

Coordination and Structure of Agri-Food Value Chains: Analysis of Banana Value Chain Strands in Tanzania

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Abstract

The strong coordination and structure of agri-food value chain increase smallholder farmers' access to resource endowments and markets for their produces which in turn improve production and marketing efficiency of the agri-food products. Following the mapping of banana value chain actors, the cross sectional information from Rombo District in Kilimanjaro region were quantitatively analyzed based on 209 responses consist of farmers, wholesalers, retailers, brokers and processors. The overall result showed that, the absence of contracts has led vertical coordination between actors of banana value chain to be weak; the loose coordination prevent the actors to enjoy the economic incentives of the value chain as a result farmers cannot deliver enough bananas to processors and traders. Lack of farmers' group associations which deal with bananas resulted to poor functioning of horizontal coordination of banana value chain in the study area. Prices and margins obtained by different actors along the chain varied significantly with the wholesalers captured higher mean price difference. The study recommends on strengthening and establishment of vertical and horizontal coordination among actors in order to have strong value chain structure for efficiency improvements.

Keywords: Agri-food, Coordination and Structure, Value Chain, Banana, Market margin, Tanzania

1. Introduction

Bananas in Tanzania are produced by more than 700,000 farm households, majority being in Kagera and Kilimanjaro regions. In these two regions, over 70% of rural households grow bananas and they are the main staple food (Byabachwezi *et al.*, 2006). Banana crop is mainly intercropped with coffee and is ranked first as a major staple food, and second or third as a cash crop in Kagera and Kilimanjaro regions (Nkuba *et al.*, 2003). Throughout Tanzania, banana farmers cultivate bananas in small farms ranging from 0.5-2 hectares (Byabachwezi *et al.*, 1999). They produce bananas for their home consumption and little surplus is traded at village markets although there is an increasing trade of bananas in urban markets. Despite the increasing trade in urban markets farmers are still fetching low price at their farm gate, by the side of the road or at the village periodic markets and as a result farm productivity is negatively affected.

Banana farmers in Tanzania obtain a little share of the last price paid by ultimate consumers as a result they cannot have enough money to purchase the required amount of inputs that would improve their production. A study by Nkuba *et al.* (2003) in Kagera region found that the farm gate prices of banana bunch fluctuate within and between seasons, ranging from about 10 to 20 times the wholesale prices. Ngambeki *et al.* (2008) in their study of assessing the distortion of market by presence of numerous intermediaries along the chain found that the middlemen had a market share of 35% while farmers had only 20% of the price paid by consumers. Inefficient coordination of value chains and its structure minimize level of banana production because of in-accessibility of market information and therefore farmers lack power to negotiate for better prices in order to capture reasonable share of banana price paid by consumers along the chain.

Most of the reviewed banana studies in Tanzania have little or no information on coordination and structure of banana value chains, studies like Kalyebera *et al.* (2007), Besel *et al.* (2008), and Malaisamy *et al.* (2008) have only covered issues of adoption of new varieties, productivity, marketing practices and marketing functions. However, these studies lack detailed information on the existing coordination and structure of banana value chain that can improve production and marketing efficiency of banana at farm level. This study therefore, sought of analysing the coordination and structure of the banana value chain in order to inform farmers on how they can get access to urban markets, by strengthening and establishing farmers' groups as well as having formal contractual arrangement with their customers.

2. Literature Review

2.1 Value Chain Concept and approach

The concept of value chain is defined in many ways by various researchers. Kaplinsky and Moris (2001) defined the value chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production, delivery to final customers, and final disposal after use. The Asian Development Bank (2006) viewed the concept of value chain as an organized system of interchanging the products in various forms from production to consumption. Therefore value chain concept in agriculture involves linkages of actors and their agri-food products towards adding value for their consumers. According to this view, the features of agri-food value chain include mapping, coordination, governance, upgrading, meeting consumer demand and becoming competitive.

The concept of the value chain originated from the *fili ère* approach which was developed by French scientist who studied vertical integration of agricultural commodities (FIAS, 2007). *Fili ère* means 'channels' and were used to export goods including cocoa, coffee, rubber and cotton from the colonies of France in Africa. The aim of most of these agricultural researchers was to increase efficiency by improving markets and reduce costs of transaction to all actors involved in agricultural activities.

