



Research Article



Effect of agricultural products price fluctuations on smallholder farmer's welfare in Rwanda. A case study of Gicumbi, Nyagatare, Nyaruguru, Rubavu Districts.

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ABSTRACT

Agriculture sector is the main motel of life in the world. The price of agricultural products plays an important role in regulating production and consumption mechanism. Mainly farmers have been affected by different problems in supply of the products particularly price fluctuation. This paper aims to assess the effect of agricultural products price fluctuations on smallholder farmer's welfare. A case study of Gicumbi, Nyagatare, Rubavu, and Nyaruguru districts. A cross sectional research design was used in the study where both purposive and simple random sampling techniques were used to select a sample size of 120 respondents. A regression analysis technique was used to identify the factors influencing price fluctuation through SPSS and STATA software. The results from the regression analysis indicated that various factors influencing price fluctuation of agricultural production including type of market, seasonal production, climate condition change, middlemen, farm inputs price, nature of product, price of petroleum, and political stability. The results of the study also indicated the effect of good price on farmers 'lifestyle change through the increased farmer' income, improved farmers livelihood, reduced the youth migration, increased their money savings, and the effective utilization of farm inputs. The study also revealed different measures for price fluctuation control; these include provision of subsidies to farmers, government price control, improvement of infrastructures, control of middlemen in agriculture sector, market stability, improvement of farming system, and creation of buffer stock zones in agro-ecological regions. As the rural and urban life mainly dependent on farmers 'produce the stability of price of agricultural products should be control along the whole value chain in all possible area particularly at farm get and market level both regional and district.

Keywords: Price fluctuation, Agricultural products, smallholder farmers, Welfare

INTRODUCTION

Agriculture plays a fundamentally important role in the economic growth and development prospects of a vast majority of developing countries including Rwanda. Agriculture sector is a major and is a main source of livelihood, providing direct employment. The sector occupies 79.5 percent of the labour force, contributes one-third of GDP and generates more than 45.0 percent of the country's export revenues. Agriculture is also important for national food self-sufficiency, accounting for well over 90.0 percent of all food consumed in the country (GoR, 2011). The majority of agriculture is undertaken by smallholder farmers and price volatility

affects their livelihoods and access to market goods and services (Mitchell, D, 2010).

The most important problem in sub-Saharan agriculture is the well-being of farmers, where farmers 'most important protection comes from food production. Most African's agricultural prices have shown a trend of frequent fluctuations, which has had a very negative effect on farmers' agricultural production and agricultural economy. The issue of food losses is of high importance in the efforts to combat hunger, raise income and improve food security in the world's poorest countries. Food losses have an impact on food security for poor people, on food quality and safety, on economic

development and on the environment (FAO, 2011). The exact causes of food losses vary throughout the world and are very much dependent on the specific conditions and local situation in a given country.

African countries became more dependent on commodity production and exports than in the past. Supported also by very low global interest rates, large investments took place in the exploration and production of commodities as well as in supporting industries such as energy generation, construction and transportation (World Bank, 2015). Commodity price declines affect all sectors of the economy (corporate, household, government and banking) through very many channels. Falling commodity prices have also reduced capital inflows for investment and increased the risk premium on external sovereign borrowing. To the extent that reduced investment inflows were associated with a decline in imports, there was no change in the overall balance of payments. Surges in food prices and increases in the prices of inputs such as fertilizers reduce the incomes of poor and vulnerable households and put stress on family budgets (FAO, 2008).

African Countries including Rwanda with deficit in production of agricultural commodities have been identified to face serious economic challenges because the cost of imports of agricultural commodities is very high and may lead to deficit in balance of payments (FAO *et al.*, 2011). Frequent fluctuations in agricultural products prices are not conducive to farmers forming stable food price expectations; thus, farmers cannot use food prices to make a reasonable agricultural production plan for the next year. In addition, a rise in food prices causes other commodity prices to rise, which leads to inflation and is not conducive to Rwanda's economic stability (Happiness Huka *et al.*, 2014).

