

# Rice farming and income distribution along the value chain in Rwanda

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## Abstract

Rice farming has become an integral part of the agricultural production in Rwanda and plays an important role in socio-economic development of thousands of farmers. The activities related to rice sub-sector provides investment opportunities for actors who want to invest in it. Due to its importance, transforming it will definitely contribute not only to the rural sub-sector development but also to national economic development and poverty alleviation for rice farmers and improve the income of other actors in rice value chain. Despite the importance of rice farming in Rwanda little is known how it affects farmers' income and distribution of benefits between actors along the chain.

This study aims at analysing the rice value chain and the level of distribution of benefits between value chain actors. The primary data was collected in Huye, Nyanza, Gisagara, Bugesera and Rusizi Districts and the total sample for rice farmers was 322, cooperatives 17, processors 9 and traders 28. To achieve the overall objective of the study; mixed methods were used and these include structured questionnaire for survey, interviews with key informants and focus group discussion.

The research findings show that there are significant disparities in gains distribution along the value chain for two types of rice crop in surveyed areas; as margins range from 0.10 to 0.23 for Youan and from 0.12 to 0.25 for Watt. Farmers currently receive the highest margin while traders received the lowest.

Moreover, although there is a formalised paddy processing and rice market supply, for 70% of wholesalers part of rice is still supplied by informal groups of small millers and traders.

For a viable long-term rice value chain, it is required that paddy and rice are supplied through the formal trading system and the economic gains are fairly distributed among the various chain participants who should be linked through a shared objective to generate higher profits and create mutually beneficial outcomes.

**Keywords:** rice farming, value chain, value chain participant, income distribution

## 1. Introduction

The Government of Rwanda has decided to give high priority to the production of rice in the country's marshlands, where, with adequate investment in irrigation infrastructure, the crop is capable of yielding up to 7 t/ha during each of two growing seasons (MINAGRI, October, 2011). The government provided this investment and farmers, in cooperatives, responded by growing rice largely as a cash crop (Stryker, 2010).

The strong presence of farmers' cooperatives enables farmers to collectively access the inputs such as seeds and natural resources. There is an urgent need to expand the capacity of extension system to enable efficient transfer of technologies on production, soil and water management, pest and disease management, harvesting, post harvest handling and storage of rice in marshlands (MINAGRI, October, 2011). The increase in production is required considering that characteristics of rice grains such as long shelf-life, ease of cooking and transportation, and less requirement of cooking fuel (compared to traditional food found in Rwanda such as potato) has made rice becoming a popular choice of food in schools, homes, restaurants, and public ceremonies in Rwanda. Rise in income levels, growing urban population, and changing lifestyles is further aggravating the demand for rice (Bogaard and Verzijlbergen, 2012).

To address the increasing demand for rice and other food crops, the government of Rwanda has taken rigorous policies to revitalize agricultural sector in order partly to reduce poverty and also ensure food security. Some of these policies include land use consolidation, crop intensification, and storage facilities implemented to overcome the repeated food insecurity. It has also set strategies to increase agricultural commercialization and some of the strategies include farmer cooperative formation, promotion of private investors in processing and marketing of agricultural produce and empowerment of smallholders especially women in the crops value chain. In this regards, major food crops have been promoted and supported by the government in various ways to increase incomes of smallholders as one of strategies to reduce poverty.

The rural incomes are generated mainly from the sale of food crops, livestock and cash crops such as coffee, tea, sugar cane, wheat, and currently rice is the most important crop which shows that it can be crucial in terms of income deliverance especially for smallholder farmers in Rwanda via the cooperatives that they belong in.

One of the approaches that can help address the issue of income generation for rice farmers is to carry out rice value chain analysis. This analysis is essential to an understanding of markets, their relationships, the participation of different actors and the critical constraints that limit the rice production and consequently the competitiveness of smallholder farmers (Rota, 2006).

Rice value chain has been subject to extensive studies in general and in Rwanda in particular. So far, existing studies analysed how to develop a competitive value chain (Stryker, 2010), determinants and profitability of rice production (Ingabire et al., 2013); financing of rice value chain (Kopparthi et al., 2016); how the value chain contributes in poverty reduction (Bolwi, et al., 2008) and value chain governance (Humpfrey, 2000).

Actually, the objective of value chain analysis is threefold: mapping of inter-value chain actors input output relations, the analysis of inter-value chain actors distributional of income and the role that rice value chain analysis plays in highlighting the power and governance relations which explain the distributional of income. While various studies have been carried out on the first and third components, little attention has been done on how gains are shared down the chain.

It is against the background above specifying that on one hand there is an increase in demand and on the other hand the increase in production that one would expect the increase in gains along the value chain. It is therefore interesting to carry out a rice value chain analysis in Rwanda and find out whether there is a fair gains distribution or if there are disparities in gains distribution along it.

## 2. Theoretical framework

The value chain as both a concept and tool has been used since long back ago to understand and analyse industries (Renjun et al., 2011). It can be defined as a full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky et al., 2000).

The focal of the value chain is the end product and the chain is designed around the activities required to produce it. The logic being that every value chain actor occupies a position in the chain; upstream suppliers provide inputs before passing them downstream to the next link in the chain, the customer.

In this regards, the production process is considered as a set of parameters defined by Humphrey and Schmitz (2000) and which correspond to the following questions: what is to be produced? How it is to be produced? When it is to be produced and how much it is produced? What is the price?

