

ASSESSMENT OF NGOKETUNJIA RICE VALUE CHAIN ACTORS' PERFORMANCE IN CAMEROON

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Abstract. Cameroon is a net rice importer, and actors' performance along the rice value chain is yet to be well understood, even though they are presumed to integrate functions along the chain. The aim of the study was to investigate the financial performance of actors in the rice value chain in Ngoketunjia division in Cameroon. A multi-stage sampling technique was used to identify and collect data from 800 actors using a structured questionnaire. The cost-return technique was employed to analyse the financial benefit of actors in the chain. The results showed that the cost of production, milling, wholesaling and retailing per kilogram was FCFA 122.38 (US\$ 0.20), for farmers, millers, FCFA 240.79 (US\$0.39), wholesalers, FCFA 336.50 (US\$0.55), and FCFA 358.90 (US\$0.59) for retailers. The profit per kilogram was FCFA 27.63 (US\$0.05) for farmers, FCFA 79.21 (US\$0.13) for millers, wholesalers was FCFA 13.50 (US\$0.02) for wholesalers, and FCFA 11.10 (US\$0.018) for retailers. Farmers and millers had higher gross margins (22.03% and 28.21%) than wholesalers and retailers (5.74% and 4.14%, respectively). The benefit-cost ratio analysis revealed that the rice value chain is profitable to all actors, with benefit-cost values of 1.23, 1.33, 1.04 and 1.03 for farmers, millers, wholesalers and retailers, respectively. Overall, farmers and millers had greater benefit from their activities in the rice value chain in Cameroon and may need less attention in the chain development as compared to wholesalers and retailers with less benefit.

Keywords: value chain analysis, rice, consumption, profitability, Cameroon

INTRODUCTION

Rice (*Oryza sativa* L.) is one of the common foods consumed by more than half of the world's population. Rice is an integral source of income for most people in Africa and Asia (Nawaz et al., 2022). Global rice production is estimated at 508.7 million tons (FAO, 2020). About 20 percent of the world's dietary energy supply is provided by rice, while wheat and maize supply 19 and 5 percent, respectively (Sharma and Khanna, 2019). Currently, in Sub-Saharan Africa (SSA), rice is the second largest source of caloric intake after maize. It is expected that demand for rice will increase continuously given the shift in consumer preference in favour of rice, and the high rate of population growth in the region (Tsujimoto et al., 2019; Gebre et al., 2020; Watanabe et al., 2021). From this perspective, rice is SSA's most essential strategic crop for food and nutrition security.

Despite the importance of rice in the world and SSA, production in Cameroon still raises many practical concerns. The first concerns the quantity of paddy rice produced annually, which trails behind national demand. In 2017, for instance, paddy rice production in the country was 332,534 tons, almost 367,000 tons below the national demand, estimated at 700,000 tons in the same year (Luis et al., 2018). The average rice consumption per head in Cameroon in 2017 reached 37.2 kg (FAO, 2020). This quantity represents a 2.73% increase over the per capita consumption in the previous year. The gap between local demand and the supply of

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rice in Cameroon has been regularly narrowed through imports in the short run and special programs promoting innovative rice technologies to boost local production in the long run (Lotsmart and Fongkimeh, 2007; Piebiep, 2008; Luis et al., 2018). Piebiep (2008) found out that around FCFA 138 billion (US\$ 226.2 million) were devoted by households in Cameroon to purchasing rice in 2007, against about 200,000 tons imported in the same year (MINADER, 2009). This amount increased to FCFA 183 billion (US\$ 300 million) a decade later (Luis et al., 2018; Fani et al., 2020), against 367,000 tons of rice imported (Mbemngong et al., 2022).

