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Expanding market access and value addition in selected agricultural value chains: the role of IAR4D in the Lake Kivu Pilot Learning Site

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Abstract

Limited access to profitable markets and production resources by smallholders restricts expansion and investment in technologies that could increase efficiency and add value to primary production. Two cases from the DRC and Rwanda, targeting the collective marketing, value addition and processing of banana and Irish potatoes, are used to demonstrate the IAR4D approach. The results show that, through collective marketing and banana processing, farmers are able to increase their returns by about 50% compared to the period before IAR4D interventions. The shelf life of the products was also increased drastically. Market efficiency improved for Irish potatoes by reducing transaction costs and decreasing the market intermediaries who would extract larger margins at the expense of the producers. Thus the tonnage of potatoes marketed increased from about 3 to 15 MTs in less than one year, while farmers were able to earn up to 10% higher prices through the IPs. Transformation to prevent postharvest losses experienced by farmers in general and members of IPs in particular is recommended. The use of flexible contracts, coupled with support from credit institutions, is also recommended.

Keywords: IAR4D; potato; market linkages; market development; collective marketing; value addition; processing

1. Introduction

The economy of countries in the Lake Kivu Pilot Learning Site (LKPLS) of Uganda, Rwanda and the Democratic Republic of Congo (DR Congo) is heavily dependent on agriculture, with over 60% of the region's population deriving their livelihoods directly from agriculture. As such, the sector's performance is critical for the growth and economic development of the region. However, the agricultural sector is affected by difficulties, which are related mainly to weak backward-forward market linkages and limited value addition. The consequence is that agriculture is being practised on small scales and mainly for subsistence. In the LKPLS, as in any other developing country, the agricultural sector remains mostly traditional, with work tools and techniques that are poorly adapted to the fragility and perishability of the product (Nkonya *et al*. 2008). This is aggravated by poor infrastructure and institutions that have a negative compounding effect on farmers' bargaining power, in addition to unsustainably low tradable volumes (Lapenu 2007).

Smallholder farming is characterised by various production and market risks that restrict the ability to expand and invest in technologies for increasing the efficiency of and adding value to primary production. The farmers also frequently have limited technical skills and poor access to information and training for improving the production processes. These constraints at the farm level result in individual small farmers having limited market surplus, which translates into inflated per-unit costs of assembly, handling and transportation. Small farmers also often lack basic knowledge of the marketing system,

current price information, market conditions and bargaining power. In periods of surplus there is no guarantee of markets, and commodities often perish for lack of value addition technologies (Lynam 2007).

In response, the sub-Saharan Africa Challenge Programme (SSACP) has tested the Integrated Agricultural Research for Development (IAR4D) approach in the Lake Kivu Pilot Learning Site (LKPLS) by engaging multiple stakeholders in finding research interventions that build and/or strengthen the value chain. Through three innovation platforms (IPs), namely Musanganya, Gataraga and Bubare, multiple stakeholders have validated the IAR4D concept by engaging in collective marketing, product transformation and building the capacity of members as key drivers to expand market access. This paper therefore is aimed at giving insight into the benefits that arise from an IAR4D approach for smallholder farmers in Uganda, the Democratic Republic of Congo (DRC) and Rwanda within the Lake Kivu Pilot Learning Site (LKPLS).

Objectives

This paper provides insight into how using the Integrated Agricultural Research for Development (IAR4D) approach solves the challenges faced by farmers in the LKPLS sites by engaging in collective marketing and adding value to products in order to increase the income of farmers participating in innovation platforms.

Specific objectives were to:

1. Examine benefits for smallholder farmers arising from collective marketing and product development of and value addition to selected agricultural commodities.
2. Provide evidence-based knowledge of market development in new market segments using value-adding technology to increase shelf life and profitability.

2. A Model for Assessing Returns from Collective Marketing, Value Addition and Processing

The main thrust of this paper was to evaluate the benefits arising from the application of the IAR4D interventions of collective marketing, value addition and processing in order to contribute to economically viable decisions among the value chain actors.

In carrying out their transactions, innovation platform (IP) actors make decisions regarding their potential customers, the product form, the product volumes, and the markets for their agricultural products, depending on the benefits they expect to derive from such transactions. This is equivalent to the maximisation of expected utility. While most smallholder producers are risk averse, participating in group marketing enables them to increase the benefits and spread marketing risks across participants. This could enable them to invest more in production. Both producers and traders prefer higher benefits, which can be expressed in the form of net profits derived from their transactions. The level of performance attained by the IP members can be represented by the magnitude of the profits and is a reflection of the extent to which IP actors have been able to achieve their objectives.