A value chain approach offers a rationale and a practical approach for using value chain analysis as an empirical tool in identifying constraints to industry growth and competitiveness (FIAS, 2007). Banana producers always complain about getting low prices whereas other actors along the chain including assemblers, traders, processors, retailers, transporters, and storage facilities proprietors get most of the value paid by the consumer. The causes behind the low prices received by farmers along the value chain include the relatively small quantities traded by individual farmers, poor access to market information by farmers, the risk of banana spoilage that is passed on to buyers, the inability of farmer to intervene further up the value chain and high transport costs to urban market. The large price gaps between what farmers receive and what consumers pay indicate a sign of marketing inefficiency characterized by several middlemen who add little value on agri-food products.

2.2 Value Chain Studies in Tanzania

Several researchers in Tanzania have employed this approach of value chain to analyze different agricultural commodities. For example, Kabuje (2008) in his study on analysis of the value chain for hides and skins in Dodoma and Arusha regions of Tanzania used the value chain approach to examine how the chain is organized, coordinated and functioning including linkages between the key actors in the value chain. Also Mgaya (2008) in his study on value chain analysis of rice marketing in Kilosa district, Morogoro region used the value chain approach to examine the organizational structures and interaction of rice traders along the rice value chain in the district. Kaplinsky and Morris (2001) pointed out that there is no single way of conducting studies on value chain analysis rather it depends on what question the researcher want to answer. In agriculture the value chain analysis as applied by various researchers is remarkable.

Firstly, value chain analysis begins with mapping of all actors involving in the production of output, the supply, and marketing activities until the agri-food products reach the end consumers. Cosmas (2008) on assessment of the wholesale-consumer segment of the value chain for fresh fruits and vegetables in Dar es Salaam, used the value chain approach to characterize fresh fruit vegetables marketing and distribution practices within the wholesale-retail segment of the value chain in Dar es Salaam region. Kaplinsky and Morris (2001) argue that, mapping helps to assess the actors' characteristics, profit accrued and cost incurred movements of commodities along the chain, employment characteristics, the endpoint sales and the volumes of sales.

Second, value chain analysis identifies the price and profit shares of actors by analyzing the margins and profits within the chain. Through this analysis, the outcome helps to know who capture most of the values in the chain and which actors are disadvantages in the chain that would need a support from organization. For this study prices and margins were obtained in order to find who in the banana value chain is more efficient than the other so as to give information to farmers and decision makers in order to improve linkages between farmers and other actors.

Third, value chain analysis examines the upgrading process within the chain which includes improvements in quality and design of the product. Upgrading can also provide information on constraints associated with agri-food development. Kabuje (2008) used the value chain approach to identify the major constraints facing actors along the value chain for hides and skin in Tanzania.

As mentioned earlier that value chain approaches have not been applied on bananas and plantains studies in Tanzania, the studies have only concentrated on productivity, improved variety, pest and diseases and economic importance of the bananas. Some of these studies are, Kalyebera *et al.* (2007) covered on overview of the banana economy with aim of explaining the economic importance of the banana, types of banana grown, main uses of banana,

production and challenges facing banana in Tanzania, Besel *et al.* (2008) on title new bananas for poor producers in Tanzania covered the contribution of agricultural research to the millennium development goals, IITA (2006) covered on strategy for banana and plantain systems research in sub-Saharan Africa and FADECO (2005) covered on importance of bananas for the economy of rural producers in Kagera Region. Therefore this study seemed important to use value chain approach to analyze coordination and structure of value chain for banana in Rombo district so as to provide information to decision makers for improving linkages within and between actors and assisting farmers receiving relative larger share of the price paid by consumers.

2.3 Coordination along the Value Chain

Coordination implies a set of two or more actors (network) who perform tasks (collaborative value creation) in order to achieve goals. Coordination of the value chain is the act of making all stakeholders involved in the value chain in a well-organized way. Coordination means managing the dependencies between activities and is therefore a core aspect of inter-organizational value creation. The variety of inter-organizational business models leads to a broad variety of coordination tasks (Riemer *et al.*, 2004). Coordination is strengthened by some legal enforcement to ensure agreements are followed accordingly. A study by Mbiha (2008) on analysis of the dairy value chain in the Dar es Salaam milk shed found that almost all contracts reported by actors were verbal or written without lawyer assistance; this means that the linkage between actors is weak as no enforcement mechanisms between them. Kabuje (2008) in his study on analysis of the value chain for hides and skins in Dodoma and Arusha regions found that vertical coordination and linkage between actors was weak as only 35% of butcher owners in Dodoma had informal contract with wholesalers.

