



Full Text Article

Innovations in collective marketing of rice among smallholder farmers' associations in mid-western Uganda using a value chain framework

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Abstract

Farmers' collective marketing arrangements are a plausible strategy for correcting inefficiencies that constrain smallholder farmers' participation in the market economy, yet a few of these arrangements are viable eventually. This study aimed to explore the constraints faced by farmers' associations and the innovations that enabled them to sustainably market rice in mid-western Uganda. Using a descriptive design and case study approach, data were obtained from three farmers' associations and 45 affiliated farmers. Content analysis using value chain approach indicated inbound logistics to be the most constrained, mostly by low-quality rice output and high transaction costs. Operations were constrained by high pressure on members to have cash before harvesting whereas delayed payments for sold rice were the major challenge in the outbound logistics stage. With the I-index of 63 for the inbound logistics stage, 69 for operations, and 79 for outbound logistics, the study suggests that there were more organizational-based innovations at the inbound logistics stage than any other stages, that became less widespread with progress through the chain towards outbound logistics stage. Innovations at inbound logistics stage included brokering of services, giving farmers access to quality seed, rental of agro-equipment and irrigation services. It is concluded that collective marketing arrangements innovate around inbound logistics, creating a production-led chain that caters for absentee markets. This could also mean that the leadership of associations is not strategic. Therefore, extension workers need to support association leadership to develop their capacity in strategic management. Policy-led subsidies that stimulate innovations by associations that increase their ownership of stores in rice-demanded areas are recommended.

Introduction

Smallholder farmers offer substantial contributions to the supply of food and materials (FAO, 2014; UN, 2017; Ricciardia et al., 2018). Most (84%) of the world's 570 million farms are less than two hectares, employing partially or entirely about 2.5 billion people worldwide (Lowder et al., 2021; Ritchie, 2021; UNCTAD, 2015). Whereas smallholder farms operate on only 12% of global arable land, they produce roughly 35% of the world food (Lowder et al., 2021). About 87% of smallholder farms are in Asia and Pacific region, 8% in Africa, 4% are in Europe, and less than 1% is in Latin America (UNCTAD, 2015). Smallholders supply about 70% of Africa's total food requirements and provide around 80% of the food consumed in both Asia and sub-Saharan Africa (UNCTAD, 2015). While it has been argued that

the operation of smallholder farms is naturally suited for expanding less stringent local markets, better opportunities often lie in organizing to supply urban and export markets (Bacon et al., 2014; Rwelamira, 2015). Superior opportunities exist for farmers who can meet the demands of high-value markets related to volumes, consistency, and quality of supply (Rwelamira, 2015). However, smallholder farmers are struggling to keep up with the consumers' demands and to keep focused on efficient operations that are cost-effective and reliable. These farmers face major disadvantages in accessing modern market chains, including challenges related to production of low volumes, variability in the quality of their produce, seasonality and limited storage facilities, high transaction costs, poor market information and contacts, and limited ability to meet the high market needs. There is consensus among development practitioners and scholars that farmers who work together can attain a stronger voice to articulate market needs and lobby for the necessary support they need to market competitively in any markets (Rwelamira, 2015). Several studies mention that farmer or producer organizations help smallholder farmers access cost-effective inputs and provide them with the innovations they need to gain access to high-value markets (Markelova et al., 2010; Sumelius et al., 2013). Farmers' organizations are formal arrangements or organizations formed by farmers for the purpose of operating and managing themselves to address a common interest. The highest level of grouping is a cooperative, then the associations, which is an assemblage of farmer groups. Farmer groups are the most micro-organized unit, and they are a gathering of farmers within close neighborhoods not exceeding two villages (Ekepu et al., 2017).

Farmer organizations are mostly promoted as collective institutions for eliminating the effects of operating at a small scale (Kilelu et al., 2017). Farmer organizations strengthen the socio-psychological capacity of the farmers to pursue higher goals (Bizikova et al., 2020; Gugerty et al., 2018). In Uganda, farmer groups, producer associations, and cooperatives have been functional (Ekepu et al., 2017). Cooperatives mainly existed as the leading channels of marketing cash crops, and they collapsed in the 1990s following the liberalization reforms by the government. The prevalence of farmer groups and associations emanated from the recent attempts to revive cooperatives. The aim was to organize farmers into farmer groups and then into associations, as the basis for creating a strong foundation for the cooperatives to re-emerge.

Farmer organizations are seen as the proper approach to improve marketing of smallholder produce including rice, through devising innovations that can eliminate marketing bottlenecks to high impact markets (Ayieko et al., 2014; Lecoutere, 2017). Eighty percent of rice in Uganda is grown by smallholder farmers and 95% of the harvest is sold for income (Hong et al., 2021). Collective marketing denotes any action of smallholder farmers who subscribe to a common group geared towards sharing market knowledge; jointly developing business opportunities, and working together to push their produce collectively to the market (Devaux et al., 2008; Kilelu et al., 2017).

One of the core strategies of farmers' organizations is to take up innovations that collectively help farmers market their produce better. Innovation refers to new knowledge incorporated into new or existing products, processes, and or services leading to the expansion of economic opportunities or benefits (Klerkx et al. 2010; Kogabayev & Taziliauskas, 2017; Ndaula, 2019). Innovation is not an event; rather it is a long cumulative journey of multiple decisions, involving generating or acquiring new ideas and incorporating them into functions that extend benefits of human interest. Therefore, it is through implementing the new ideas within targeted groups that benefits are realized (Ndaula, 2019). Newness pertains to what is perceived as new to the adopting organization, and innovation includes technological, market, and or a new way of organization (Kogabayev & Taziliauskas, 2017; Ndaula, 2019).