With the value chain concept, value is co-created by a combination of activities carried out in the chain and some activities add more value and are more lucrative than others (Peppard et al., 2006). But, a value chain to be sustainable, participants must get mutual benefits.

In this regards, value chain analysis focuses on segmenting the different activities that add value in the production and sale of a product or service. It can be described as “*an analysis that attempts to understand how a business creates customer value by examining the contributions of different activities within the business to that value*” (Pearce and Robinson, 2007, pp.31).

Thus, identifying each activity involved in the chain and the cost attached to each activity are essential steps in value chain analysis.

In general value chain analysis aims at answering the following questions: *What are the economic costs along the value chain? Where is the most value added to the value chain? Who are the most import actors within the value chain? What is the institutional framework of the value chain? Where are the bottlenecks in the value chain? Where is the market potential for growth? What is the size of the sector/chain? What is the potential for upgrading? What possible synergies exist?*

As the mapping the value chain has three main objectives: visualize networks in order to get a better understanding of connections between actors and processes in a value chain, demonstrate interdependency between actors and processes in the value chain, and create awareness of stakeholders to look beyond their own involvement in the value chain; the rice value chain analysis will help visualize the status of the income distribution among value chain participants.

Kaplinsky and Morris (2001) delineate how value chain analysis plays a key role in mapping out value chain actors and in showing how actors benefit from the value chain. By making value chains function more effectively, for example by improving flows of knowledge and establishing linkages, it is expected that interventions will benefit the poor.

The main premise behind a value chain is to efficiently capture value in end-markets in order to generate higher profits and create mutually beneficial outcomes for all value chain participants involved in a product's supply chain from production to consumption. For a value chain, it is therefore in all stakeholders' best interest to work co-operatively with open communication and transparency (Demont and Rizzoto, 2012). This advances the assumption that mutually beneficial outcomes for value chain actors will be attained if disparities in generated income per unit of produce along the chain are not significant.

Therefore by linking producers to consumers through a shared objective, value chains present a more sustainable approach to production and consumption than segmented and adversarial production chains (Demont, 2010).

As the value chain analysis is carried out under the assumption that value chain development will help reducing poverty (Kaplinsky and Morris, 2001), this study intends to analyze challenges pertaining each segment of the rice value chain, identify opportunities to increase farmers' income and more specifically analyse the gains distribution among value chain actors.

One of the most important aspects of the value chain is its dynamic nature. An action by one value chain actor can influence activities of other value chain participants. Or an action by one participant may require further actions by other participants to be effective. This can have broad implications. Therefore, in analysing the value chain, all aspects of the chain must be considered: inputs dealers, farmers, millers, traders and final consumers or any other value chain actors whose presence in the network can influence value creation (Peppard et al., 2006).

Much has been written about value chain and value chain analysis, but considering the existing literature review, little attention has been paid to how the farm income is generated by value chain actors and most importantly how it is distributed along the value chain. For this study, the farm income is defined as the difference between the gross profit and the costs incurred by the value chain actor to produce or add value to a kilo of rice. It means that the farm income distribution is analysed by considering how much each value chain participant generates per 100 Rwf of sales.

By systematically understanding linkages within a value chain, one can better prescribe policy recommendations and further understand their impacts throughout the chain and formulate development strategies to alleviate poverty. In this regards, an appropriate research methodology was developed to collect required data, analyse them and formulate recommendations.

### 3. Research methodology

In Rwanda, rice is cultivated mainly in the marshlands over an area of 6,838 Ha. It is mainly cultivated by resource-poor smallholders who grow the crop through farmer-cooperative schemes, and around 45% of rice growers are women (MINAGRI, October 2011). This study was therefore conducted in marshlands located in Huye, Bugesera and Rusizi Districts. These areas were selected, on the basis of their rice farming organisation models. In Huye District, rice farmers are members of cooperatives grouped in UCORIBU (Union des Coopératives Rizicoles de Butare), which owns 40% shares of Gikonko Rice Milling Factory, while rice farmers in Bugesera and Rusizi Districts are members of cooperatives growing rice and selling it to a processing factory.

Required data was collected from secondary and primary sources. While secondary data was collected from various reports provided by cooperatives, millers and traders; and relevant publications; primary data was provided by sampled rice farmers, cooperative managers, millers and traders. Random and purposive sampling methods were applied to sampled respondents. The details of the sample involving rice farmers, cooperatives, millers and traders are shown in table 1:

**Table 1: Population of the study and sample**

Description	District					Total
	Bugesera	Rusizi	Huye	Nyanza	Gisagara	
Farmers	123	120	31	16	32	322
Traders	11	12	2	2	1	28
Millers	3	4	1	0	1	9
Cooperatives	8	4	2	0	3	17

As the population of the study was defined, data was collected on the basis of various methods in particular: desk

research, interview schedule for key informants, and administration of questionnaires, focus group discussion, field visits, surveys and observations. The semi-directed interview was conducted with concerned stakeholders in the rice industry, rice value chain actors, value chain enablers and value chain supporters; while focus group discussions were conducted with members of cooperatives.

With respect to interview; key informants including main value chain actors, value chain enablers, and value chain supporters were contacted for the interview to validate some of the assumptions of this study as well as the collective opinion obtained in the focus group discussions. Information collected during the survey at individual level helped map out the rice farming value chain; leading to the analysis of how gains are distributed along the value chain.

Moreover, four specific questionnaires were administered to each value chain actor: rice farmer, cooperatives, miller and trader. The questionnaire was used in order to gather first hand information from respondents. They were asked to indicate costs incurred for their activities, encountered constraints and available opportunities in their respective activity.