Even though the country has a large amount of suitable land – about 20.6% of 475,442 km² (World Bank, 2010) – the underproduction of rice in Cameroon, in general, and Ngoketunjia Division, in particular, has led to huge imports and capital flight. This raises a second practical concern as to whether endogenous factors such as weak capacity of the nation's institutions to develop the rice value chain are mainly responsible for lower-than-expected rice production levels, or whether the entry point of intervention needs to be better suited to address performance questions. The rice value chain development rests with a few specialised agricultural development agencies. The key ones include *Société d'Expansion et de Modernisation de la Riziculture de Yagoua* (SEMRY) and *Upper Noun Valley Development Authority* (UNVDA) (Lotsmart and Fongkimeh, 2007). These agencies have special programs and projects launched and operated to sustainably increase rice production in these two important rice basins, based on technological innovations. Some additional agencies of relevance for rice production in Cameroon include National Agricultural Extension and Agricultural Research Program (PNVRA)¹, Competitiveness of Agricultural Operations Improvement Program (ACEFA)² and the Agricultural Value Chain Development Support

Program (PADFA)³ (Horwitz, 2014; MINADER, 2017; IFAD 2019). These programs' entry point for intervention is often at the farming level due to limited information about the financial performance of other actors' operations in the rice value chain (Fuh and Sama, 2015; Mbemngong et al., 2022).

The living standard of the actors in the rice value chain has declined substantially in recent years, as they face many challenges. According to Dossou-Yovo et al. (2020), rice yield per unit land area is declining in Ngoketunjia. The traditional production system remains with limited adoption of innovations, the current marketing system does not benefit actors, and the Ngoketunjia rice remains largely unknown in the country (IFAD, 2019; Dossou-Yovo et al., 2020; Fani et al., 2020; Tumenta et al., 2021). This study investigated the nature of the rice value chain and actors' performance along the chain in the Ngoketunjia division of the north-west of Cameroon. It also looked at possibilities to improve the chain into a sustainable rice value chain in the study area.

METHODOLOGY

The study was carried out in Ngoketunjia Division of the north-west region of Cameroon, the country's second most important rice-producing area (Zama et al., 2021). The Divisions of Mezam border this division to the west, Noun to the east, and Bui and Bamboutos to the north and south, respectively. The division covers a surface area of 2,347 km² with a population of about 230,501, about 80% of whom are actively engaged in agriculture (Mbarga, 2010; Kometa et al., 2021). The division has suitable ecological conditions for rice production. According to Fuh and Sama (2015), there are 11,285 registered rice farmers in the database of the Upper Nun Valley Development Authority (UNVDA), the government agency responsible for rice value chain development in the study area and multiple actors input suppliers, traders, millers, transporters, wholesalers, retailers (MINADER, 2017).

¹ PNVRA is a development program that targets all types of producer groups and aims to improve technical assistance schemes for producers, developing farms' potential and production, and conservation management of natural resources and protection of the environment.

² ACEFA is a development project whose target/beneficiaries are members of all types of producer groups to build a capacity of secondary and tertiary level professional organisations to improve the services provided to their members and finance their projects in increasing productivity. This program is funded by AFD/C2D resources.

³ PADFA is another development project whose target/beneficiaries are producer organisations to increase rice and onion production, improve the storage, processing, and marketing of targeted products and strengthen rice and onion farmers' technical and organisational capacity. IFAD sponsors this program and is in its second phase.