Farmers' organizations can support members in adopting technological innovations, accessing new markets, and/or organizing for more profitable markets. Farmers who accept to market collectively expect their collective marketing arrangement to lead them in the innovations that solve the challenges nested in the marketing processes (Kilelu et al., 2017). For instance, a collective marketing arrangement can innovatively support members to produce under a contract which could also require them to plant the same cultivar using similar methods (Kogabayev & Taziliauskas, 2017). The majority of the smallholder farmers do not get full returns from production, because value addition is not included in the packages extended through extension and advisory services (Kogabayev & Taziliauskas, 2017).

Value addition in most cereal crops, including rice, involves product transformation of form, shape, or standard of the grain to attract more profitable prices (Kilelu et al., 2017; Klerkx et al., 2010; Kogabayev & Taziliauskas, 2017). For example, rice grain that has been threshed, dried, graded, and packed has better markets and higher profits (Kogabayev & Taziliauskas, 2017). In addition, collective marketing arrangements can reduce transaction costs spent on transport and receipt by optimizing gains of collective power attained through bulked purchases and sales. While the aforementioned are some of the innovations farmers' associations can implement to trigger sustainable collective marketing, it remains unclear whether the innovations are being utilized. Well suited as they may sound, for collective marketing arrangements to benefit farmers, they have to overcome the marketing-related challenges that trap these farmers in marketing-constrained positions.

Scoping studies and reports however show that despite being subscribed to marketing associations, smallholder farmers continue to market their products outside collective marketing, often at a lower price, and sometimes before the crop reaches the full maturity (Ekepu et al., 2017; Kilelu et al., 2017). When the farmers do not appreciate the innovations proposed or implemented by their collective marketing associations, these farmers can develop low loyalty to collective marketing. However, a knowledge void exists regarding the implementation of innovations among rice farmers' associations in Uganda.

Thus, the thrust of this research was to assess successful farmers' associations for relevant innovations that consolidate farmers to sustainably market their rice collectively. Insights of this study are likely to feed into government and non-governmental agencies' long-term interest in improving smallholder farmers' well-being by connecting them to competitive markets. This is particularly important because farmers' failure to be committed to collective marketing pragmatically points to the likelihood of the arrangement to lose collective bargaining.

Conceptual framework for innovations in collective marketing

The value chain constitutes the activities involved in bringing products to the market. According to Porter (1985), a value chain is constituted by three stages, including the inbound logistics, operations, and outbound logistics stages. The inbound stage handle inputs, the operation stage handles the transformative activities of the inputs into outputs, whereas the outbound stage deals with marketing of the outputs. In adopting the value chain approach in this study, it was intended to support the identification of the innovations which are routines, practices, technologies, and support services offered by associations along the marketing stages. Klerkx et al. (2010) and Faure et al. (2019) postulate that innovations entail aligned tangible products or a well-defined set of practices and technologies (hardware innovations), new modes of thinking, and corresponding practices and learning processes (software innovations), and new institutions and social-organizational arrangements (orgware innovations). It was assumed that associations that sustainably market undertake innovations that improve the quality of rice, volume of rice, timeliness of rice delivery to collection centers, the operations at the centers and, the logistics of rice distribution and delivery to the market. Under value chain, organizing the different actors (orgware)

towards efficient and timely delivery (software) of the right quantities and required quality attributes (hardware) across chain is important (Ayieko et al., 2014). It requires collective or chain wide strategies to innovate as well as take up innovations that address marketing challenges within value chain processes, Figure 1.

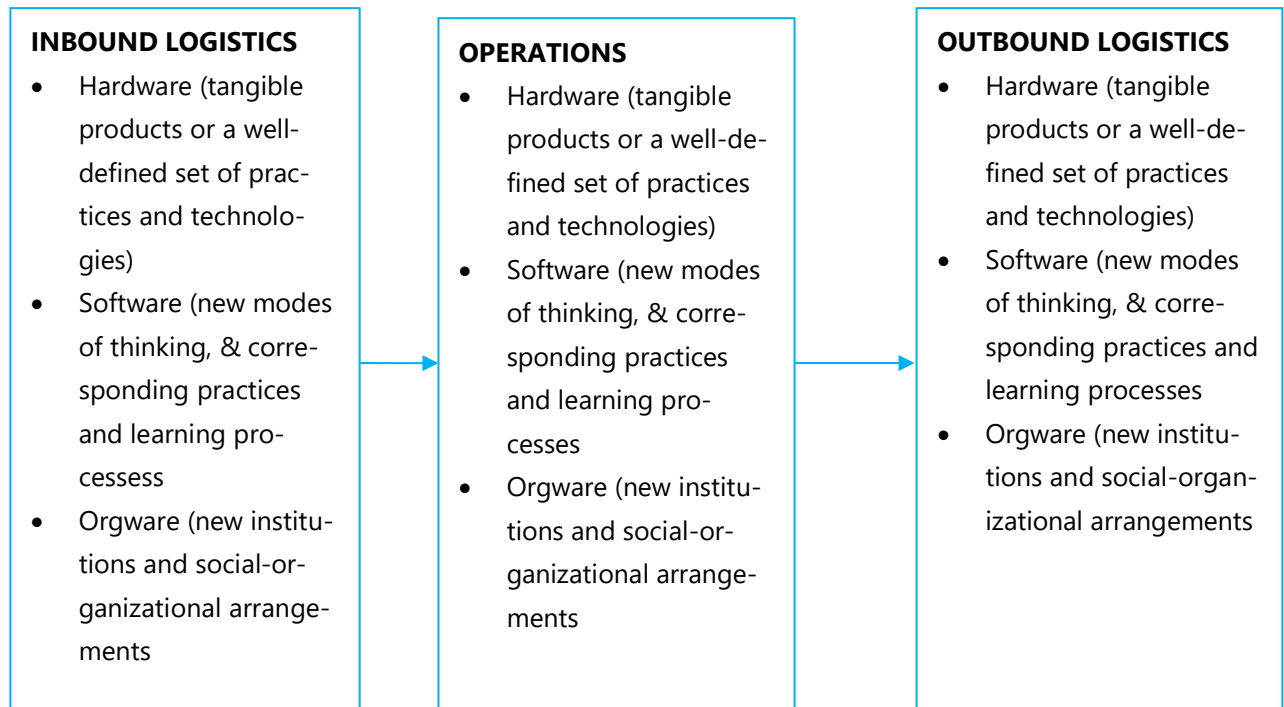


Figure 1. Conceptual framework for innovations in collective marketing.