Contractual arrangements with firms can lead to improvement in production and marketing systems. The smallholder farmers are expected to enjoy more benefits from contract farming because they need inputs (cultivars and fertilizers) on credit (Tuan *et al.*, 2005). Furthermore, contract farming can play significant role to support quality upgrading of poor banana farmers. Apart from inputs and credit provision to farmers, firms may provide farmers with training, technical assistance and other services, as well as having a guaranteed market for their produce. Having guaranteed market is a very crucial deal to farmers because Nkuba (2007) found that during the high peak periods of banana supply, local markets were not able to absorb all bananas being sold by farmers; even the market outside the region did not absorb the banana surpluses either. This situation lowers bunch prices despite of large bunch sizes of new banana variety and reduces the adoption rate. Banana market system of selling per bunch and not by weight is disadvantageous to farmers because a uniform price is given for all bunches irrespective of the bunch size. Thus a contract is one way of ensuring the flow of output to urban markets where demand is high.

With effective linkages, coordination can range from informal contracts between producers themselves by organizing purchases and sales of output or from formal contracts facilitating the joint actions through farmers associations like cooperative. Farmers association or groups represent horizontal coordination where managers make most of decisions on behalf of farmers (Lyne and Martin, 2008). The main advantages to banana value chain stakeholders from being part of an effective linkage is the possibility of reducing costs of operations and therefore increase their revenues, also help farmers to increase their bargaining power in input and output prices. Therefore, horizontal coordination would be more helpful to farmers if they could join their effort through associations and/or cooperatives because the informal and poorly organized supply networks is a big challenge/constraint to them. Through joint action, banana producers can create efficiency and reducing number of middlemen by grading, bulking and transporting banana bunches themselves to urban market. Studies in Tanzania on value chain like that of Mbiha (2008) on analysis of the dairy value chain in the Dar es Salaam milk shed found that overall dairy value chain was weakly organized and coordinated as there was generally low knowledge of milk organizations/groups by value chain actors. Also Kabuje (2008) in the study of analysis of the value chain for hides and skins in Dodoma and Arusha regions found that horizontal coordination was generally weak as regional associations of butcher owners were found to be inactive with no influence on market prices of hides and skins although they were well informed about hides and skins prices in Dare s salaam as well as prices in foreign markets.

3. Methodology

In this study marketing margin was used as an indicator of efficiency of marketing the bananas along the banana value chain. Reardon and Timmer (2005), defines marketing margin in absolute and relative terms. In absolute terms marketing margin is defined as the difference between the prices paid by consumers and prices received by farmers. Tomek and Robinson (1981) defines marketing margin as the price difference between two market levels. They said marketing margin can be affected by number of factors such as distance to be covered, adequacy of transport,

effectiveness with which various separate activities are carried out and services are provided. Marketing margins expressed in percentage terms are dependent on the relative levels of prices. It is a common means of measuring market efficiency through evaluating price efficiency. High marketing margin may imply high marketing costs and/or profits, if one or two or both are extremely high or low, it indicates that the market is not efficient in coordinating the allocation of resources (Mdoe and Mnenwa, 2004). For an efficient market, marketing costs and profit ought not to be too low or too high, and so do marketing margins. According to Mendoza (1995), high marketing margin could sometimes refer little or no profit or loss for the particular actor in the chain because it depends on cost associated with marketing together with the buying and selling prices. Marketing margin determines the portion of final selling price that is taken by individual actor in the chain.

The study therefore used gross marketing margin to measure marketing efficiency of the banana produce at each node. The marketing margin was calculated by finding the price differences at different levels in the chain and then related them with the final price paid by the consumer using the following formula:

$$Tm = \frac{Cp - Pp}{Cp} X(100) \dots\dots\dots(1)$$

$$Gm_i = \frac{Sp_i - Sp_{i-1}}{Cp} X(100) \dots\dots\dots(2)$$

Where Tm = Total gross marketing margin in (%)

Cp = Consumer price in USD

Pp = Producer price in USD

Gm_i = Gross marketing margin of i^{th} actor at a given point in the value chain in (%)

Sp_i = Selling price by i^{th} actor at a given point in the value chain in USD

Sp_{i-1} = Selling price by a preceding actor ($i-1$) or is the buying price paid by i^{th} actor at a preceding point in the value chain in USD.