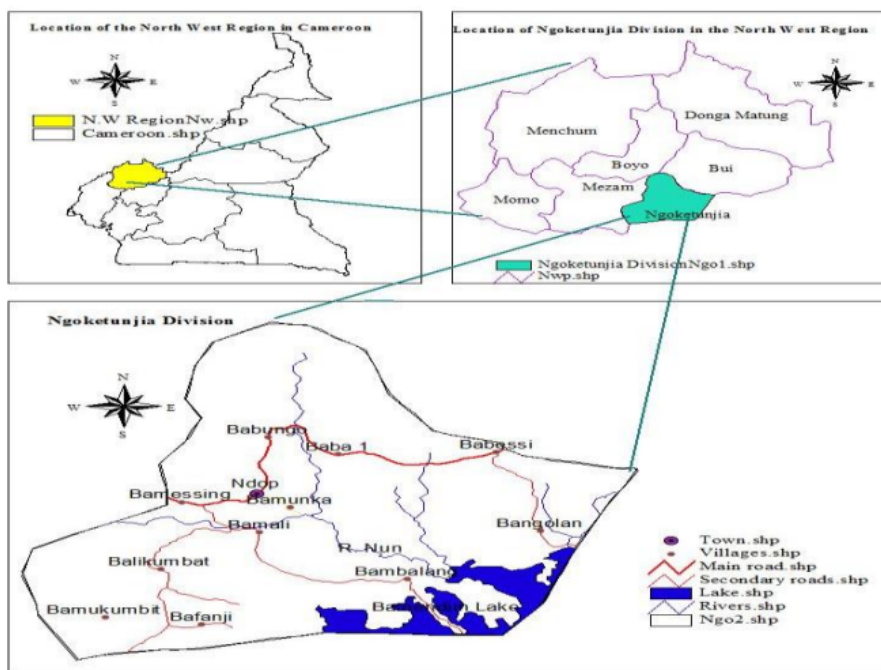


Fig. 1. Study site map
Source: Kometa et al., 2021.

The principal rice production zones in Ngoketunja Division are Bangolan, Babungo, Lower Bamunka, and Upper Bamunka, and these were chosen as they have the highest concentration of rice actors (see Fig. 1).

Multi-stage sampling was applied in this study. In the first stage, Ngoketunja (the second largest rice producing area in Cameroon) was selected; the second stage was the production zones in the area, in which a sample of 800 actors (6% from each zone) received the study questionnaire. The choice of random sampling was made to give every actor a chance to be selected and to allow for the generalisation of the results. The first stage provided demographic data of the entire population. Purposive sampling was applied in the second stage to select 160 respondents, 40 actors at the four chain levels. The purposive technique assists in limiting data collection to the population of interest. The selection was based on respondents' willingness to provide expected data and to engage in recall processes.

Different indicators have been used over time to capture performances. In this research, indicators included revenue, sales volume and value share along the value

chain (Krliev et al., 2014; Ciric et al., 2016; KIT and IIR, 2008). The mean income of actors along the chain was compared. First, their financial positions were established, and this focused on Total Income (TI), which was calculated by multiplying the price (P) per unit and quantity (Q) of the goods sold.

$$TI = P \times Q \quad (1)$$

The average income from actor performance was derived by dividing aggregate income from actors (operating surplus) by the numbers engaged at the level. The average income per category of actors was computed by summing the total income of all actors and dividing the number of actors. The following equation was used to obtain their average income:

$$\text{Average} = \frac{\text{Sum}}{\text{Count}} \quad (2)$$

whereby:

- sum – is the result of adding all of the given total income of a particular category of actors,
- count– is the number of each category of actors investigated

Actors' financial positions or benefit were calculated, and the focus was on unit operating profit. The formula below was used:

$$GI = TI_i - TVC_i \quad (3)$$

whereby:

- GI – gross income of farmers, millers, wholesalers, and retailers (FCFA/kg),
- TI – average total revenue of farmers, millers, wholesalers, and retailers (FCFA/kg),
- TVC – average total variable cost of; farmers, millers, wholesalers, and retailers (FCFA /kg),
- $i = 1$ -nth farmers, millers, wholesalers, and retailers.

The gross income equation added the total fixed cost and net income estimated for the respective actors. The net income estimation equation used was:

$$NI = GI - TFC \quad (4)$$

whereby:

- NI – net income
- TFC – total fixed cost.

For further clarification, the gross margin, the gross profit per production unit, is calculated. First, calculate this by dividing the gross income by the revenue earned from sales. Then multiply it by 100 to give a percentage.

$$\text{Gross margin} = \frac{\text{Gross income} \times 100}{\text{Total Revenue}} \quad (5)$$

Given the interdependencies between actors, estimating each actor's value added to the chain was important. This was done with the help of the formula:

$$\text{Added value} = \text{Price received by actor} - \text{Price paid by an actor} \quad (6)$$

Finally, the value share per actor, which is the percentage of the final retail price that the actor earns, was calculated using the following formula:

$$\text{Value share} = \frac{\text{Added value} \times 100}{\text{Final retail price}} \quad (7)$$

Further, the cost-benefit analysis (CBA) was conducted using the following equation.

$$\text{Benefit Cost Ratio} = \text{TR/TC} \quad (8)$$

To calculate the benefit ratio, total revenue was expressed as price per kilogram, and total cost was taken

as the fixed cost and variable cost converted to cost per kilogram.