This study sought to answer the question: *What constraints did farmer associations encounter, and what innovations did they implement to sustainably market rice in mid-western Uganda?*

Materials and Methods

Study area

The study was conducted in Uganda, a country that lies between 1°29' South and 4°12' North of the Equator and between 29°34' East and 35°00' East of the Greenwich, particularly in Kagadi and Kikuube, which are two rural districts, (Figure 2). These districts were purposively selected because they are among the largest smallholder rice-producing areas of the mid-western hub (Ministry of Agriculture, Animal Industry and Fisheries [MAAIF], 2009).

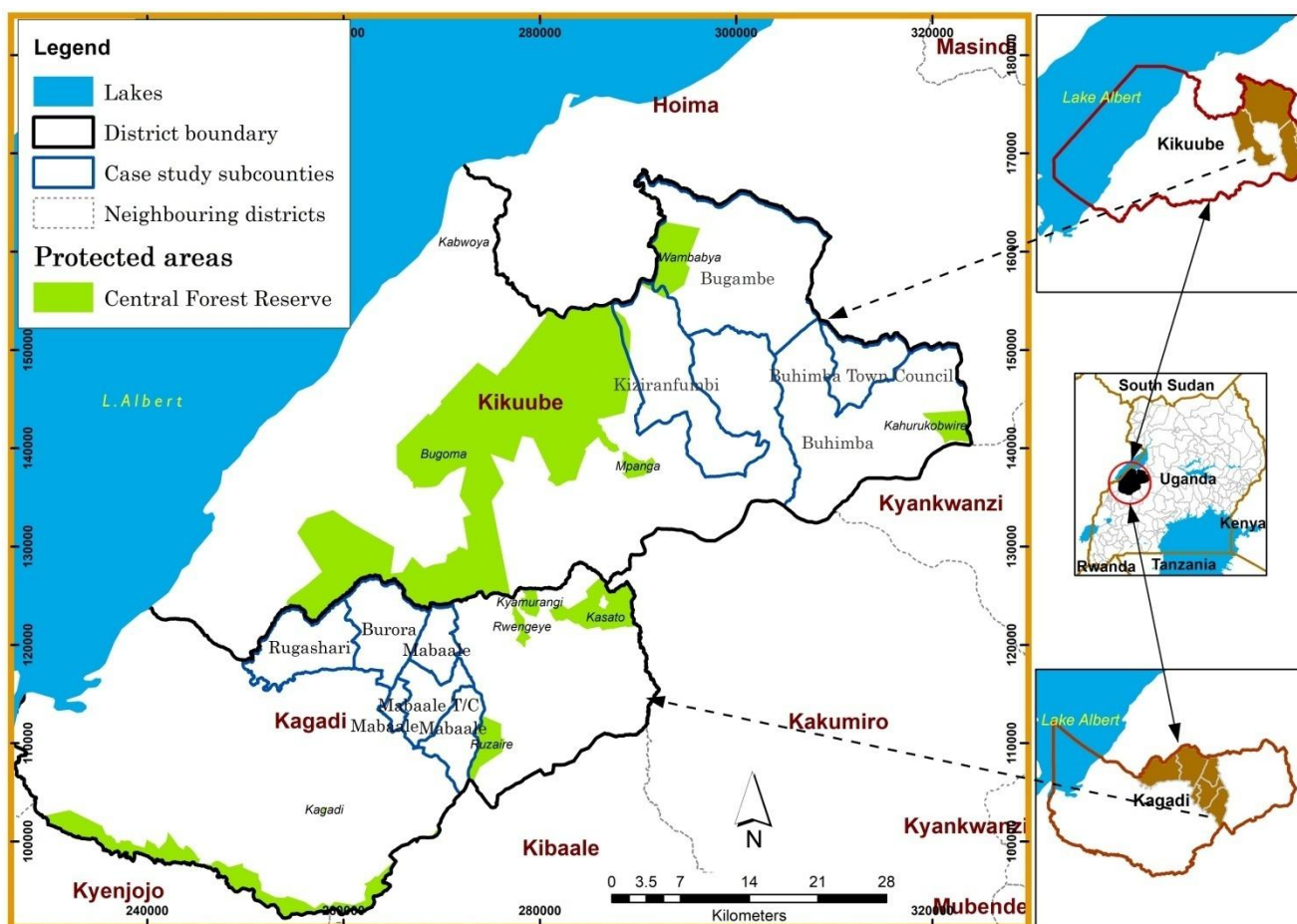


Figure 2. Map showing areas of mid-western Uganda covered by the study.

Rice farming in mid-western Uganda is dominated by smallholder farms. Particularly, Bugambe, Buhimba, and Kiziranfumbi sub-counties in Kikuube district and Rugashaari, Burora, and Mabaale sub-counties in Kagadi district were purposively targeted since they had the most active farmers’ organizations that are carrying out collective marketing (MAAIF, 2009).