4. Results and Discussion

4.1 Structure of the Banana Value Chain

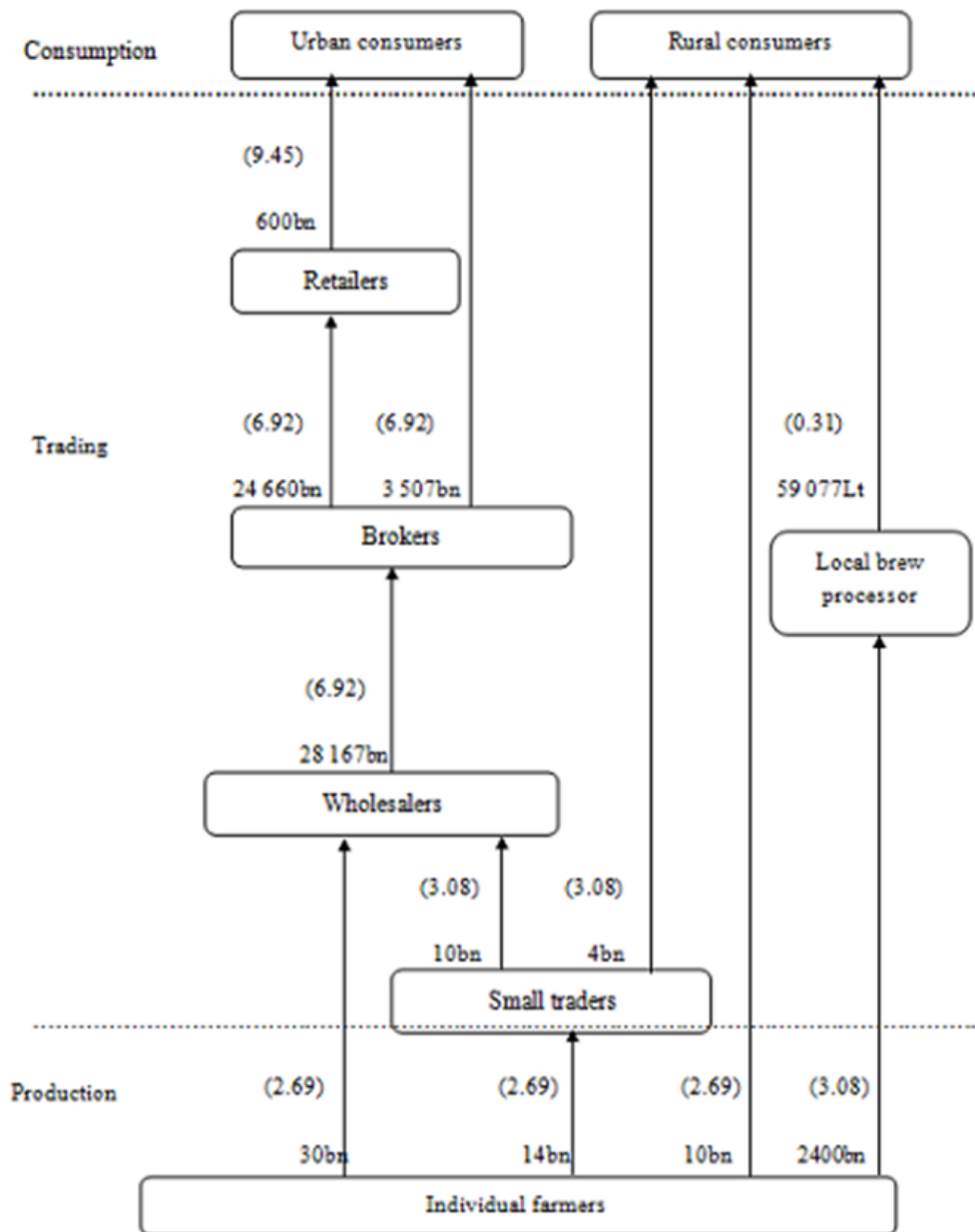
The banana value chain in the study area is diagrammatically presented in Figure 1. The chain consists of seven main value chain strands. The first strand was that of farmers selling cooking banana directly to consumers. The strand was found to be the shortest of all the banana value chain strands identified during the survey. In this strand, farmers sell cooking bananas to household consumers and restaurants at the village markets. The quantity of bananas sold through this strand per household averaged 10 bunches per year at an average price of USD 2.69 per bunch. The second strand was that of farmers selling cooking bananas to small traders and eventually small traders selling them to final consumers. In this strand farmers sell about 14 bunches of banana per year at an average price of USD 2.69 per bunch. The price received by farmers selling through this channel is similar to price received by farmers selling directly to consumers because they all meet in one market place. The small traders sell to the final consumers and restaurants in the village markets at an average price of USD 3.08 per bunch. The average quantity sold per small trader in 2009/10 season was 4 bunches per week.