After data collection data analysis was done using Excel spreadsheet, SPSS for windows. Qualitative and quantitative analytical approaches were combined. The combination of these two approaches was useful in the sense that some information was not easy to quantify such as collective opinions obtained from the focus group discussions.

The production cost (including the cost of inputs, activities and materials) and the gross profit were determined for each value chain participant: Rice farmers, cooperative, millers and traders.

#### 4. Results and discussion

##### 4.1 Value Chain actors

##### 4.1.1 Farmers

- **Gender composition of rice farmers:**

**Table 2: Surveyed rice farmers**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Male	198	61.5	61.5	62.1
Female	124	38.5	38.5	100.0
Total	322	100.0	100.0	

The table 2 shows that men are more involved in rice farming than women. In surveyed areas, they are mostly involved in activities like land preparation, transplanting, harvesting and transportation while women are involved in nursery, weeding and threshing.

However, various studies prove the opposite that women are more likely to sum up an important number in the work force in agricultural value chain (Webber and Labaste, 2010, Taglioni and Winkler, 2016). The great participation of men in rice farming may be attributed to the fact that rice product is considered as cash crop.

- **Cooperative membership:**

**Table 3: Cooperative membership**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	299	92.9	92.9	92.9
No	23	7.1	7.1	100.0
Total	322	100.0	100.0	

As show in the table 3, most of the rice farmers are cooperative members and the number ranges from 399 to 2,121 farmers. This is explained by the fact that membership of an association or cooperative facilitates information exchange and enables members to negotiate for better terms on the input and output markets. This is in line with Amin & Uddin, (2014) who argue that the cooperative contributes significantly by solving some issues facing mankind today. Moreover, as per the Ministry of Trade and Industry guidelines (2013), rural traders have been banned and producers are allowed to sell paddy through cooperatives and unions directly to mills.

It is in this regard that the good management of any cooperative associations is crucial to protect the interests of its members and further generate employments for income creation. In addition, the significant adhesion in the cooperative societies explains the degree of awareness due to the impacts of cooperative in terms of socio-economic development in general. It is also explained by the fact that rural traders were banned and producers were allowed to sell paddy through cooperatives and unions directly to mills (Kathiresan, 2013).

- **Rice farmers income:**

**Table 2: Rice farmers' margin per kg of paddy**

Cost of activities(RWF)		Cost of Inputs and Materials(RWF)		
Activities	Cost/Ha	Materials	Activities	Cost/Ha
Nursery	15,000		Fertilizers	108,000
Land preparation	30,000		Urea (390)	39,000
First ploughing	52,500		Pesticides	30,000
Second ploughing	52,500		Seeds	20,000
Third ploughing	52,500		Packages	0
Transplanting	60,000		Sheeting	30,000
Fertilizer application (NPK)	12,000		Sewing thr	0
First weeding	45,000		Other mat	8,000
Fertilizer application (UREA)	3,000		<b>Sub Total</b>	<b>235,000</b>
Pesticides application	12,000			
<b>Activities</b> Second weeding	30,000			
Third weeding	15,000	<b>Margin per Kg of paddy</b>	<b>Youan</b>	<b>Watt</b>
Clearing water channels	60,000	Cost of Materials	235,000	235,000
Second pesticides application	24,000	Cost of Activities	779,500	779,500
Control against birds and other r	30,000	<b>Total Cost</b>	<b>1,014,500</b>	<b>1,014,500</b>
Harvesting	96,000	<b>Yield per Ha</b>	5,500	5,500
Threshing	48,000	Production cost per 1kg of paddy	184	184
Transport to drying ground	48,000	Price of sales to cooperatives	240	245
Meals for workers	30,000	<b>Profit</b>	<b>56</b>	<b>61</b>
Drying	24,000	<b>Margin</b>	<b>23%</b>	<b>25%</b>
Cleaning	15,000			
Sorting	10,000			
Winnowing	15,000			
<b>Sub Total</b>	<b>779,500</b>			