Research design

A descriptive design using a case study approach was employed in this study (Manjunatha, 2019). The participants were the smallholder rice farmers who subscribed to the selected associations. The case study approach was appropriate for gaining the specific constraints to collective marketing and the implemented innovations that triggered successful collective marketing. Quantitative data were collected from 45 participants, 15 per each of the three case study associations, selected purposively for their consistency to market collectively. To merit inclusion, associations had to have outstanding performance of individual members at meeting threshold volume set to be marketed collectively. These cases were mutually nominated by the researcher and collective marketing promoters. Particularly, quantitative data were used to develop a case selection checklist, which included: 1) membership size; 2) meeting of average volume; 3) number of affiliating farmer groups and; 4) portion of members selling collectively. In addition, targeted case associations needed to have had more than two farmer groups and more than 50 individual subscribers on top of having consistently marketed rice above 50% of the set threshold volume. Using the set criteria, Ageeteraine, Katweyambe and Rukiga associations were enrolled for the in-depth

study (Table 1.) These selected organizations aimed to market ≥ 2 bags of rice (≈ 250 kg) and Katweyambe had the highest threshold set at ≥ 5 bags of rice (≈ 635 kg). While the three organizations marketed between 70% and 90% of the set threshold in 2017, bulked rice varies across seasons. For example, between 2015 and 2017, associations bulked up to 20 bags in good seasons and as low as 2 bags in the bad seasons, because their priority in bad seasons is on ensuring enough food for family.

Table 1. Summary of the description of selected case study associations.

Association	No. of bag	Weight (kg)	Members		% of threshold ^a consistently sold in 2017	Bulked rice by association (2015 to 2017)			
			No. of farmer groups	Total individual		Maximum (during good season)		Minimum (during bad season)	
						No. of bag	Weight (kg)	No. of bag	Weight (kg)
Ageeteraine	2	250	6	75	72	9	1,125	2	318
Katweyambe	5	625	6	224	86	20	2,500	5	625
Rukiga	2	250	6	217	73	20	2,500	3	375
Average	2.5	312.5				13.0	1625	2.7	333.3

^aMinimum expected volume a member is supposed to market collectively

The rice is bulked in an unprocessed form in weight per bag is 120-130 kg \approx 125 kg per bag

Description of the cases

Case 1: Ageeteraine farmers' association

Ageeteraine is a medium (50 to ≤ 100 members) sized association founded in 2005 by farmers. It is located in the Bugambe sub-county, Kikuube district. Fifty-five percent of the members are male. The association's major goal is to produce high-quality rice, support members to access premium prices, and overcome middlemen exploitation. The group also promotes beans and groundnuts production. The association is also affiliated with Mayirirwe cooperative and pays USD 5.2 in annual subscription and 1 kg of sorted rice per rice bag stored by members in its facilities. The cooperative brokerages extension, seed, and financial services on behalf of the association.

Case 2: Katweyambe farmers' association

Katweyambe is a large-sized association with 224 members, founded in 2005 by farmers. It is located in the Buhimba sub-county, Kyabatallya parish, Kikuube district. The association is currently constituted of six farmer groups with 69% male. The main objective of the association is to promote the production, bulking, and collective marketing of a single crop, encourage members to produce enough food for food security, help members in field operations collectively, and to save and acquire loans from the group to address members' needs. The group also promotes maize, ground nuts, beans, and vegetable production. The association is advised by World Vision and Hoima District Farmers Association (HODFA). The association brokerages most of the services, including extension, seed, value addition (grading, packing, and quality control) and financial services on behalf of its members.

Case 3: Rukiga farmers' association

Rukiga is a large-sized (217 members) association founded in 2011 by farmers. It is located in Rugashari sub-county, Ndeba parish, Kagadi district. The association is composed of six farmer groups with 60% male. The main objective of the association is to mobilize collective action to guarantee good farming practices, marketing of produce, food security and to diversify income sources. The association also promotes sanitation and hygiene at the household level. To retain membership, one has to pay a registration fee of USD 2.6, save consistently, and must repay on time when given a loan. The association is advised by Muhooro Area Cooperative Enterprise, Uganda Rural Development and Training (URDT) program, and Hoima Caritas Development Organisation (HOCADAO). It brokerages most of the services, including extension, seed, value addition (grading, packing, and quality control), and financial services on behalf of its members.

Data collection and analysis

Quantitative data were collected using an interview guide administered by trained interviewers to obtain the constraints individual members faced when marketing collectively. Respondents were asked to assess the level of impact of the identified factor(s) constraining each farmer's collective marketing goals. Each factor was assessed using a 10-point semantic differential scale (1=no impact, and 10= very high impact). A ten-point scale offered a wider range of choices, more discrimination and allowed more self-reflection than a five- or seven-point scale (Norman, 2010). Farmers also ranked each constraint on a ten-point semantic differential scale (1=not important, and 10= very important) to assess the importance of each constraint in collective marketing. Given that members of each group assigned differing levels of importance to the same constraint, the scores for the impact of a constraint were less important without factoring into their assigned importance. Thus, these constraints were normalized by multiplying the mean impact of each constraint for all the associations with its corresponding mean importance in collective marketing per association. Normalization rendered responses from different individuals and associations comparable (Ndaula et al., 2021; Teshome et al., 2014). The final matrix constituted the vital constraints; a factor was regarded as a major constraint if its value was ≥ 50 ($\approx 50\%$ of computed value, ranging between minimum, $1 \times 1 = 1$ and maximum, $10 \times 10 = 100$).

Three focus group discussions (FGDs) were conducted; each with 10 farmers from each case. Open-ended questions were used to elicit spontaneous discussions. Interviews were recorded with permission from the interviewees, transcribed, and analyzed to generate an innovation matrix along the value chain and across the three cases. Thematic analysis along the value chain stages that is inbound logistics, operation and outbound logistics stages was used to identify innovations from qualitative data. Through participatory ranking within the FGDs, the percentage of farmers who were using the innovations out of the total of those in the FGD was computed. The percentages were transformed into adoption levels where proportion of farmers using the innovation was $< 1\%$ it was converted to = 0; then $> 1 \leq 25\% = 1$; $> 25 \leq 50\% = 2$; $> 50 \leq 75\% = 3$ and; > 75 through $100\% = 4$. These figures indicated the level of prevalence of an innovation within the association, where zero meant that the innovation was least used whereas 4 implied that it was used by all members. Then, an innovation index was computed to estimate the level of prevalence of an innovation across the three case study associations. The innovation index was calculated as a percent value of the combined prevalence of the innovation across the three organizations divided by the probable prevalence value (12) assuming that the innovation was being used by all members across the organizations (Renwick et al., 2014). An innovation index was used to sort the innovations that were worthy of reporting. I-index threshold value $\geq 50\%$ was considered relevant in identifying scalable innovations.