This was done considering the recent contention that cost-benefit analysis is an instrument that may be used to make informed decisions regarding the profit level (Ekardt, 2022, Dreze and Stern, 1987). When the ratio is greater than 1, the business activity is considered profitable. When the ratio is less than 1, it is considered to be unprofitable, while when the ratio is equal to 1, the business activity operates at breakeven point. Demographic data and annual income were managed using the statistical package for the social sciences software – SPSS version 25.0. The cost-return and cost-benefit technique was employed for the analysis to measure financial performance at selected stages for actors in the rice value chain (producers/farmers, milling/millers, wholesaling/wholesalers and retailing/retailer).

RESULTS AND DISCUSSION

Socio-demographic characteristics

The age distribution, years of experience and family size: The distribution of the rice value chain actors according to age is presented in Table 1. Farmers and wholesalers had an average age of 48 years, 52 and 46 years for millers and retailers, respectively. The rice value chain actors generally showed an ageing population with actors above 70 years. Older actors in the study area could be attributed to two reasons: limited interest from young people in agriculture, and the sociopolitical crisis pushing younger people out of the study area (Bang and Balgah, 2022).

This ageing population contrasts with the study by Nneka (2018) in Nigeria, which suggested that the populations of rice actors were still within their productive age. The mean years of experience for farmers was 23 and 19 for millers, while wholesalers and retailers had 20 and 18 years on average in the rice business. Luis et al. (2019) concluded that experienced actors perform better in rice production, which is expected in the research. The average family size of all actors was 4 persons. Olum et al. (2020) proposed that large family sizes can relax the labour constraints required in the production process, which is often costly for farmers with small family sizes.

Sex of actors in the chain: At the level of farming and retailing in the chain, females dominate males in the ratio

Table 1. Respondents' age, years of experience and family size

Role(s) in the rice value chain		Age	Years of experience	Family size
Farmers	Min.	17	3	1
	Max.	74	55	12
	Mean	48.70	23.68	4.56
	N	580	580	580
	Std. Deviation	15.01	9.66	1.52
Millers	Min.	28	8	3
	Max.	78	33	7
	Mean	52.55	19.73	4.60
	N	40	40	40
	Std. Deviation	13.63	6.07	1.26
Wholesalers	Min.	17	9	2
	Max.	78	34	7
	Mean	48.86	20.55	4.93
	N	134	134	134
	Std. Deviation	12.77	5.59	1.39
Retailers	Min.	18	9	2
	Max.	66	32	7
	Mean	46.91	18.30	4.79
	N	46	46	46
	Std. Deviation	12.27	5.15	1.21

Source: own elaboration based on field survey data, 2021.

of 62% to 38% for farmers and 59% to 41% for retailers. At the milling and wholesaling stages, there were more males than females. The breakdown of millers was 75% males and 25 females, while for wholesalers this was 66% male and 34% female. Overall, female predominate in the rice value chain in Ngoketunjia division, as they constitute 55% of all the actors compared to 45% of males (See Table 2). This result overshadows contextual arguments favouring male-dominated access and control over land favoured by the dominant patriarchal inheritance system in the study site (Balgah et al., 2019).

Group membership: The study revealed that the largest population (81.72%) of farmers does not belong to any rice farmers group, while 18.28% are members of the rice producers group. For millers and wholesalers, the study indicated a large number (87.5 % and 93.28%) who do not belong to a group and 12.5% and 6.72% belong to the rice actors group. For retailers, none of the respondents belongs. In the rice value chain generally, the results showed that 85% of actors were not members while 15% were members of any group that supported them in rice production activities, as shown in Table 2. It had been noted that groups like cooperatives avail co-operators for the benefit of pooling resources together, reducing risk, and improving performances (Tumenta et al., 2021). A smaller number of actors belong to groups and this made improved performance difficult. This result is contrary to the findings of Nneka (2018) in Nigeria, in which over 50% of all rice actors are members of cooperatives.