The net gains obtained by the producers and traders, however, are constrained by various factors, which include individual IP member socioeconomic characteristics and social capital, IP-specific factors, the location of the IPs, transaction costs facing the IP members, including production cost structure, as well as the nature of contracts to be used in the transactions. The agents also face certain input-related constraints when transforming their products in readiness for the market (or when purchasing raw materials, acquiring the raw products from the farmers, acquiring materials and equipment to effect transformation and value addition, as well as acquiring transportation

equipment). Given the above constraints, the objective function in the light of the constraints above can be expressed as (Van Dusen 2000; Wale Zegeye 2004):

$$(1) \qquad Max\ \mathrm{E}(\pi) = E[PQ(Z,C) - I'C]$$

Subject to production input quantities and costs, I and C, and the socioeconomic and social capital attributes, location, contract arrangements and transaction cost factors (such as distance to markets), $E(\pi)$ is the expected profit, given the constraints facing producers and traders in the market. P is the output price, and Q is the output expected to be transacted in the market.

We assume that $E(\pi)$ is fully known to the parties transacting themselves, and independent of the transactions entered into, and that it is a linear combination of the observed and unobserved characteristics determining it. Then $y^* = E(\pi)$ are the net gains arising from implementing collective marketing, undertaking value addition activities and introducing product processing.

3. Methods and Data

Two cases, from Rwanda and the Democratic Republic of Congo, were used to evaluate the IAR4D interventions. The data used in the two cases was collected through diagnostic market surveys of key products (banana and Irish potatoes) in key markets in the two countries. Additional data was collected from the production and processing activities on the value-added products through observations and measurements. The markets surveyed were Goma and Bukavu in the DRC, and the Kigali city markets in Rwanda (see Farrow *et al*., this issue, for details about markets). Comparative data on the attractiveness of the markets was collected for banana products and Irish potatoes in the two countries for a period spanning from 2009 to 2011. In all cases, the involvement of private-sector IP members was secured and the processing activities were supported by Makerere University's Food Science Department.

In Rwanda, the innovation platforms (IP) for potatoes[1] conducted a diagnostic consumer survey in Kigali city in order to understand the existing market situation, which was mostly disorganised. The survey identified consumer-desired product attributes that IP members were later to include in the products through value-addition activities. The value-addition activities included washing, sorting, grading, packaging and branding. Traditionally, farmers in Rwanda have been producing and selling Irish potatoes to middlemen directly from their farms. The target market was the Kigali buyers (hotels, restaurants and supermarkets) from which data was collected during the diagnostic surveys. Representatives of ten major outlets (supermarkets, hotels and restaurants) were interviewed.

In the DRC, data was collected from 69 banana suppliers from one of the innovation platforms (Musanganya IP) that was carrying out collective marketing of bananas. Diagnostic surveys were conducted to understand the major banana markets of Goma and Bukavu. The IP was interested in undertaking banana value-addition activities.

Table 1 presents the data on the collective sale of bananas by Musanganya IP members in the Bukavu and Goma markets. The data shows that the members of the Musanganya IP supplied 1 706 bunches of bananas, mostly destined for the Bukavu and Goma markets. The three main banana products were cooking bananas, beer bananas and plantains. The mean values are summarised values for the products, based on a sample of 69 banana suppliers over a period of nine months.

[1] In this paper, potato refers to the *Solanum* potato.

Higher returns were realised for banana types in Goma market than in Bukavu. The transportation costs of the banana bunches generally did not vary across the product types. However, prices changed depending on the type and quality of banana, and sometimes on consumer tastes and preferences for the bananas.

The data shows that, on average, 100 bunches were supplied per day. Calculations of the returns associated with the different banana types show that banana beer bunches had the highest returns, at 19%, relative to cooking (11%) and plantain bananas (13%), all in the Goma market. This can be attributed to the potential value of processing the bananas into other products, where cooking bananas appear to have limited possibilities. Bukavu market, which did not have much in the line of bananas other than cooking bananas, reported negative returns on sales. In general, the returns on the unprocessed bananas were quite low and this is what motivated the IPs to evaluate the possibility of adding value to their bananas before marketing them. This approach reinforces the importance of market research to inform farmers which markets to target with their products. Focus group discussions with farmers revealed that most of them previously believed that the Bukavu market was more profitable than the Goma market, but the results showed otherwise. Most of the time the farmers did not know the prevailing prices in other, distant markets. They may not have been factoring in the costs of accessing these distant markets accurately.