Results and Discussion

Constraints faced by farmer associations

This section presents the constraints associations face when marketing collectively. The most constrained stage was the inbound logistics and most with hardware type of constraints (Table 2). Farmers highlighted 8 major hardware types of constraints to be affecting the inbound stage compared to five cited for the operation and only for outbound stage. This study reveals that the major factors constraining inbound logistics stage include: low-quality rice (stones, grain size, and molds) (57) and seasonal or climatic changes (52) in the hard type. High transaction costs (58) was the major software type of constraint. Within the operation stage, in-season need for cash by members (72) is the hardware type of constraint that was the most constraining factor on operation stage activities, and delayed payments to members (67) were the major constraint to outbound activities. Cash needs and delayed payment could have emerged as strong constraints within the study cases because all the associations were not producing under contract, thus delays existed between the time of harvest and payment. For example, a male farmer interviewed in Katweyambe, in June 2017, noted, "Failure to access the market on time after bulking is frustrating and leads to unstable prices". Lessons from cooperatives show delayed payments to members of collective marketing arrangement as one of the major constraints which they strategically addressed by using their collective bargain to direct marketing channels, and payment terms (Action Aid, 2013; National Planning Authority, 2018).

Similarly, the low quality of rice could be linked to the economic status of the farmers and variations in weather. Variations in weather conditions cause poor grain quality and constrain sun-based grain drying are commonly used in study cases (Chandini et al., 2021). A farmer in Rukiga, in June 2017 noted, "During rainy season, moulds grow all over harvested rice and traders don't buy such rice". Similarly, differences in rice grain, result in broken grain during processing, as exemplified by a male farmer in Katweyambe, in June 2017:

"Machine operators set machine once to save time which spoils people's rice. We plant different varieties; one farmer can have NERICA IV and another NERICA X, NERICA I, or highland. The grain of highland cannot have the same size with those of NERICA I, then the grain of NERICA IV cannot have the same size with SUPERICA II...."

".....The challenge we get is that the machine operator will set the machine to mill the 30 bags of SUPERICA II, and then when another farmer comes with 10 bags of NERICA IV, the operator puts in rice without changing the settings. The machine, thus, ends up crushing all the rice or the processed rice comes out with a lot of broken grains]", a farmer in Katweyambe, June 2017.

A case-by-case analysis showed that uncoordinated planting time within Katweyambe (54) constrained the association's collective marketing activities. This was linked to inadequate tractor services that caused delays in field preparation. Urfels et al. (2021), attest to this finding, noting that resource-constrained farmers tend to plant late ceteris paribus, because of delayed access to farm machinery, seed, fertilizer, and labor. Delayed planting constrains collective marketing because it affects grain quality and leads to different harvest days (Chandini et al., 2021).

Table 2. Constraints in collective marketing of rice of the farmer associations in Uganda.

Stage*	Constraints	Type	Ageeteraine			Katweyambe			Rukiga			Overall value
			Mean impact	Mean importance	Computed value	Mean importance	Computed value	Mean importance	Computed value	Mean importance	Computed value	
			1-10	1-10	1-100*	1-10	1-10	1-100*	1-10	1-10	1-100*	1-100*
Inbound logistics	1) Fake weighing scales by traders		3	8	24	4	4	12	8	8	24	20.0
	2) Impure or low quality rice (stones and moulds)		8.5	7	59.5	5	5	42.5	8	8	68	56.7
	3) Seasonal changes	Hardware	6.5	7	45.5	8	8	52	9	9	58.5	52.0
	4) Pest and diseases		2	3	6	7	7	14	4	4	8	9.3
	5) Produce differing rice, attracting low price		5.3	1	5.3	2	2	10.6	7	7	37.1	17.7
	6) Impassable roads, during rainy seasons		4	8	32	3	3	12	9	9	36	26.7
	7) High transaction costs due use of boda-boda (bicycles or motorcycles used as taxis to carry passengers and goods) to transport rice to store and unprompted payments	Software	7.5	8	60	7	7	52.5	8	8	60	57.5
	8) Failure to commit to the agreed volume to sell collectively per person	Orgware	4	7	28	8	8	32	8	8	32	30.7
Operation	1) In-season cash needs		9	7.5	67.5	9	9	81	7.5	7.5	67.5	72.0
	2) Lack of electricity leading the to selling of paddy rice cheaply	Hardware	6	7	42	5.5	5.5	33	9	9	54	43.0
	3) Exploitative traders who supply rice seed		4.5	6	27	6	6	27	5.5	5.5	24.75	26.3
	4) Failure to pay back loans	Software	5.4	1	5.4	7	7	37.8	2	2	10.8	18.0
	5) Planting at different times due to a shortage of tractors		9	4	36	6	6	54	2	2	18	36.0
Outbound logistics	1) Delayed payment of members	Orgware	8	8	64	9	9	72	8	8	64	66.7

*Threshold ≥ 50 ;
For Stage: 1 = in-bound logistics, 2 = operations and; 3 = out-bound logistics

In addition, collective marketing across case study associations was constrained by high transaction costs because of challenges related to the state of infrastructures that facilitate collective marketing. This was exemplified in farmers' narratives below:

"The roads are bad, so transporting our produce from our homes to the stores is very expensive because vehicles can't pass so we normally use boda bodas (motorcycles) which is expensive", male farmer, Ageeteraine, June 2017.