Source: Cooperative reports

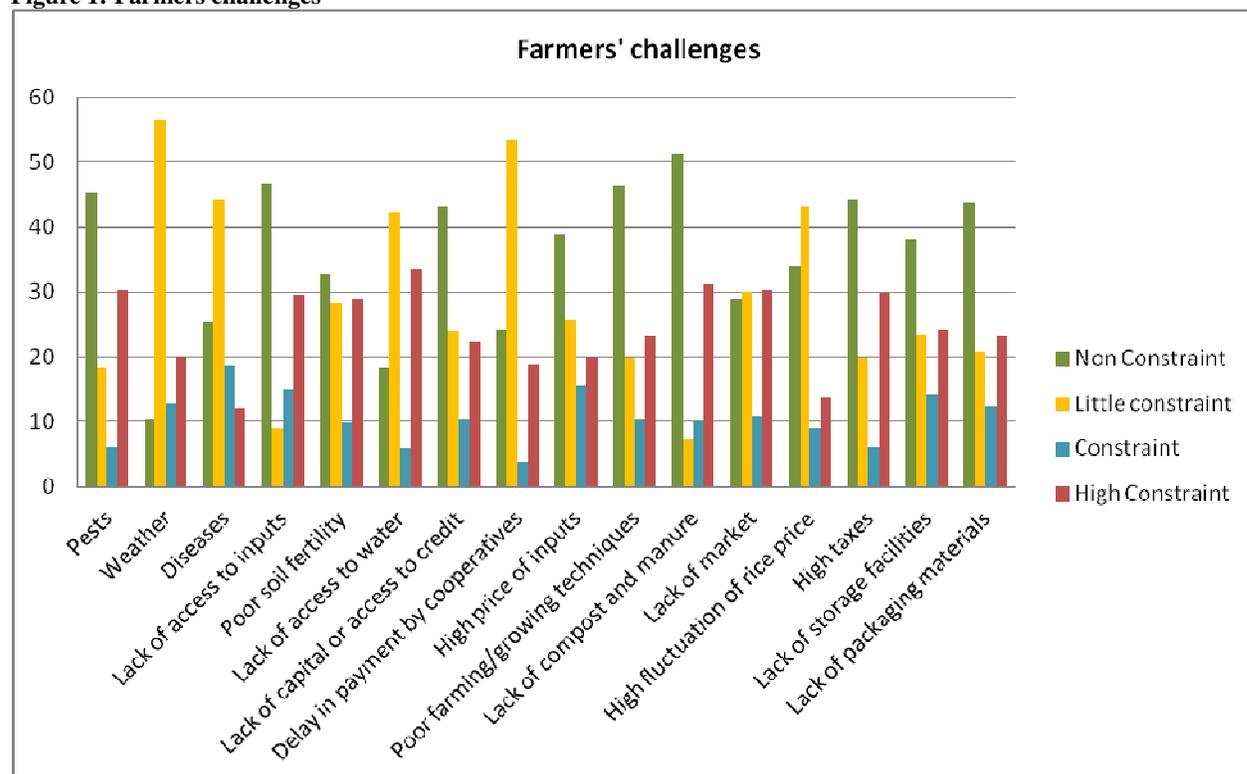
Although three types of rice are produced in Rwanda: Basmati, Youan and Watt, the analysis focuses on the two last one, as they are the main produce in investigated areas. The average production cost is Rwf 180 for both and among the paddy production cost components, the highest cost incurred by rice farmers is the cost of fertilizers, then harvesting, clearing water channels and transplanting. To help rice smallholder farmers find a guideline value for their production, the Ministry of Trade and Industry sets farm gate prices every season and at the time of study, the paddy was sold at Rwf240 for Youan and Rwf 245 for Watt.

Therefore, the rice farmers' profit, for the Youan and Watt (VAT excluded) amounts to Rwf 56 and Rwf 61 per kg respectively (table 2). In other words, the margin is 23% for Youan and 25% for Watt. As the profit depends mainly on market price and the production cost, one way to increase rice farmers' gain would consist of not only increasing the yields but also reducing inputs cost: for fertilizers and for activities like harvesting, transplanting and clearing water channels which constitute 33% of the total rice production cost.

Increasing the market price would be counterproductive as one of the challenges encountered by respondents is the uncompetitive price. This is in accordance with Kathiresan (2013) who argue that when the total cost of paddy production (as determined in establishing the farm gate prices) in Rwanda is compared to that in other rice producing countries in Africa and Asia, it becomes obvious that Rwanda's cost of production is significantly higher.

- **Rice farmers challenges:**

**Figure 1: Farmers challenges**



Source: Primary data

While around 60 percent of farmers specify that they are not affected or slightly affected by challenges mentioned in figure 1, 40 percent consider those challenges as constraints or high constraint. It means that each of these challenges should be addressed so that rice produce can be increased and thereby improve rice farmers' income. In other words, as all of the constraints affect negatively the rice production and therefore rice value chain actors' income, support institutions should monitor, eliminate or mitigate each of the mentioned challenges. Challenges which should be addressed include: pests as 29% of respondents mentioned that they are affected by pests and lack of inputs, 33% by the lack of water, 31% by the lack of compost and manure and 30% by the lack of market.

#### 4.1.2 Cooperatives:

As specified by respondents, rice farmers receive fertilizers, pesticides and certified seeds from cooperatives and in line with the Ministry of Trade and Industry's guidelines (2013), they sell their paddy only to their respective cooperatives at a price set by the Ministry in consultation with the Ministry of Agriculture and Animal Resources, Rwanda Agricultural Board, cooperatives and millers.

- **Cooperatives' profit:**

The paddy is purchased by cooperatives and in investigated areas, on average the costing and the profit for cooperatives are as follows:

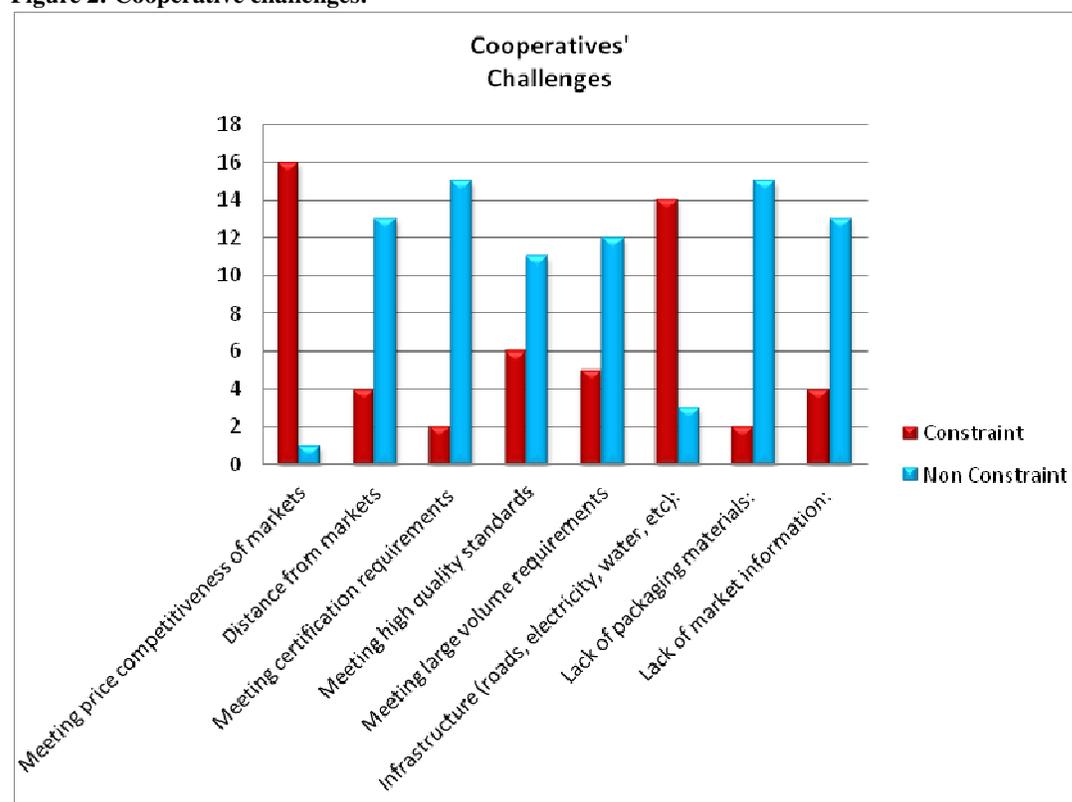
**Table 3: Cooperatives' gain (in Rwf)**

Cooperatives' profit			
Items	Description	Profit per kg (Youan)	Profit per kg (Watt)
		Paddy (cost)	240.00
	Electricity	0.05	0.05
	Furniture	0.03	0.03
	Housing	1.00	1.00
	Communication	0.02	0.02
	<b>Total</b>	<b>241</b>	<b>246</b>
	<b>Price of sales to millers</b>	<b>275</b>	<b>280</b>
	<b>Gross profit</b>	<b>34</b>	<b>34</b>
	<b>Margin</b>	12%	12%

Source: Cooperative reports

The costing for cooperatives includes not only the cost of paddy, but also the cost of value added services rendered to improve the quality of paddy. On average, cooperatives 'profit amounts to Rwf 34 per kilo and the profit margin to 12% regardless of the type of paddy.

**Figure 2: Cooperative challenges:**



With reference to the figure 2, 94% of respondents specify that the main challenge encountered by cooperatives is uncompetitive price while 82% mention the lack of adequate infrastructure (roads, electricity and water). As rice is cultivated in marshlands, accessing to roads is a challenge. This is line with Don Seville et al. (2011) who contend that downstream and middle-stream in farming value chain in low- and middle-income countries often operate in areas with inadequate infrastructure (roads, electricity, irrigation and wholesale markets) and lack access to skills and services (training, credit, inputs) and are highly dependent on favourable weather.

Respondents wish rice support institutions help in building or refurbishing existing roads along the marshlands to facilitate transportation of rice from the fields/collection centres to mills facilities. This will reduce the transport cost and hence improve the price and volumes of trading.

#### 4.1.3 Millers

Millers play a crucial role in rice trading process. As aforementioned, individual traders were banned and producers were allowed to sell paddy through cooperatives and unions directly to millers. It means that millers are key rice value chain actors. Out of 19 mills operating in Rwanda, 9 mills were investigated. Data analysis show that they operate under capacity as they process on average 3.2 tonnes per hour. This concurs with Kathiresan (2013) who states that following a ban on inefficient small rice mills in the country, almost all the mills that are operational in the country are of at least medium capacity (>3 t/hr). On the basis of their financial reports, the profit reaped by millers is estimated as follows:

**Table 4: Millers' gain**

COST DESCRIPTION	COST DESCRIPTION	Basis	Youan(Cost per kg)	Watt(Cost per kg)
PADDY PURCHASING	Paddy	Cost/Kg of Paddy	275	280
	Transport	Cost/Kg of Paddy	7	7
	Loading and off loading	Cost/Kg of Paddy	2	2
	Storage	Cost/Kg of Paddy	2	2
	Electricity	Cost/Kg of Paddy	6	6
	Processing	Cost/Kg of Paddy	151	151
<b>Gross Production cost of 1 Kg of White rice</b>			<b>442</b>	<b>447</b>
Administration costs	Packing bags	Cost/Kg of White Rice	12	12
	Office supplies and other costs	Cost/Kg of White Rice	8	8
Financial Charges		18%	17	17
Depreciation		Cost/Kg of White Rice	16	16
Insurance		Cost/Kg of White Rice	1	1
<b>TOTAL COST</b>			<b>496</b>	<b>501</b>
Selling Price			580	600
Profit			84	99
<b>Margin</b>			<b>15%</b>	<b>17%</b>

Source: Millers' financial reports

The table 4 shows that millers' profit per kilo is around Rwf 84 for Youan and Rwf 99 for Watt and the margin is 15% and 17% respectively. The rice processing cost which is around 33% of the total cost is the highest cost among other components.

The challenges encountered by millers include: poor quality of rice, insufficient paddy rice quantity (interviewed millers indicated that their milling capacity is underutilised), inadequate infrastructure like roads and high interest rate.

Furthermore, 40% of respondents state that the high interest rate prevents them from borrowing and investing in assets and equipment that would allow them to improve the quality of rice.