Table 2. Sex and actor group membership

Variable	Category	Your role(s) in the rice value chain								Total	
		Farmers		Millers		Wholesalers		Retailers		Freq	%
		Freq.	%	Freq.	%	Freq.	%	Freq.	%		
Sex	Male	222	38.3	30	75.0	89	66.4	19	41.3	360	45.0
	Female	358	61.7	10	25.0	45	33.6	27	58.7	440	55.0
	Total	580	100.0	40	100.0	134	100.0	46	100.0	800	100.0
Group membership	No	474	81.7	35	87.5	125	93.3	46	100.0	680	85.0
	Yes	106	18.3	5	12.5	9	6.7	0	0	120	15.0
	Total	580	100.0	40	100.0	134	100.0	46	100.0	800	100.0

Source: own elaboration based on field survey data, 2021.

Income level of actors along the chain

The income is a function of farm size, yields, and the number of bags of rice actors handled in one year. The data presented in Table 3 shows that farmers in the study area have an average farm size of 0.259 hectares.

Given that other actors had integrated their activities backwardly in the rice value chain, the miller's average farm size was 0.257 hectares, while that of wholesalers was 0.247 hectares. The average farm size is generally lower than that of farmers in Nigeria, where Nneka (2018) reported 0.6ha.

Their average yields per hectare were 7.3 tons for farmers, 7.8 for millers and 7.2 tons for wholesalers. On the basis of average yields from actors, the average

farm size per actors who are active at the farming level was calculated, as well as the rice those active downstream in the chain, the average revenue of farmers sold at FCFA 150.0 (US\$ 0.25) per kilogram and had an average income of FCFA 276,908.5 (US\$453.95). Millers further processed paddy rice and sold a kilogram for FCFA 165.0 (US\$ 0.27), generating an average income of FCFA 1,649,175.0 (US\$ 2703.57) in 2020.

That same year, wholesalers sold a kilogram at FCFA 170.0, (US\$ 0.28) resulting in FCFA 5,674,600.0 (US\$ 9302.62) average revenue. In contrast, retailers sold a kilogram to consumers at FCFA 185.0 (US\$ 0.30) and had an average income of FCFA 1,598,400.0 (US\$ 2620.33). Though the average income is almost

Table 3. Other socioeconomic characteristics (farm size, yield and income)

Your role(s) in the rice value chain		Farm size	Total yield (kg) in 2020	Total rice (kg) in 2020	Income
Farmers	Mean	0.2595	1 806.00	1 806.0	276 908.5
	N	580	580	580	580
	Std. Deviation	0.10963	860.80	1 043.0	171 598.4
	Minimum	0.07	4	4	60 000
	Maximum	0.61	52	145	2 682 500
Millers	Mean	0.2578	2 027.00	9 995.0	1 649 175
	N	40	40	40	40
	Std. Deviation	0.13096	1 055.87	5 048.38	832 982.5
	Minimum	0.15	600	5 000	825 000
	Maximum	0.53	4 100	25 000	4 125 000
Wholesalers	Mean	0.247	1 814.90	33 884.0	5 674 600
	N	134	134	134	134
	Std. Deviation	0.16347	1 201.78	16 518.15	2 688 919
	Minimum	0.16	600	10 000	1 700 000
	Maximum	0.53	4 200	80 000	13 600 000
Retailers	Mean	NA	NA	8 608.51	1 583 000
	N	46	46	46	46
	Std. Deviation	NA	NA	3 253.75	581 034.8
	Minimum	NA	NA	5 000	925 000
	Maximum	NA	NA	18 000	3 150 000

Source: own work based on field survey data, 2021.

the same as that found in recently Fani et al. (2020), it is, however, lower than the estimated of IFAD (2019) in a survey conducted in 2018 at the PADFA project completion report that showed that the average income of rice growers benefitting from the project had risen by 70 percent, while some actors have earned over FCFA 10,000,000 (US\$16393.44). In addition, in assessing rice production sustainability performance indicators and their gaps in twelve sub-Saharan African countries by Arouna et al. (2021), the high profit per hectare was FCFA 435,878(US\$662) in Cameroon for farmers, which is lower than the amount revealed by these findings.