"We have problems with transport, the roads are bad and impassable in rainy season, yet drivers prefer passing in the areas where the roads are good, so the buyers fail to come", farmer in Rukiga, in June 2017.

The above narratives show that farmers' collective rice marketing costs are hiked by high transport costs. This finding is divergent from the theory underlying collective marketing because farmers who sell collectively are expected to experience low transaction costs. Distantly suited storage facilities (≥ 15 kilometers) and impassable roads are reported by the farmers to be working together to precipitate high costs on collective marketing, mainly because farmers mostly depend on motorcycles to transport their rice to stores in small units. Further, concerns about delayed payment were precipitated by follow-up costs used by the farmers to cover, communication and transport costs before they finally get paid. This was exemplified by the farmers:

"Because of delayed payment by the buyers, we incur high transport costs taking our produce to stores and then going back to be paid, so members complain a lot. Buyers need to pay cash", female farmer, Rukiga, June 2017.

"Transport charges are high. For example, an individual pays between UGX 5000-8000 (1USD = UGX3,804) for a bag on a vehicle hire while as a group, the cost is UGX 5000(US\$1.31) for the same bag", farmer, Katweyambe June 2017.

Transactions were not completed on the same day the farmers delivered their rice for collective marketing. This extended extra costs to farmers spent in follow-up, in an environment where transport costs to the collection centers were high. This implies that beyond focusing on bulking for outbound logistics, it is important to pay attention to logistical activities that precede bulking as such contribute to the economic meaningfulness of the collective marketing to individual farmers. Thus, under the circumstance of unpredictable extra costs and payment dates, farmers cannot be expected to be committed to collective marketing (Ndaula et al., 2021).

Innovations propelling association led rice collective marketing

Overview of innovations in collective rice marketing

Innovations do exist among the case study farmer associations, which could be benchmarked to enhance the sustainability of collective rice marketing. In line with Faure et al., (2019), software, hardware, and orgware innovations were sought in the collective marketing value chain nodes (Table 3). Most innovations were under inbound logistics (software = 2, hardware = 3, and orgware = 8) and operation (software = 3, hardware = 3, and orgware = 7) and a total of 13 innovations were recorded for each stage whereas only four (software and hardware = 1 each and orgware = 2) were registered under the outbound stage.

Table 3. Innovations propelling association-led rice collective marketing.

Value chain dimension	Innovations	Association			Prevalence of innovation		
		Ageeteraine (n=10)	Katweyambe (n=10)	Rukiga (n=10)	Total	I-Index	
Software	1. Brokering training services	4	2	0	6	50	
	2. Brokerage of tractor services to increase acreage	4	4	0	8	66.7	
Hardware	3. Use the cooperative digital weighing scale	4	0	4	8	66.7	
	4. Quality seeds	4	2	4	10	83.3	
	5. Equipment hire service like irrigation pumps, tarpaulins, threshers, collapsible dryers	3	4	4	11	91.7	
Inbound logistics	6. Plant the same variety, weed, and harvest individually, collect, store and sell together	3	0	4	7	58.3	
	7. Contract land use rights	0	4	0	4	33.3	
	8. Contract tractor hire services	4	4	0	8	66.7	
	9. Contract irrigation services	3	4	4	11	91.7	
	10. Optimal planting density	0	4	0	4	33.3	
	Orgware	11. Social solidarity in helping members cope with unexpected social challenges, including rice cultural activities	0	4	0	4	33.3
		12. Rationalize portion for food and collective marketing at the time of harvest	4	0	3	7	58.3
	13. Exchange visits to share information	4	2	4	10	83.3	
Total		2.8	2.6	2.1	7.5	62.8	

Table 3. Continued...

Operation	Software	1. Loaning of quality control and production assets, e.g. tarpaulins, seed, pesticides, and tractor via a third party entity	4	2	4	10	83.3
		2. Loan repayment is managed through a deductible fee like system at the point of selling	4	0	4	8	66.7
		3. Training farmers in rice production marketing, value addition, and rice post-harvest handling practices	4	4	2	10	83.3
		4. Diversification of sources of income – e.g. into livestock	4	4	4	12	100
	Hardware	5. Use of wood logs as pallets for storing dried rice	0	0	4	4	33.3
		6. Use hermetic silos to avoid rats	0	0	4	4	33.3
		7. Use of wood logs as pallets for storing dried rice	0	0	4	4	33.3
		8. Flexible rules and collaborative decision making on the threshold	3	2	4	9	75
		9. The store gets a share equivalent to 1kg/bag as a service charge	4	0	0	4	33.3
	Orgware	10. Loan and production committees control quality and pay bay of seeds to the providers	4	2	4	10	83.3
		11. Sanitation Hygiene and well-being training	2	3	4	9	75
		12. Soft loans in case a member needs money to attend to household needs	4	4	4	12	100
		13. Dry, clean, and sort rice before storing or selling	4	4	4	12	100
	Total		2.8	1.9	3.5	8.3	69.2
Outbound logistics	Software	1. Contract-based seed production	4	4	4	12	100
	Hardware	2. Sell paddy rice to seed companies	4	4	4	12	100
	Orgware	3. Mill rice, store it, and sell it during off-season at a high price	4	0	0	4	33.3
	Total		3.8	2.8	3.0	9.5	79.2

Adoption level: <1 = 0; >1≤25 = 1; >25≤50 = 2; >50≤75 = 3; >75 through 100 = 4

Table 3 presents the summary of innovation scores across case study organizations and the overall innovation index. The overall I-index of 63 for the inbound logistics stage, operations (69), and outbound logistics (79) indicated that innovations at the outbound logistics were few and widespread across the study case. Innovation at the inbound and operation were many and more organizational based. Overall the major innovations implemented across the three stages are presented in Figure 3.