#### 4.1.4 Traders:

Traders include wholesalers and retailers. They constitute the hinge linking the rice value chain and the end consumer. They were distributed as follows:

**Table 5: Distribution of respondents by province**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid East	11	39.2	39.2	39.2
West	12	42.9	42.9	82.1
South	5	17.9	17.9	100.0
Total	28	100.0	100.0	

Among traders who responded to the questionnaire, 60% are registered as companies while the remaining traders

are not yet registered. Among them, 53% have contract with suppliers to ensure that they are supplied each harvesting season at agreed quantity and price. This arrangement is in line with Neven *et al.* (2009) as they argue that formalized market suppliers tend to have greater certainty about when the sale will take place and at what price. In such a way, traders increase income security through contractually defined supplies.

However, as shown in table 6 more than 78% respondents confirm that although they are supplied through the formal trading system, they are still part of informal trading group.

**Table 6: Source of rice purchased by traders**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Cooperatives	4	14.3	14.3	14.3
Individual farmers	2	7.1	7.1	21.4
Other Traders	22	78.6	78.6	100.0
Total	28	100.0	100.0	

The findings reveal that although the rice trading is formalised to some extent and rice is supposed to be supplied through cooperatives and millers, there is still an informal value chain linking individual farmers, small paddy traders, millers, wholesalers and retailers. From group discussions, it was revealed that some individual farmers would prefer side sell paddy because cooperatives delay the payment while they need money as soon as they harvest paddy. It is clear that, while a rice trading system was put in place, it is required to ensure a conducive As mentioned earlier, the gross profit has been analysed for the two types of rice: Youan and watt and is estimated as follows:

**Table 6: Average traders' profit estimate**

Cost description	Basis	Youan	Watt
White rice purchase price	Cost/Kg	580	600
Transport	Cost/Kg	10.00	10.00
Loading and off loading	Cost/Kg	1.00	1.00
Storage	Cost/Kg	4.00	4.00
Electricity	Cost/Kg	0.10	0.10
Salaries	Cost/Kg	4.00	4.00
Office supplies and other costs	Cost/Kg	0.20	0.20
Financial Charges	18%	8.70	8.70
Insurance	Cost/Kg	0.83	0.83
<b>Total cost</b>		<b>609</b>	<b>629</b>
<b>Selling Price</b>		<b>680</b>	<b>750</b>
<b>Gross profit (per kg)</b>		<b>71</b>	<b>121</b>
Margin (per kg)		10%	16%

Source: Traders' financial reports

The table 6 shows that traders generate higher profit for Watt than for Youan. Apart from the purchase cost which constitute the largest proportion of the total cost, the cost of activities represent only around 4.5% of the cost incurred by traders for the two types of rice.

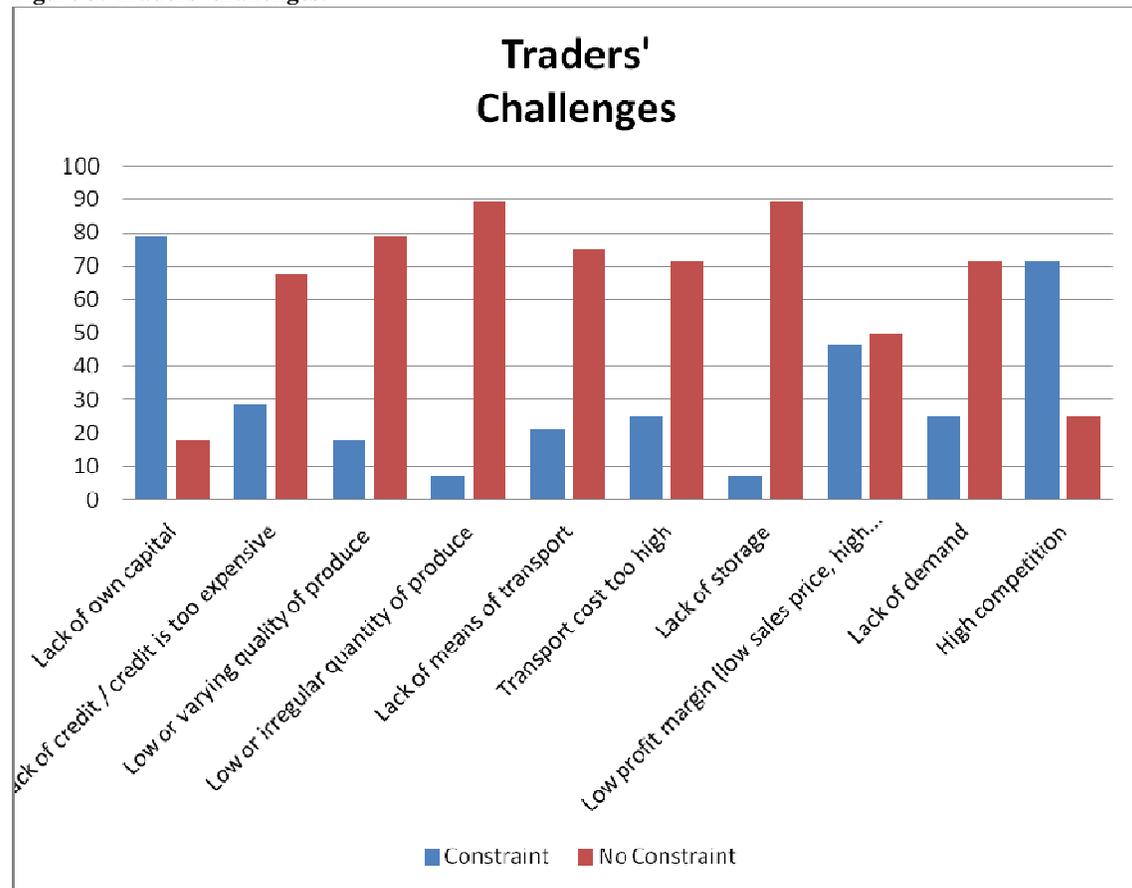
Even if 70% of respondents mention that the competition is high, and 60.7% manage to sell out purchased rice within a relatively short period as shown in table 7.