Unit benefit and value share of actors along the chain

The actor's performance is additionally measured by calculating profit margin, added value, and value share. There the unit conversion factors for the calculations are as follows;

1 bag of paddy = 100 kg of rice

1 bag of hulled white rice = 50 kg of rice

1 room of plot = 20 m × 10 m = 200 m²

The average yield per plot of 200 m² was 120kg extrapolated from farmers' yields.

The profit per kilogram was calculated using the production cost for a plot of 200 m² by farmers. This is presented in Table 4.

This implies that the average cost of cultivating, harvesting, and transporting to the warehouse was estimated at FCFA 14,685.0 (US\$24.07) per plot of 200m². This resulted in a profit of FCFA 27.63 (US\$0.045) per kilogram. The results for this actor category seem better than those that Fani et al. (2020) found in their work on productivity analysis among smallholder rice farmers in the West Region of Cameroon, namely, 67,000 FCFA/ha (US\$109.84). The profit per kilogram for other actors was further calculated for one bag of rice each actor purchased and the associated cost. The total cost per bag of 100kgs for millers is FCFA 16,855.0 (US\$27.63), while they received FCFA 79.21 (US\$0.13), which is the highest profit per kilogram for actors in the chain. This profit does not consider the extra revenue millers obtain from rice by-products, as this constituted a separate value chain that needed to be analysed in the study. The higher profit per unit for millers is contrary to the contention outlined by KIT and IIRR (2008) in analysing several value

chains that showed the highest profit accrue by rather wholesalers. They attribute this to the rather specialised function of wholesalers, which is often less risky with the least investment in their wholesaling activities (Fuh and Sama, 2015). The findings revealed that wholesalers had a cost of FCFA 16,825 (US\$27.58) for a 50 kg bag of white rice. When the profit per kilogram was computed, they had FCFA 13.5 (US\$0.022) per kilogram, which is less than half of the profit earned by millers. This profit could explain why wholesalers have little interest in promoting Ngoketunjia rice, and the promotion cost may further reduce their profit. Finally, the cost for retailers for the same 50kg bag was FCFA 17,945.00.0, (US\$29.42) and their profit per kilogram was calculated to stand at FCFA 11.1 (US\$0.018) per kilogram. The least profit for retailers may be attributed to the retailing function, which cuts across other consumers' food products, allowing them to continue their function in the chain (Soullier and Moustier, 2021). The implication of this least profit per kilogram by retailers is that they do not invest in promotion; therefore, Ngokuntunjia rice is less known in the market.

The gross income, added value, gross margin, and value share of each actor in the whole rice value chain were calculated per kilogram, as shown in Table 4. What is of the greatest interest is the gross margin, which is the percentage of the actor's revenue considered as profit. Farmers have a gross margin of 22.03%, while millers have 28.21%, consistent with the profit per kilogram. Though farmers have a lower gross margin than millers, they had other opportunities to increase their profit through horizontal or vertical integration to improve production and engage in processing, as Soullier and Moustier (2021) suggested. The higher margin is an incentive for small millers' investment in rice processing, which could increase their marginal profit depending on the paddy supply and their current mills' utilisation capacities. Full-capacity utilisation of mills could directly be attributed to the backward integration of millers where they engage in farming, as shown by Fuh and Sama (2015).