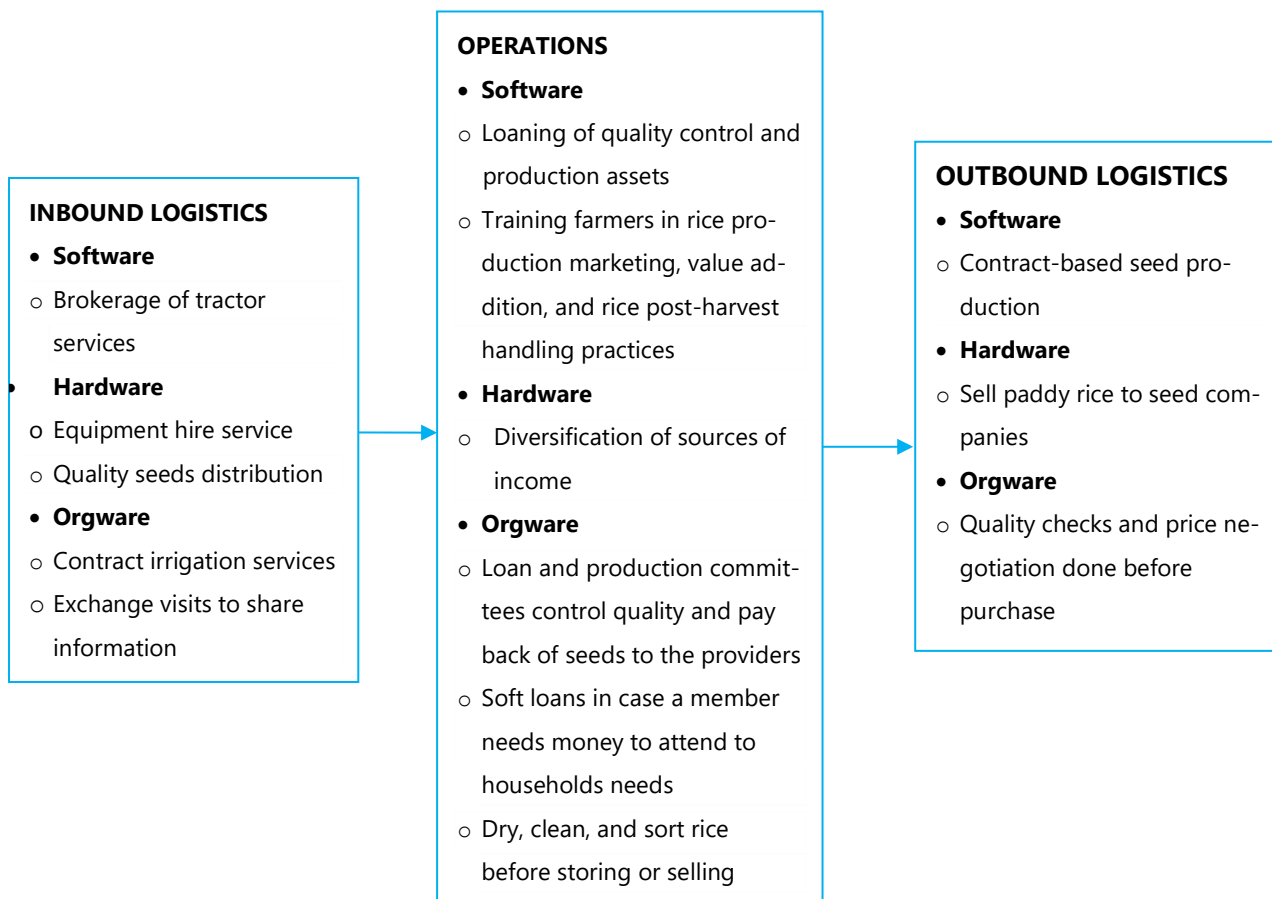


Figure 3. Innovations in collective marketing of rice.

The finding shows that majority (19 innovations in inbound logistics and operations against 3 innovations in outbound logistics) of the innovations were on the production side of collective rice marketing chain, which could mean that collective marketing of rice is production-led. Going by the norm of value chain analysis (Kaplinsky & Morris, 2001), the low innovations on the out-bound logistics stage (demand side) could imply that control over determination of the value created in the rice value chain in the study cases is buyer-driven. Mean scores of each value chain stage (inbound, operation and outbound) were used to compare variations in the innovations across the three case study associations.

Inbound logistics

Software innovations under inbound logistics included brokerage of training services from other organizations (50) and brokerage of tractors services (67). Hardware innovations included using cooperative tested scales (67), the use of quality seed (83) and equipment (irrigation pump, tarpaulins, threshers, collapsible dryers) hire service (92). This helped farmers who were resource-constrained to access the relevant resources in rice production economically (Kilelu et al., 2017; Kogabayev & Taziliauskas, 2017). This finding is also important

because, as other scholars have shown (Kelly et al., 2003; Poulton et al., 2010; Ton et al., 2015), the micro-operations of the smallholder farmers create absent farmer demand which is a disincentive for private sector service providers to invest in service delivery to smallholders. The value of the brokerage scheme may lie in the fact that it does not provide direct monetary gifts which create pseudo input and service markets but contributes to creating a more mature and self-supporting market.

Orgware innovations involved the use of contracts in extending tractor (67) and irrigation (92) services to the farmers. On average these innovations were moderately implemented across the three associations (average scores in the range of 2). The organizations also carried out exchange visits to share information (83), planted the same variety, weeded and harvested individually, collected, stored, and sold together (58). These innovations had varying impacts on the farmers' collective marketing strategy. For example, regarding exchange visits, it was observed in an FGD conducted in June 2017 in Rukiga that:

"We visited a farmer whose harvest per acre was 37 bags of rice, ours was 15 bags per acre. The difference between our harvests was because we did not use fertilizers. Through these interactions we have gained knowledge and improved our farming systems; we used to plant few acres but after visiting our colleagues and saw what they were doing we increased the area under production", FGD in Rukiga, June 2017.