Price fluctuation is not only harmful to consumers but also affects producers. A study by Oxfam and IDS13 suggests that farmers in developing countries are producing fewer surpluses because of increased input prices. 'High input costs have squeezed people's purchasing power, which means that profits from growing and selling food remain low for those with least scope to diversify and spread risk (Baffes, 2011). A business that is planned to attain growth and maximize revenue will not charge minimum price for its products or services. Price fluctuation is a multifaceted problem attributed to various factors which, when combined, culminate in dangerous consequences for the most vulnerable (Happiness Huka *et al.*, 2014). The pricing of agricultural products is an important part of Rwanda's macro-control policies for economic development, and the implementation of such policies has a very important role in the supply and demand of agricultural products in Rwanda. Food pricing also has a crucial impact on Rwanda's economic development and the welfare of farmers. Frequent fluctuations in food prices will make it difficult for the government to implement effective macro-control measures for the agricultural products market.

High international prices for food commodities benefit countries that export those products, while low prices benefit importing countries. Agricultural research and cost-effective irrigation are urgently needed in order to reduce the production risk facing farmers, especially smallholders. These types of investments will reduce price volatility and will lower production costs per tonne, which will reduce food prices (Descargues.S,2011). Commodity prices are volatile and extremely difficult to predict. It is also difficult to transfer their price risk to global financial markets. Moreover, experience from all continents shows that governments have had difficulties in putting in place a macroeconomic framework that safeguards the stability of economic growth during commodity price swings (I M F, 2015c).

Thus, the fluctuation of the price of agricultural products is closely related to Rwanda's agricultural production and food security. High input costs have forced people's purchasing power, which means that profits from growing and selling food remain low for those with least scope to diversify and spread risk.

In order to be effective at reducing the negative consequences of price volatility, targeted safety-net mechanisms must be designed in advance and in consultation with the most vulnerable people. The principal instruments that could be used to manage the price volatility of food imports are futures and options contracts (Dorosh. P, 2009). Over the longer term, however, the reduced risk faced by farmers can encourage them to invest in more-profitable technologies that raise their productivity and income.

Governments must reduce food waste in developed countries through education and policies, and reduce food losses in developing countries by boosting investment in the entire value chain, especially post-harvest processing. More sustainable management of our natural resources, forests and fisheries are critical for the food security of many of the poorest members of society. To be optimistic that global food security will be achieved. To make a progress and better control of the future will make us to be committed to favorable policies, market information transparency, sound analysis, good science and adequate funding for appropriate interventions (FAO, 2011). Due to the observed effect of price fluctuation of agricultural products on smallholder farmers income, this paper aims to identify the factors influencing price fluctuation of agricultural products, to assess the effect of stable price on smallholder farmers welfare, and to determine the measures to control price fluctuation.

MATERIALS AND METHODS

A cross sectional research design was used in the study where two sectors were selected for from each of four chosen namely Gicumbi of Northern Province, Nyagatare of Eastern Province, Rubavu of Western Province, and Nyaruguru of South Province as the study area. Both purposive and simple random sampling techniques were used to select a sample size of 120

respondents including farmers from selected sectors. Multiple approaches including questionnaire, interviews were used to gather both primary and secondary data, which enabled the researcher to do cross-data validity checks. Cobb-Douglas model, and regression techniques were used to identify the factors influencing price fluctuation of agricultural production while quantitative techniques involved utilization of descriptive statistics were used to assess the effect of price fluctuation on agricultural production, and measures to address price fluctuation. Descriptive analysis was done using SPSS and regression using STATA software version 13.

Table 1. Study area and sample size

District	Sector/market	Sample size
GICUMBI	RUBAYA	15
	BYUMBA	15
NYAGATARE	RWIMIYAGA	15
	MIMULI	15
RUBAVU	GISENYI	15
	NYAKIRIBA	15
NYARUGURU	CYAHINDA	15
	KIBEHO	15
Total		120

RESULTS AND DISCUSSION

Socio-Economic Characteristics of respondents

The results from 120 respondents sampled in study area. Among the interviewed farmers, 72 (60%) were male and 48(40%) were female. This indicated that male in study area heads more households than female and it indicated that male prefer growing crops that are commercial than those used in family feeding. For this reason, male, receive more information about market price than female. The results also revealed that in study area the majority of respondents are presented by 45(37.5%) with age ranged between 41-50 years followed by the range of 31-40 years with 36(30%). This means that majority of the respondents were within the working age class. The third class is in the range of 51 years and above with 24(20%). The last class is that of 30 years and less with 15(12.5%). This is because this class is composed of respondents who do not own land for agriculture and sometimes this class do not prefer agriculture sector due to their and they prefer to migrate to cities like Kigali where they can find other occupations. Based on results the majority in study area indicated that 56(46.7%) of respondents had primary school education followed by secondary with 33 (27.5%). The university represent 12(10%) while illiterate represent 19(15.8%). The majority of formal educated respondents implies that respondents will be more receptive to farm innovations as well as market information and price situation.