The implication is that millers will continue to perform better than any other rice value chain actors, as suggested by Soullier and Moustier (2021) in their study of modernization of the rice value chain in Senegal. However, Ndirangu and Oyange (2019) in their analysis of millers in Kenya's rice value chain found that millers had 12% margin, and retailers 17.3%, while farmers had

Table 4. Profit per kilogram of paddy produced

Cost item	Farmers	Millers	Wholesalers	Retailers
	Amount in FCFA			
Land preparation	3,700.00	–	–	–
Planting	1,500.00	–	–	–
Weed control	500.00	–	–	–
Harvesting	2,000.00	–	–	–
Transport	1,000.00	500.00	200.00	120.00
Input	4,700.00	20.00	15.00	10.00
Purchasing cost of rice	–	15,000.00	16,000.00	17,500.00
Warehouse/storage	10.00	50.00	150.00	40.00
Electric bills	10.00	340.00	70.00	15.00
Repairs/maintenance	15.00	60.00	5.00	5.00
Labour	5.00	30.00	25.00	25.00
Phone calls	55.00	50.00	20.00	15.00
Other cost (packages, loading, losses etc.)	380.00	30.00	10.00	5.00
<i>Subtotal variable cost (TVC)</i>	<i>14,035.00</i>	<i>16,080.00</i>	<i>16,495.00</i>	<i>17,735.00</i>
<i>Total variable cost/kg</i>	<i>116.96</i>	<i>229.71</i>	<i>329.90</i>	<i>354.70</i>
Farm development due	100.00	–	–	–
Taxes/market levies	80.00	70.00	100.00	80.00
Depreciation	550.00	705.00	230.00	130.00
<i>Subtotal fixed cost (TFC)</i>	<i>650.00</i>	<i>775.00</i>	<i>330.00</i>	<i>210.00</i>
<i>Total fixed cost/kg</i>	<i>5.42</i>	<i>11.07</i>	<i>6.60</i>	<i>4.20</i>
Total cost/per plot or/bag (TC=TFC+TVC)	14,685.00	16,855.00	16,825.00	17,945.00
Total cost/per kg	122.38	240.79	336.50	358.90
Yield from the purchase cost	120.00	70.00	50.00	50.00
Selling price/kg	150.00	320.00	350.00	370.00
Cost per kg	122.38	240.79	336.50	358.90
Gross income/kg	33.04	90.29	20.10	15.30
Profit per kg	27.63	79.21	13.50	11.10
Added value (<i>Price received by actor – Price paid by actor</i>)	150.00	170.00	30.00	20.00
Gross margin (<i>Gross income x 100 / Total Revenue</i>)	22.03	28.21	5.74	4.14
Value share (<i>Added value x 100 / Final retail price</i>)	40.54	45.95	8.11	5.41
CBA (<i>Total revenue/Total cost</i>)	1.23	1.33	1.04	1.03

Source: field survey data, 2021.

the greatest at 34.4%. The margins for wholesalers and retailers in Kenya's rice value chain were more favourable when compared to Cameroon, where we observed that wholesalers had a gross margin of only 5.74%, and retailers, 4.14%.

When gross margins are excessively high in a specific part of the value chain without a reasonable explanation, this may be an opportunity for intervention to make the chain more efficient. This is similar to the findings of Obinna et al. (2020), who found the rice value chain in Nigeria to be a profitable business for retailers, processors, and farmers in that order. In certain value chains, where the final product is scarce in the market, retailers' gross margin is higher, at the expense of consumers, who must pay to consume the product. Actors in the study area did not have an excessive gross margin, which is in line with the observation by Soullier and Moustier (2021) that none of the actors appears to enjoy an excessive margin, with a return on working capital around 7 to 10% in West Africa. In general, when gross margins are excessively high in a specific part of the value chain without a reasonable explanation, this may be an opportunity for intervention to make the chain more efficient.