Third strand was that of farmers selling cooking bananas to wholesalers and wholesalers sell to consumers through brokers. In this channel, farmers sell their bananas to wholesalers who transport the bananas to Dar es Salaam and distribute them to various brokers at Mahakama ya ndizi market and who finally facilitate the wholesalers in selling bananas to consumers at an average price of USD 6.92 per bunch. Brokers' fee is 10% of the selling price. The fourth channel is not different from the third channel except that, instead of brokers facilitate in selling directly to consumers they sell to retailers at an average price of USD 6.92 and retailers sell to urban consumers inform of single banana at an average price of USD 0.15 which in turn gives an average price of USD 9.45 per bunch.

The fifth strand is that of farmers selling their cooking bananas to small traders at an average price of USD 2.69 per bunch. These small traders sell to wholesalers at an average price of USD 3.08 per bunch who transport the bananas to Dar es Salaam and hand them to various brokers (at Mahakama ya ndizi market) at an average price of USD 6.92 per bunch and sell to consumers via brokers (Fig. 1). The sixth strand found in the study area was the

longest one where by farmers sell their cooking bananas to small traders who also sell to wholesalers and wholesalers transport them to Dar es Salaam. The wholesalers hand them to various brokers (Mahakama ya ndizi markets) who sell to retailers and finally retailers sell to consumers at an average price of USD 9.45 per bunch. The prices along this strand are similar to those of fifth strand.

The last main strand was that of farmers selling ripe bananas to local brew processors who add value by brewing local brew popularly known as ‘*mbege*’ and sell it to rural consumers. The average selling price by farmers was USD 3.08 per bunch and the processors sell ‘*mbege*’ at an average price of USD 0.31 per litre (Fig. 1). One bunch of banana was estimated to produce 20 litres of *mbege*.



NOTE: Values in brackets are selling prices (USD), bn = Average bunches sold, Lt = litres of brew ‘*mbege*’

Figure 1: Structure of banana value chain in the study area.

4.2 Comparison of Shares of the Consumer Prices Received by Producers in the Alternative Banana Value Chain Strands

Table 1 shows that, strand three and five, and strand four and six are the same in terms of consumer’s price shares received by farmers which are 39% and 28% respectively. The similarity is due to zero price differences received by

producers because both consumers and small traders meet with producers at the same market place. Also it can be revealed from the table that, the longer the strand the lower the consumers price share received by farmers. Malaisamy *et al.* (2008) on their study of supply chain management of banana in Tamil Nadu, India found the same that low producers share in consumer price happened when the number of middlemen in the channel increased, and it was caused by higher total marketing cost. ANOVA test was used to test whether there is significant difference in consumers' price shares received by farmers along the banana value chain strands. The result showed that the difference was not statistically significant at 5% level (Table 1).

Table 1: Comparisons of farmers share along the banana value chain strands

Strands	Producer Share	Significance level
Strand one	100	0.172 ^{NS}
Strand two	87	
Strand three and five	39	
Strand four and six	28	

NS= Not Significant at 5% level.

4.3 Comparison of selling prices along the banana value chain

Analysis of variance (ANOVA) was employed to test whether the selling price variation between value chain actors were statistically significant. The test statistics revealed that there was significant difference in mean selling prices between actors at $p < 0.01$ with the retailers selling at the highest price. Furthermore the Post Hoc test of pair-wise group comparison revealed that the farmers' mean selling price differs significantly with wholesalers' and retailers' mean prices at $p < 0.01$ (Table 2).