Factors Influencing Agricultural Products Price Fluctuations

The results of the model shows that the data fitted well (R-square = 0.742 and p-value < 0.0001). The results are presented in Table (3). As indicated in table above three

variables (type of market, seasonal production, climate condition change) were statistically significant influenced price fluctuation at $P < 0.001\%$ level. Four explanatory variables (Price of petroleum, middlemen, and market instability, and climate condition change) negatively influenced price fluctuation in study area. While only farming system was not influenced the by price fluctuation.

Table 2. Socio-Economic Characteristics of Sampled respondents

	Frequency	Percentage
Gender		
Male	72	60
Female	48	40
Total	120	100
Age		
≤ 30	15	12.5
31-40	36	30
41-50	45	37.5
≥ 51	24	20
Total	120	100
Education level		
Illiterate	19	15.8
Primary	56	46.7
Secondary school	33	27.5
University	12	10
Total	120	100

For example, change of climatic condition should contribute much on determining the level of harvest to farmers. This is because agricultural supply is mostly based on rain and highly dependent on the weather, therefore for the farmers the annual weather differences is more important than eventual climate change. The study of Gilbert & Morgan (2010) argued that the impact of climate factors on major grain-producing areas could lead to unpredictable food production. In addition, it was found that farm inputs price should cause price fluctuation to farmers, this is because on the product affect the price charges from the agricultural products to be low or high accordingly. This indicated that the importation and exportation of agricultural product also it affects the price sustainability of domestic price of agricultural product. Price of petroleum also affect the agricultural products price fluctuation. This was supported by the study of Sage, A. (2010) indicated that the increase in fuel prices would mean the cost of transporting the produce would also increase. This imply that the prices of food in the local market would rise in order to cut losses that the investors and producers incurred in production and transport. On the other hand, oil prices do not have a direct effect on food prices lately, since more countries are now switching to alternative sources of energy (Davidson *et al.*, 2011).

The Seasonal productions is also another factor, most agricultural products are seasonally produced which cause an equal balance of the availability of it and for this reason price tend to be low during long time and to

be high during short time hence to make rise and fall of price in different periods. This also is explained the basic assumption of the cobweb theory is that the current production of the commodity is determined by the price in the previous period. If prices fall, many farmers will go out of business, the next year supply will fall. This causes price to increase. However, this higher price acts as incentive for greater supply. Therefore, next year supply increases and prices plummet again (Sage, 2010). A variation in rice price will give a corresponding change on production, which corresponds with the findings of (Adeniyi, 2009). The result corresponds with the Cobweb theory, which says lower price acts as incentive for lower supply in the next year and higher prices acts as incentive for greater supplies in the following year (Sage, 2010).

Type of market is one among the causes of price fluctuations; there is high difference in level of price stability between monopoly and competitive market within or outside country that make the ever changing of prices for agricultural products from time to time around the year especially when farmer is price taker. If the buyer is the price make there is a higher change of price that can even cause farmer to leave the sector and migration of youth. Price of petroleum fluctuation causes the price of agricultural products to fluctuate; it was argued that the unstable fuel prices cause everything else including farm products to fluctuate more often due to high cost of transporting the farm product from the farm area to the markets.

Nature of products was also indicated to be another cause of price fluctuations; it was established that most agricultural products tend to be perishable in nature as to why it influences the rise or fall of price over time. The perishability nature of some agricultural product especially horticultural crops makes it difficult to store during plenty time hence farmers have to sell them even when the price is still low.

Market instability was also indicated to be another cause of price fluctuations, it was established that most agricultural products tend to be perishable in nature as to why it influences the rise or fall of price over time, when there is a market instability some barriers are created and makes it difficult to get market outside. However, this is directly a cause of price fluctuation. In addition, contingent political instability of the African region has led to mass destruction of agricultural farms and products. As a result, local farmers experience great losses in the production that discourages them from engaging in commercial farming (Eicher, C., and Staatz, 2003). Arezki, R., Brückner, M. (2011) have offered a different view as to how political situation and food prices relate. They explained that higher food prices drive most people of low-income countries to riot and demonstrate against the government, thus, increasing the fragility of the state.