Table 1: Mean banana bunch profitability of Musanganya IP in the Bukavu and Goma markets

Type of banana	**Market**	**Number of suppliers**	**Number of bunches**	**Gross purchase value (US$)**	***Gross sale value (US$)***	**Expenses (US$)**	**Net margin (US$)**	**Share of net margins on sales (%)**
Beer	Goma	21	295	500.5	852.2	186	165.7	19
Cooking	Bukavu	25	86.8	409.2	400.1	58.1	-67.2	-17
Cooking	Goma	16	38.8	109.6	171.7	43.2	19	11
Plantain	Goma	7	51.3	146.8	229.3	53.5	29	13

Further data compared the unit selling prices and costs of the different banana types in the Goma and Bukavu markets, as shown in Table 2. The table highlights the advantages that can be available in different markets and with different products if these are selected well. The availability of the banana types varied in the two markets. Only cooking banana was available in both markets. Plantain was found only in the Bukavu market, while banana beer was available in only the Goma market. With large volumes obtained through collective marketing, the unit costs are likely to reduce and, consequently, the returns are likely to increase.

Table 2: Average selling prices, expenses and returns in the Bukavu and Goma markets of the DRC

Banana type	**Costs and returns for bananas in Bukavu market in USD**				**Costs and returns for bananas in Goma market in USD**			
	Selling price per bunch	Average expenses per bunch	Cost per kg	Average returns per kg	Selling price per bunch	Average expense per bunch	Cost per kg	Average returns per kg
Plantain	4.46	1.04	0.22	0.56				
Cooking banana	4.6	0.66	0.13	0.77	4.48	1.12	0.15	0.51
Beer banana					2.88	0.56	0.1	0.63

Note: Beer banana was sold in Goma only.

The data in Tables 1 and 2 provided the IP with adequate information to justify value addition activities for their bananas, with beer banana being selected for value addition through processing.

4. Results and Discussion

4.1 Banana processing in the DRC: The case of Musanganya IP

Following the market diagnostic surveys, banana processing was initiated by the IP to add value to beer banana. Three products were identified for production: banana juice (mutobe), light wine (kasiksi) and strong wine (butunda). The IP thereby built on the tradition of producing juice and wine from bananas in the banana-producing communities in the region. However, the products in the re region have been used mainly for local consumption, due to their short storability of no more than three days. The banana processing involved interventions that introduced better and hygienic handling of the process of pasteurisation in order to prolong the shelf life of the products. It also introduced bottling in order to distribute the products at a distance from the production area to consumers in nearby towns. This was done to increase commercialisation of the banana products. The first product that is generated in the processing is banana juice, followed by light wine (Kasiksi), and finally a stronger wine (Batunda).

For the first product, banana juice, ripe bananas are used to extract juice, which is then filtered, packed and pasteurised for longevity. Further processing of the banana juice can give rise to banana wine (Kasiksi and Butunda), which is done by adding sorghum to add flavour and waiting for fermentation to take place. After fermentation for three days, packaging or bottling is done in the same way as for banana juice. This gives rise to light wine (Kasiksi). Further processing of Kasiksi (by adding citric acid and preservatives and prolonging fermentation time) yields Butunda (strong wine).

Analyses of the profitability of processing beer banana into other products indicated that it was profitable (Table 3). Using 13 bunches of bananas, the IP was able to show that net benefits (profits) of USD 141 could be obtained, which indicated a marginal rate of return of 92%. This compares favourably with the highest return obtained for the sale of raw beer bananas of 19%. If the banana bunches were to be sold unprocessed, only USD 26 would be received by the farmers.

Table 3: Returns on processed banana juice and wine, Musanganya, DRC

Particulars	US$	Percentage of revenue/cost (US$)
Sale revenue	295	
Juice (Mutobe), 5 boxes @ US$10/box	50	17
Light wine (Kasiksi), 17 boxes @ US$10/box	170	58
Strong wine (Butunda), 5 boxes @ US$15/box	75	25
Variable cost of processing/marketing	153.25	
Raw banana material, 13 bunches	26	17
Processing supplies[a]	9.25	6
Packaging and labels[b]	53	35
Transportation	30	20
Labour	15	10
Other costs	20	0.13
Profit	141.75	
Marginal rate of return	92%	

[a] Processing supplies include stabilisers and sorghum
[b] Packaging material: boxes, capsules and labels

The results show that there is a clear advantage for the IP members from shifting from the sale of raw bananas to processing them into higher-value products. This has been one of the most important motivations to move from the collective marketing of raw bananas to value addition through processing in the banana IP (Musanganya) of the DRC under the IAR4D interventions. The processing of bananas was led by a private-sector member of the IP, with technical support from the research team (Makerere University). Through capacity building on the innovations in the production processes, the production unit has been able to run sustainably, with producers supplying the bananas required. Through support for publicity for the new products, a larger pool of consumers can be created to support the value-added products. The benefits generated, if shared with the producers equitably, should be able to sustain the innovations.

