Marketers	1.05	0.05	0.65	13.93	1,230.00

On the other hand, the Table also shows that the benefit cost ratio (BCR) of the processors was ₦1.04 which indicates that each one naira spent by the processors yielded revenue of one naira and four kobos. However, for the rate of return on investment (RRI), it was observed that only four kobo was generated as a net profit per naira invested by the processors. This implies that the processors earn little profit from the rice processing activities. Similarly, the value of the net income ratio (NIR) shows that each one naira income earned by the processors, leads to a net profit of twenty five kobo. This value is economically low because it is closer to zero than to one. The value also confirmed the little profit obtained from (RRI). As for the operating ratio (OR) the figure shows that the processors spent up to ₦5.24 on variable inputs for every one naira income earned in the rice processing activities. This implies that the potential ability of the processors to sustain their operations cannot be guaranteed due to the high cost of variable inputs incurred which led to a ratio of 5.24 while a ratio less than unity is often preferable. In the case of the marketers, the Table 5 reveals that each one naira invested in rice marketing gives revenue of one naira five kobo and a net profit of only five kobo. The value of the net profit is significantly low because a ratio greater than unity is favored when computing rate of return on investment (RRI). However, the effective performance of the marketers in income generation is fair as 65 kobo was earned per naira income received. As for the operating ratio (OR), the situation is economically beyond expectations because a ratio less than one is often desirable but up to 13.93 was recorded. This implies that a rice marketer in the area had to spend ₦13.93 on variable inputs before he/she is able to earn one naira income. Thus, high capital is required for one start rice marketing in the area and this can affect the performance of some marketers in the long run since personal saving was earlier reported as the main source of capital for the majority of the actors along the rice value chain in the study area.

Rice value chain map in Katsina State

Value chain mapping was employed to recognize the different rice actors along the rice value chain of the study area as well as to understand their roles and linkages along the chain. This is presented in *Figure 1*.