Table 2: ANOVA Post Hoc test of pair-wise price comparisons between value chain actors

Actor	Mean price difference (USD)	Significance
Farmers' price Vs Wholesalers' price	4.23*	.000
Farmers' price Vs Retailers' price	6.76*	.000
Wholesalers' price Vs Retail price	2.53	.113

F- Value = 29.4, * = the mean difference in selling price is significant at 0.01 level.

4.4 Vertical coordination

Most (85.4%) of the transactions between farmers and their buyers were spot. Only 14.6% of the sample banana farmers' had informal contractual agreements with banana buyers based on mutual trust. These findings suggest weak vertical coordination in the banana value chain. About 6.2% of the sampled farmers with informal agreements with banana buyers had mutual agreement on prices while the remaining 8.3% agreed mutually on quantities of bananas to be supplied.

For traders, the study observed that most (69.2%, 51.9% and 44.4%) of the transaction between sampled wholesalers, retailers and brokers respectively had contractual agreements with their customers which are in the form of informal agreement. About 46.2% and 23.1% of sampled wholesalers agreed with farmers on prices and quantities respectively. About 18.5%, 11.1% and 22.2% of the sampled retailers agreed with brokers (on behalf of wholesalers) on prices, quantities and buying on credit respectively. About 22.2% of the sampled brokers agreed with retailers on prices and quantities.

4.5 Horizontal coordination

Fifty two percent of the sampled farmers reported to be members of associations. About 18.8% of those who are members belong to coffee cooperatives and community based associations (*kiarano*). None of them reported to be members of an organization that specific dealt with banana production or market. The benefits of cooperative membership as mentioned by sampled farmers were easiness to market coffee and payment of extra income (*nyongeza ya bei*) following better prices obtained by cooperatives from export of coffee. The community based organization (*kiarano*) is mainly for saving (*upatu*) and to help each other in social problems like school fees and solving personal

conflicts between members. Those farmers who had no membership at all said the major reasons for not being members were no idea and no knowledge on dynamics of associations as indicated by 25% and 10% of the respondents respectively. The membership in an organization improves farmers' negotiation power. Ssango *et al.* (2008) in their study found that farmers through their managerial members were able to enhance their and negotiation skills that led them to receive better prices.

Unlike banana producers who did not belong to specific organization dealing with bananas, about 30.8%, 33.3%, 66.7% and 7.7% of the sampled wholesalers, retailers, brokers and processors respectively belonged to banana associations. However, the low percentage of the sampled traders and processors who were members of associations, suggest weak horizontal coordination at various nodes along the banana value chain. Besides membership in associations dealing with bananas, 15.4% of wholesalers, 14.8% of retailers and 44.4% of brokers belonged to microfinance associations mainly for credit acquisition while 7.7%, 7.4% and 22.2% belonged to community based associations mainly for social unity to solve social problems. The sampled traders without membership in association indicated fear to take loans and lack of knowledge on dynamics of associations to be their major reasons for not being members.

5. Conclusion

The strong coordination and the structure of value chain ensure visibility of agri-food products movement from production to consumption stage. Help to align symbiotic activities of the actors towards achieving production and marketing efficiency through logistic management, incentive sharing and access to market information. The structure of banana value chain found in the study area showed that between the two banana products, cooking bananas have been traded in large quantities, traded along six out of the seven value chain strands while local brew bananas have been traded in small quantities along only one out of the seven value chain strands. Processing is much limited as only one type of processed product (local brew) is found in the study area. Vertical and horizontal coordination of the key actors along the banana value chain are generally weak as a result it is difficult for the key players to advance in production and marketing efficiency. The prices and margins obtained by the different actors in the chain varied significantly with the wholesalers and processors obtaining significantly higher price differences. It can therefore be concluded that processing and wholesaling is an effective way of generating profits as prices at these two stages are relative higher because value addition activities like grading, bulking and brewing are performed.

The findings emphasize the need to improve horizontal coordination that can be achieved through establishing and strengthening farmer's group associations. This requires creation of awareness among farmers on the benefits of such associations. Farmers' groups will not only increase their bargaining power but also reduce transaction costs in marketing banana as well as achieve economies of scale through bulking of bananas. Also for improving vertical coordination farmers need to be directly linked to urban markets with other actors so as to enhance power sharing among them and meet the contractual agreements.

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