Innovations cited inbound logistics were more prevalent in Ageeteraine (avg. 2.8) and Katweyambe (avg. 2.6) than in Rukiga (avg. 2.1). The figure of organization total average above 2.1 indicated that innovation under inbound was being used by most members.

Operations

Software innovations under operations, included loaning of quality control and production assets, e.g., tarpaulins, seed, pesticides, and tractor via a third party entity (83), training farmers in rice production marketing, value addition, and rice post-harvest handling practices (83), loan repayment managed as a deductible at point of selling (67). Trainings helped farmers to improve the quality of the rice across the value node, as asserted by farmers in an FGD in Rukiga, in June 2017:

"We used to sell paddy rice but after we attended training about value addition, members decided to mill their rice. Now one sells rice and takes back their rice bran to feed the animals at home. For example, the paddy rice that used to earn somebody UGX1,000,000 (USD262.9) would earn one 1,500,000shs (USD394.4) after milling with the benefit rice bran".

The widespread hardware innovation was income diversification (100). Orgware innovations included flexible rules and collaborative decision making on the threshold (75), the creation of loan and production committees to manage quality (83), investment in wellbeing of members through offering sanitation, hygiene, and wellbeing training (75), and offering of soft loans for members to attend to household needs (100). Regarding flexible decision-making, a farmer in Ageeteraine June 2017 noted: "When we harvest, members meet and set the number of bags each member should store and the volume to be retained at home for consumption". Such flexible and participatory processes build trust and keep farmers committed (Kilelu et al., 2017; Klerkx et al., 2010).

In addition, supporting farmers in non-farm challenges, such as arrangements to pay the school fees of farmers' children using bulked rice for collective marketing as a guarantee or to diversifying sources of income, reduced pressure on farmers to sell rice prematurely. For example, it was noted by a female farmer in Ageeteraine: "My child was chased from school, I ran to the cooperative and they helped me secure the fees because they had my harvest stored in their store, and after selling they deducted the money that I had taken", farmer Ageeteraine, June 2017. Another farmer in Rukiga noted: "Before I joined the group

I used to plant any type of variety but when I joined, they gave me 3 kg of maize and I harvested 6 bags out of them, so I was motivated because of the improved seeds”, a farmer in Rukiga, June 2019. Giving services before payment is a vital innovation that corrects market inefficiencies. It is similar to the voucher system where farmers pay service providers with vouchers that are cashed later when their products are sold (Kilelu et al., 2017).

Outbound logistics

Under outbound logistics, associations grew uniform rice varieties through engaging in contractual seed advances or loaning to farmers (100). All case study associations sold paddy rice to seed companies (hardware) and negotiation with rice buyers was done after production had been bulked (orgware). This means that farmers under collective marketing did not produce for any specific market. The total average figure above 2.8 showed that the four innovations cited under outbound were being used by most farmers, although these innovations were widely prevalent in Ageeteraine (3.8) and Rukiga (3.0). The few innovations and their widespread could mean that the associations have less focus on activities that would directly link them to the market. This finding consolidates an earlier observation that collective marketing in study cases is production-oriented. For example, according to farmers in Ageeteraine, their association maintains high-quality rice standards to attain buyer loyalty across seasons. However, producing quality rice has not yet resulted in contract-based production, not even with the seed companies. This exposed the associations to intermediary exploitation because market forces (demand-supply) determined the selling price (Kaplinsky & Morris, 2001). Farmers in an FGD held in Kikuube in 2017 noted: *“Traders are exploitative, for one bag of seed advanced to a farmer, 3 bags of the harvest have to be given back to the company”*.

Ageeteraine association has attempted to control rice price through storing and selling rice at off-peak marketing time, however this innovation, creates undesired delays to pay farmers after they have delivered their rice at the association’s premises. Delayed payments force farmers into selling their rice cheaply before it has attained maturity. Farmers in an FGD held in Ageeteraine, in May 2017 noted: *“If one is given a loan worth UGX50,000 (USD13.2), repayment is done with a bag (125 kg) of unthreshed rice, which is considered as a giveaway price for rice”*. Altogether, the low innovations in the out-bound logistics stage could mean that collective marketing arrangements are still producing for absentee markets, which presents value determination by buyers.

Conclusion

This study aimed to find the challenges and innovations that were being taken by farmer associations that sustainably marketed rice of smallholder farmers collectively. Based on the findings, the major challenges of collective marketing associations for rice were the in-season need for cash, delayed payments, high transaction costs, and producing for absentee markets. These factors worked together to constrain collective rice marketing in farmer associations. Amidst numerous challenges, several innovations are being taken by the associations.

The operation stage was constrained by in-season need for cash whereas delayed payments to members were the major constraint for the outbound stage. Outbound logistics had few and widespread innovations compared with in-bound logistics and operations stages where many innovations had been cited and tend to be more organizational based. Major software innovations under inbound logistics stage included giving farmers brokering of services from other organizations. Hardware innovations included giving farmers access to quality seed and for hire agro-equipment whereas the major orgware innovations was an extension of irrigation services to the farmers. These innovations were moderately implemented across the three case associations. However, because the innovations are

production-led, the value creation is largely buyer-based. Farmers' associations promoting collective marketing need to invest in market-oriented innovations, such as contract farming to re-orient the value creation systems of these associations to becoming producer-oriented. High-impact innovations are likely to be those that aim to lower transaction costs associated with transporting rice to bulking centers, lower the financial challenges surrounding the farmer, and train association leaders in strategic management. Policy-led subsidies that stimulate innovations by associations that increase their leadership in marketing rice, such as through ownership of stores in rice demanded areas are recommended. Such initiatives can increase the farmers' control over the market.

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