**Table 7: Average period of storage of rice between purchases and sales**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1-2 weeks	7	25	25	25.0
3-4 weeks	10	35.7	35.7	60.7
> 4 weeks	11	39.3	39.3	100.0
Total	28	100.0	100.0	

The following figure shows the constraints encountered by traders:

**Figure 3: Traders' challenges:**



The main constraints mentioned by respondents include: the lack of own capital (79% of respondents), high competition (70%) and low profit margin (46%). As traders play a crucial role in the functioning of rice markets, it is required to address these constraints to make the rice value chain long term viable.

Considering the total cost and the selling price per kilo at each value chain level, the profit margin distribution along the rice value chain is as follows:

Figure 4: Rice value chain map:

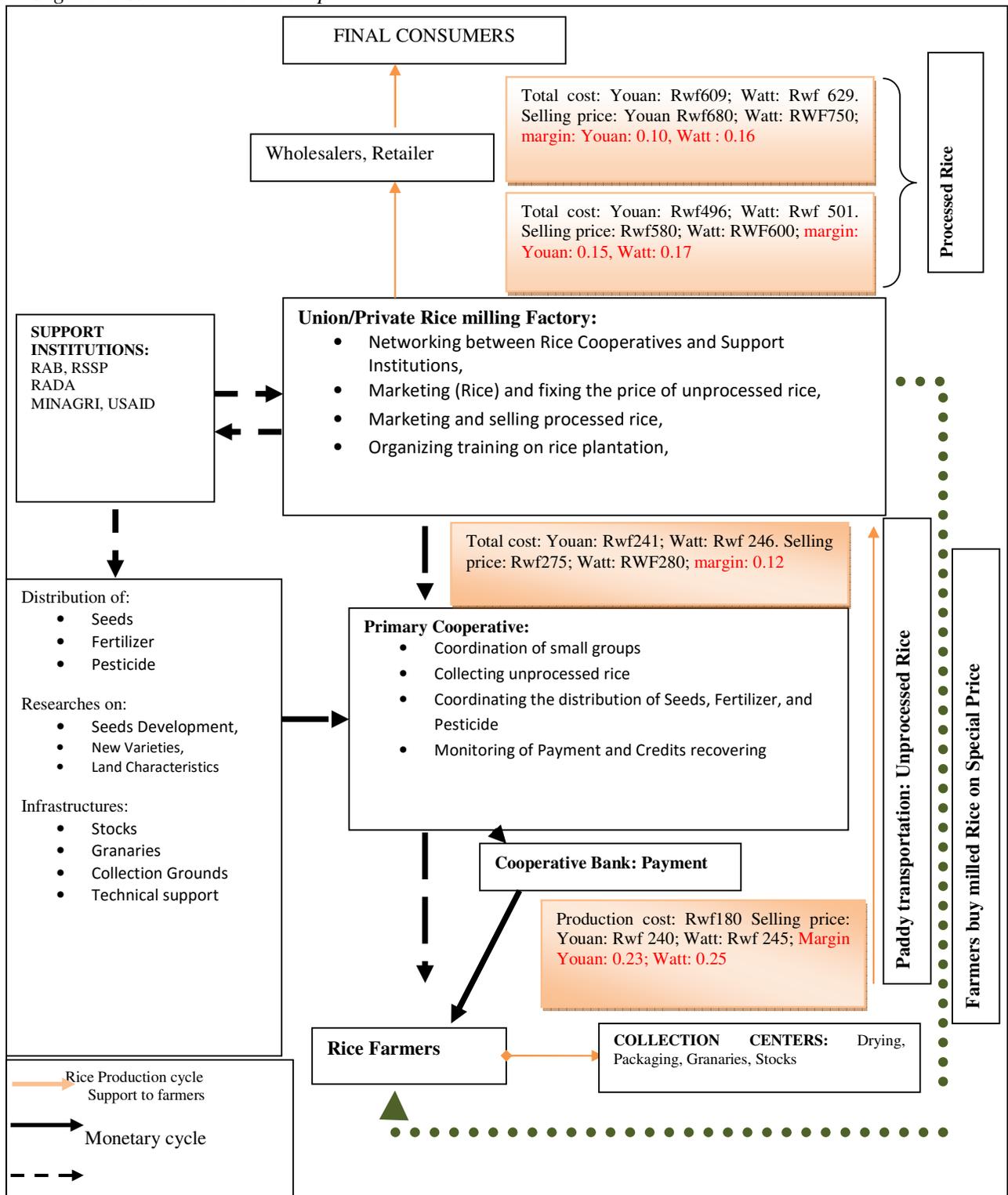


Figure 4 shows that the major inputs for rice farming are provided by support institutions (Rwanda Agriculture Development Authority, Rural Sector Support Project, Ministry of Agriculture and Animal Resources, Rwanda Agricultural Board and USAID) via cooperatives. They include: seeds, fertilizers, pesticides and loans if required. Drying, cleaning, and packaging are done at collection centres and unprocessed rice is sold to millers through cooperatives. Milled rice is finally sold to traders and then to consumers.