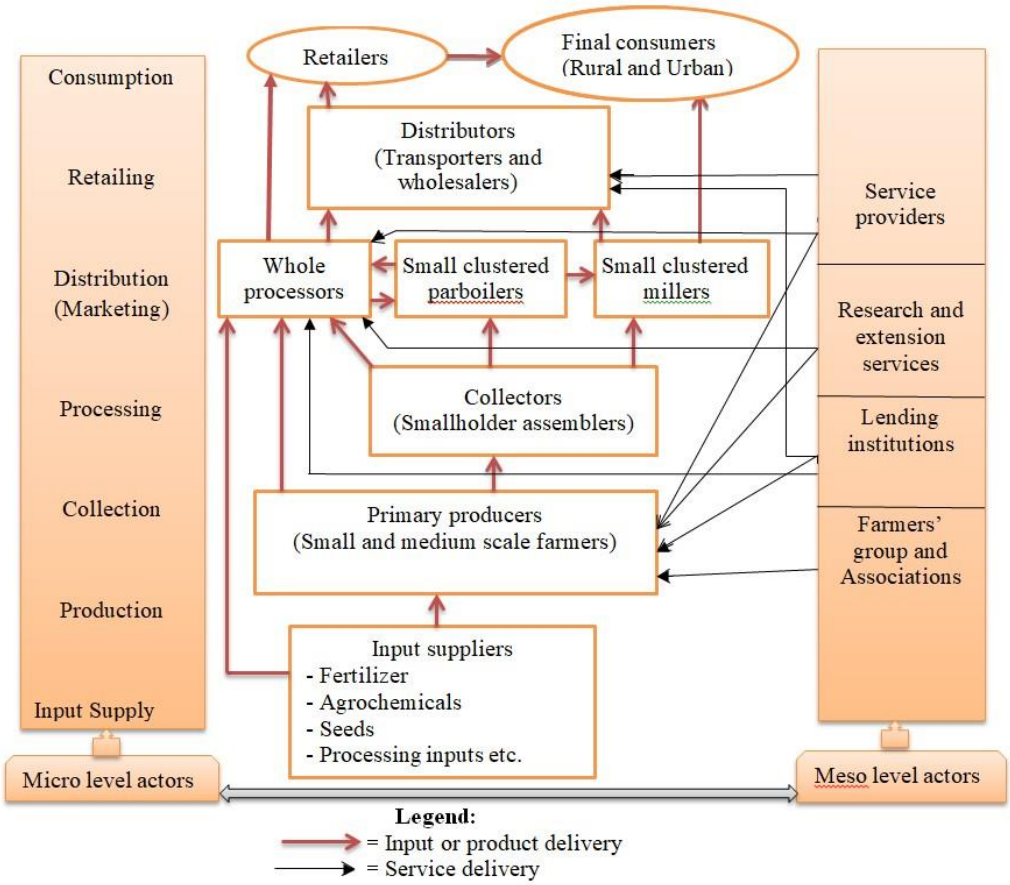

Figure 1. *Rice value chain map of Katsina State.*

The value chain mapping analysis for the rice value chain in the study area in *Figure 1* indicates that there are two different groups of rice value chain actors in the area (micro level actors and meso level actors). The micro level actors are the key or direct actors that are carrying out the rice value chain activities in a sequential manner by having direct contact with the output, such players include input suppliers, farmers, collectors, processors, distributors, retailers and consumers. The map reveals that inputs supply is the starting point of the value chain activities in the area. This function is played by input dealers who specialized in delivering production and processing inputs on commercial basis to farmers and some whole rice processors. The inputs were mainly chemical fertilizers, agrochemicals, improve seeds, and some processing equipment. Some farmers were also reported sourcing some production inputs especially fertilizers and quality seeds from government agencies such as Central Bank of Nigeria under its Anchor borrowers programme in Katsina state and also from the state agricultural development projects. However, the inputs were not given in sufficient quantity hence force the farmers to have commercial relationship with the input dealers. After sourcing the inputs, the primary producers who are mainly small and medium scale farmers play a vital role by converting the inputs to produce an output in form of paddy from which on average about 30% is for home consumption while the remaining 70% is directly sold to whole rice processors or paid off by paddy traders known as collectors who are mainly small scale paddy assemblers in the area. These assemblers are responsible for supplying the paddy to the whole processors (who parboil and mill the rice at the same point and in relatively large quantity using modern processing

equipment) most of the times bear a good business arrangement because some whole processors can buy the paddy from the assemblers or even give the assemblers a huge sum of money to go and source the paddy for them. This is probably due to the fact that the paddy assemblers are expert in determining a qualitative paddy before making any purchase and it is obvious that paddy is the most important input in the rice processing segment hence qualitative paddy is required for high productivity and for superior processing output (milled rice). It was observed that linkage between the whole processors and the paddy traders was the strongest relationship than between any other rice value chain actor in the study area. This disagreed with the findings of Mataia et al. (2020) in Philippines who reported that the vertical relationship between farmers and paddy traders was one of the strongest links among the actors in the area.

Apart from the whole processors, small clustered parboilers and millers in the area also source the paddy from the collectors (paddy traders). The small clustered parboilers who are mainly women specialized in parboiling the paddy and provide the parboiling services to their owned purchased paddy or to any individual who needs the service. The parboiled paddy is then sold to whole processors or to small clustered millers who mill the rice by traditional hand pounding using locally available equipment. The group of traditional millers normally sold the milled rice to wholesalers in large quantities accrued from individual millers or directly sold to the final consumers in relatively small quantities. Similarly, the whole processors also supply the milled rice to the wholesalers who buys the product in bulky. Such wholesalers were from within the different parts of the state of the study and from the neighboring states especially Kaduna and Zamfara states. The wholesalers used transporters in moving the finished product from one point to another within and outside the study area. However, the most important point of delivery for the wholesalers was the retailing points, mostly on request by the retailers in their desired quantities. Though some retailers used to buy the milled rice from the wholesaling points by themselves in the local markets and other various locations and then finally sell the finished product in small quantities to the final consumers. The findings are in line with that of Islam and Ahmed (2019) in Adamawa state where they disclosed that agents of the wholesalers buy the rice from parboilers, processors and arrange to transport to the wholesalers who now sell the rice to retailers from whom the rice consumers make their purchase for domestic consumption.

On the other hand, the meso level actors in the area include the farmers' groups and associations, lending institutions, service providers, and research and extension services. Such actors play their important roles along the rice value chain in the area by supporting, facilitating, advising, promoting, training, technology development and provision of financial services. These actors operate in isolation and scattered with minimal linkage mechanisms with the micro level actors (direct actors).

Conclusion

The rice farming, processing and marketing in the area were financially and economically profitable. However, the rice farmers were more financially profitable among the rice value chain actors followed by marketers and then processors. The rice value chain of the study area was functioning, but characterized by long chain actors such as input suppliers, farmers, collectors, processors, distributors, retailers, service providers and ultimate consumers. Longer value chains mean smaller stakeholder profit, so efforts may be made to shorten the value chains. Thus, emphasis on effective shorter

value chain is recommended. The abundance of active value chain actors in the study area indicates the need for stakeholder collaboration towards implementing rice value chain development programs with the aim of boosting the rice value chain activities. Similarly, formulation of sound policy would help to support industrialization through private firms to drive investment in order to make rice more profitable along the chain (Profit enhancement).

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Conflict of interest

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