When the consumer buys a product in a more or less different form than it left the farm, such as processed white rice, there is much value added to the chain. We expect the processor downstream of the chain to have the highest value share and vice versa. Value share is the percentage of the final retail price that each actor manages to capture; as shown in Table 4, rice farmer earns 40.54% of the final retail price; their value share is a result of their functions in producing, drying, storage and sales of paddy, while the millers earn 45.95%. Therefore, rice millers were the important players in the rice value chain, as they had the most value-added value, which comes from converting paddy into white rice. The study observed that rice millers added value to rice in three forms: purchasing paddy, milling paddy, and storing and selling white rice. This result is similar to the economic analysis of the rice value chain in India by Pavithra et al. (2018), where they found millers to be the highest and most important value adder in the chain; rice millers added value in three stages of purchasing paddy, milling of the paddy and selling of white rice. These stages align with the findings of Watanabe et al. (2021) in their study on the value-added ratio at the

processing stage highest for the value chain of locally grown japonica rice in Mwea, Kenya.

Similar results were found in the rice value chain analysis in the Philippines conducted by Mataia et al. (2020). There, farmers and millers obtained the major shares of the margin, 40 percent each of the unit price of rice due mainly to the high cost of producing paddy and high paddy price and processing, respectively, which resulted in high unit price of rice. They also contested that wholesalers and retailers had a share of 5% and 4% of the total added unit cost, respectively, of which administrative cost, transportation/shipping, and working capital are the biggest cost components. This result is slightly similar to our findings. Rice wholesalers and retailers have limited opportunities to add value as compared to all other actors, which justifies the low-value share received by wholesalers with 8.11% and retailers with just 5.41% observed. Their value-added activities are mainly buying white rice, storage and sales. Therefore, wholesalers and retailers could compensate for a smaller value share by increasing their efficiency in rice storage or further packaging into small units for consumers to buy or by handling larger volumes of rice. Such activities are made difficult, as both wholesalers and retailers face particular challenges in the chain due to the increasing level of import of rice (Luis et al., 2018), lesser business operations as a result of the ongoing crisis, and higher informal taxes these actor incur which is often not accounted for, according to Fani et al. (2020). The discrepancy at that level of value share may be a reason for well-informed innovations that may produce progressive results for the whole chain.

Furthermore, the benefit-cost ratio analysis revealed that the rice value chain is profitable for all actors, with benefit values of 1.23, 1.33, 1.04 and 1.03 for farmers, millers, wholesalers and retailers, respectively. This ratio is in line with the view expressed by Obinna et al. (2020), who found significant differences in net returns among rice farmers, processors and traders in the rice value chain in Nigeria. They also observed the existence of lucrative production-related, processing-related and marketing-related investment opportunities in the rice value chain. Actors upstream in the chain (farmers and millers) have a better ratio than those downstream (wholesalers and retailers), which does not motivate downstream actors to invest in modern distributions and promotional activities of Ngoketunjia rice.

CONCLUSION

Growing demand for white rice in cities inside Cameroon and beyond raises the question of whether participating in the rice value chain could be an opportunity for income generation for rural communities in Cameroon, or at what stage of the value chain can potential actors enter to benefit the most financially. As the demand for white rice increases, the market is expected to expand, and the number of relevant stakeholders in the production, milling, and marketing stages will grow. The key actors observed in the Ngoketunjia rice value chain are producers in the production stage, mills in the processing stage, wholesalers and retailers in the distribution stage, and consumers. It is desirable to ensure that the value chain remains close to this form to increase efficiency and profit for each stakeholder.

Costs are incurred at each stage in the chain by the respective actors, which affects their financial performances in different ways. For example, farmers and millers had better gross margins of 22.03% and 28.21%, respectively, while wholesalers and retailers appeared to have lower gross margins (5.74% and 4.14% in that order). This margin implies that actors' performance at the farming and milling stages is better than others, and profitability varies in the rice value chain stages. Lower profit margins for wholesalers and retailers act as a disincentive for promoting Ngoketunjia rice.

Overall, farmers and millers have a high-value share of the rice chain, which can positively affect the rural population in the north-west region of Cameroon. Before, however, thinking about reducing rice imports, the enabling environment should be the entry point for chain development. Building sustainable relationships amongst rice value chain actors, improving the information flows, decreasing transaction costs and establishing quality requirements are necessary conditions for a bright future for Ngoketunjia rice.

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