The figure depicts also disparities in margins distribution along the value chain in investigated areas. On one hand, while traders apparently reap the highest profits per Kg: Rwf 121 for Watt and Rwf 71 for Youan, actually they generate the lowest margins compared to other value chain participants: 10% for Youan and 16% for Watt. On the other hand, rice farmers receive the largest margin of the ultimate value of their output 23% for Youan and 25% for Watt. It means that for 100 Rwf sales, rice farmers generate 23 Rwf of profit for Youan and 25Rwf for Watt. The findings are not in line with the findings by Kaplinsky (2000), who contends that value chain “governors” commend high returns while producers abide by parameters set by governors and reap low returns. Furthermore, the findings not in accordance with Don Seville et al (2011) who argue that agricultural markets have a long history of pushing costs and risks onto the weakest players in the supply chain and thereby giving them a small fraction of return.

Indeed, although the total production cost borne by rice farmers is higher than the cost incurred by other rice value chain actors, as the total cost of activities performed to add value to the rice along the value chain amounts to Rwf 377, rice farmers incur 48% of the total cost and the remaining percentage is shared by other actors; they generate the highest profit margin while wholesalers and traders generate the lowest yet they constitute the hinge between the value chain and the end consumer. As aforementioned, challenges encountered by wholesalers and traders include high competition, low quality and low profit margin.

Adjustment of production and distribution cost is required to improve the profit margin distribution along the value chain including wholesalers. The findings concur with Riisgaard (2008) who draws the attention that when a large proportion of the cost is borne by the supplier, the standards can serve to reinforce retailer dominance and adversarial supply chain relations.

The improvement of profit margin distribution would be also in tune with the theory stipulating that risk and rewards should be shared down the chain by reducing marketing distortions, building relationships among various chain actors, strengthening farmers ‘cooperatives or other organizations they belong to (Rota, 2006).

It is good that the agricultural policy has set prices but an adjustment of cost and prices is still required to monitor the distribution of margins; and currently to increase the fraction of gains which goes to wholesalers. This is what Bolwig et al. (2010: 176) define as *governance considered as the process of exercising control along the chain through the specification of what type of product needs to be supplied, by whom, in what quantity and when, how it should be produced, and at what price.*

## 5. Conclusion and implications

In accordance with the study objectives which consisted of analysing the rice value chain in selected areas in Rwanda and see how the gains are distributed along the chain, the research findings reveal that cooperatives and support institutions provide rice farmers with a tremendous support in availing required inputs and infrastructure, the absolute gains to them are relatively high, but lower for the remaining value chain actors particularly for the final chain participant. It is required that support institutions ensure the economic gains in rice value chain are fairly distributed among the various rice value chain actors, including wholesalers and traders to avoid adversarial rice supply chain relations.

Furthermore, they should mitigate the challenges aforementioned at each value chain level including: pests, lack of access to water, poor soil fertility and lack of compost and manure for farmers; low quality and lack of adequate infrastructure for cooperatives,

Actually, the following main findings emerge from this study. Firstly, as revealed by the analysis, rice farmers incur the highest proportion of the total cost of value added services per kilo along the value chain (Rwf180 for farmers, Rwf 1.1 for cooperatives, Rwf 168 for millers and Rwf 28.83 for traders).

It seems that the higher the proportion of total cost of activities incurred at each value chain level, the higher the profit margin as shown in table 8.

**Table 8: Rice Value Chain Actors' margins**

	<b>Youan</b>	<b>Watt</b>
Farmers	23%	25%
Cooperatives	12%	12%
Millers	15%	17%
Traders	10%	16%

As specified above, unlike findings by other scholars (Don Seville et al, 2011) stating that the agricultural markets push costs and risks onto the weakest players (farmers) in the supply chain while providing them with a small fraction of return, in this case, rice farmers reap the highest profit margin and it is striking that traders get a small proportion of the margin generated along the rice value chain while they constitute a key link between the chain and the market. It was revealed by data analysis that more than 45% of traders mention that the competition is high and the rice produced locally has a low return compared to imported rice.

Considering that disparities in generated income per unit of produce along the chain are significant, it is required support institutions re-think how to share the profit margin fairly among value chain actors and thereby create a value chain long-term viability. A fair distribution of gains can result from higher productivity and or reducing the cost along the value chain, the production cost that Bogaard and Verzijlberg (2012) found also high, and thereby increasing the profit at each value chain level.

Secondly, the findings revealed that although there is a formalised rice trading system, and thereby one would expect rice to be traded through the formal rice value chain, more than 70% of wholesalers confirm that they are informally supplied by individual farmers and small traders. The persistence of informal group may be explained by the delay in payment by cooperatives while rice farmers need money as soon as they harvest. As highlighted by other scholars the persistence of informal trading is a response to over-regulation and those who run informal businesses do so to reduce their own costs and increase their own profit (de Soto, 1990). The study findings imply new areas of research. First, as the research was conducted in selected cooperatives in Rwanda, it can be extended to cover the whole country and also carry out a comparative analysis involving sub-region countries, to find out how gains are distributed along the rice value chain in EAC. Second, considering that despite formalised rice supply chain wholesalers are partly still supplied by small millers and traders, it would be interesting to find out why the persistence of informal rice trading system.

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