A similar approach was also applied in one of the IPs in Uganda (Kasenge 2009), where the concept of IAR4D was implemented in collaboration with a private firm (HUNTEX Industries Ltd) to process sorghum into a drink called MAMERA (Bushera) within the sorghum IP (Bubare). The processes of developing the product included packaging, labelling and branding, along with certification of the product to meet market standards. The combination of innovative processing methods, packaging and branding allowed the product to penetrate up-market outlets and therefore attract better prices and appeal to middle-class consumers in Kampala and other markets. These kinds of interventions have the potential to become a model of intervention in other value chains.

4.2 Achieving niche markets for value added and postharvest products in Rwanda

In Rwanda, there was a realisation that, for most farmers, potatoes did not reach the required maturity before they were harvested. The farmers did not sell beyond their farm gates and lacked adequate information and knowledge of the markets for their potatoes. Through the IAR4D process, farmers were able to get feedback from the market on what buyers prefer in relation to potatoes. They were also able to identify appropriate entry points into the market. All these were achieved through intensive capacity building efforts among the IP actors.

The results of the intervention show that farmer members of the potato IP were able to access niche potato markets in Kigali directly for the first time in 2009. This was despite the added transportation costs being paid by the trader to the key markets. The main buyers and quantities that were sold, which focused mostly on supermarkets, hotels and restaurants in Kigali city, are shown in Table 4. The IP began with only four niche buyers in 2009, but the number of buyers more than doubled in 2010 to 10. In 2011, there were more than 13 buyers serving the IP.

Table 4: New niche markets for potatoes and estimates of quantities and prices in 2009

Niche market	Estimate of quantity supplied (kg)	Prices (in RWF)	Average price in ordinary markets (RWF)	Net increase in prices
Nakumat Supermarket/Kigali	200-300	200	80	120
La Galette	400 (unwashed)	160	80	80
	600 (washed)	180	80	100
Ndoli Supermarket	170	170	80	90
Jehovah Witness	170-200	180	80	100
Average		178	80	98

USD1 = RFrw580

The increase in the number of buyers was also reflected in the volumes of potatoes supplied, which increased over time in the year 2010 from the initial 2.5 MT, to stabilise at about 21 MT (Figure 1).

Thus an increase of over 800% in the volume of potatoes delivered to the market was achieved in less than two years under the IP.

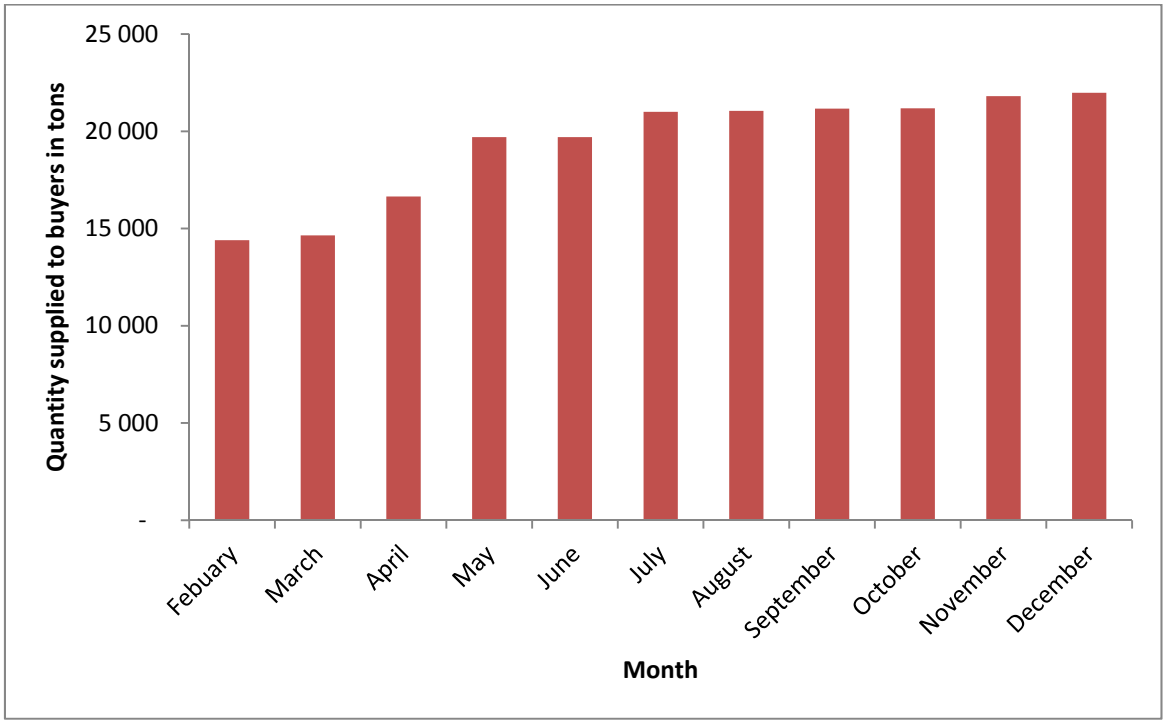

Figure 1: Monthly supply of potatoes to key buyers in Kigali during 2010

The IP was facilitated by a private trader who undertook to collect and supply the potatoes to the Kigali city market. The IP supplied both washed and unwashed potatoes, depending on the preferences of the buyers. Washed potatoes fetched about RWF 20 more than unwashed potatoes. The IP operated an innovative system of contracts between buyers and farmers. The contracts were designed to be flexible and were reviewed every three months. The contracts were designed to ensure that both the trader and the farmers benefited. The characteristics of the contract were: that each farmer delivers 150 kg per week on a group basis, where the farmer groups alternated or rotated on a weekly basis. The price set depended on whether the farmer delivered the potatoes to the washing station or the trader picked up the potatoes from the farmer. If the potatoes were delivered to the washing station, the farmer received RWF 30 above the prevailing market price, otherwise the farmer would get RWF 20 above the prevailing market price per kg. Thus the reference point of pricing was the prevailing market prices. To ensure that the quality of the potatoes was optimal, farmers were given access to credit by the buyer so that they did not harvest their potatoes before they were fully mature, or so that they did not sell the potatoes while they were still in the fields. The credit thus ensured that the quality of the potatoes was assured to meet the market requirements, and that the potatoes were harvested only when the market was ready to receive them or when it was the turn of the farmer to deliver the potatoes. The farmers repaid the credit on delivery of the potatoes. The credit was negotiated on behalf of the farmers by the buyer. On the other end of the trader and the markets, the contracts ensured that the trader earned at least RWF 50 per kg when transacting with the supermarkets and hotels. The IPs undertook a self-monitoring and control system that ensured that each of the parties to the transactions met their side of the contract. The incentives were also attractive and made business sense to the parties involved, as they were getting better prices and were assured of ready markets. The ability to review the contracts frequently (every three months) ensured that feelings of being tied to longer-term binding

contracts were minimal. In this way, an innovation contract system that was sustainable was created and used by the IP.

5. Conclusions and Recommendations

The results from market linkages in the DRC indicate that farmers have potential to benefit from better markets from among those available, as well as from engaging in some value-adding activities and processing of products. However, it will only be possible for well-organised farmers to achieve the required scale of production. Processing helps to prevent postharvest losses experienced by farmers in general, and members of IPs in particular. More investments in processing facilities will be required to upgrade and sustain the processing of the products. The promise of better profits and market availability will make this process attractive to farmers and other actors on the IPs.

The results from the IPs in Rwanda indicate that proper linkages to target markets increase the returns to the farmers, and will tend to eliminate inefficiencies in the value chains. Producers are able to engage directly with buyers in order to better respond to them. Transport costs are also reduced. To sustain the market linkages, production planning to supply products over longer periods is necessary among the producers. In addition, simple value adding activities such as packaging and branding are likely to have a positive effect on farmer incomes. Overall, the role of easy-to-understand and flexible contracts between the different IP actors goes a long way to ensuring that markets and product deliveries are respected and motivate the players to play their roles.

The combination of extended shelf life, packaging and branding allowed the products to penetrate into more profitable and distant markets, and therefore to attract better prices and appeal to middle-class consumers. This kind of intervention has become the driver for the banana value chain in the DRC as well as the sorghum value chain in Uganda, and could be replicated in other value chains.

However, some challenges still remain to be addressed: the retail system for banana products in the DRC is still weak and needs to be strengthened through training and sensitisation on the new products. However, new and distant markets will also be required to sustain the growth of the banana value-added chains. More technical support will be required for the upcoming processing units in order to enhance the quality of the processed products. In the Rwanda potato value chain, the sustainability of the interventions will rest largely on the ability and availability of credit institutions to sustain pre-harvest lending to the farmers so that they can postpone immediate sales of produce in preference for better prices and markets. Credit was also seen to play a major role in sustaining the delivery contracts among the farmers. The credit component of the IP should thus be strengthened by bringing on board friendly financial institutions.

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