Middlemen variable was also found to be the cause of price fluctuation. This is because they block the value chain of agricultural product and they set the price as

they want. This affect production of agricultural products in terms of high cost of production and create a long period between harvesting and selling. When value chain is controlled by, intermediaries price tends be very low for farmers who is selling and very higher to consumer compared to the value chain that was not blocked by these intermediates.

Table 3. Factors Influencing Agricultural Products Price Fluctuations

Variables	Coef.	Std. Err.	T	P>t
Farm inputs price	0.033	0.694	0.047	0.089
Type of market	0.028	0.073	0.383	0.000
Seasonal production	0.549	0.517	1.061	0.001
Farming system	0.071	0.477	0.148	0.043
Nature of product	0.023	0.107	0.214	0.052
Climate condition change	-0.414	0.691	0.599	0.000
Price of petroleum	-0.097	0.318	0.305	0.034
Middlemen	-0.068	0.025	2.720	0.000
Market instability	-0.476	0.675	0.705	0.021
Intercept	0.092	0.269	0.342	0.009
Number of obs =120	F(9, 110) = 49.71			
Prob > F = 0.0000	R-squared = 0.742			

Effect of Stable Price on Farmer welfare

The results of the study pointed out that the good price of agricultural product contributed much more to the welfare of farmers. Based on the results in figure above (96.7%) of respondents asked said that satisfactory price increased farmer' income. In this case the per capital incomes of farmer increased in the extent that they can easily afford the basic needs like health insurance, school fess, new house construction or rehabilitation, electricity, food, clothes, and so on. It was indicated that (88.3%) of respondents asked said that good price improved farmers livelihood. They argued that when the price is fair to small scale famers it facilitates them to better change the lifestyle. It was revealed that good price reduced the youth migration where (77.5%) of youth and gender enter the agriculture sector rather than to live the place of birth. For example, youth grow vegetables, fruits and flowers for national and international markets. This is because; youth are more adopters of innovation than older people are as well. Since horticulture crops like fresh beans, broccoli, and amaranths, normally grow very quickly and should be produced more than three times per year it helps youth to meet quickly their basic needs and motivate them to reduce migration. The study indicated that (72.5%) of respondents, asked, said that good price increased their savings and they agreed that good price for agricultural product help farmers and other environment people in their good livelihood. Effective utilization of farm inputs is another contribution of good price to farmers where by (64.2%) the famers use effectively farm inputs and get sufficient production and productivity, which in return facilitate farmers to get more profit for the sector. It was found that the majority of respondent (100%) said that the first major solution to address the problem of

agricultural product price fluctuations is crop insurance followed by agricultural price control (94.3%) through price makers by considering the whole value chain especially from the price of inputs. Provision of subsidies should be one of the best ways in stabilizing prices and gaining control over the market and the economy of the country at larger. The second solution is control of middlemen in agriculture sector, this is because middlemen in value chain they directly became the price makers and price change accordingly. (80.9%) respondents identified intermediaries. The fourth solution is the control of market instability in all agro ecological zones and at all regional and district markets which is represented by (77.7%). The fifth major solution with (62.8%) to address this problem is the improvement and increase of infrastructures as well to overcome the problem of loses both in storage and in transport. The fourth solution to address price fluctuation is the improvement of farming system with (58.5%).

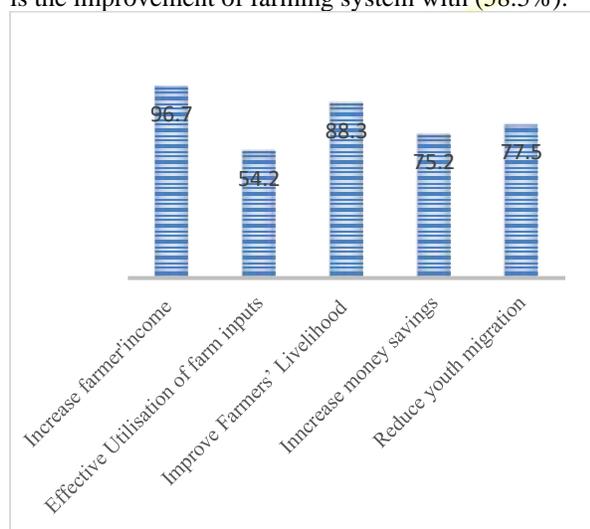


Figure 1. Effect of stable Price on Farmer welfare

This is because if farmers continue to practice subsistence agriculture the policy makers will not be able to control price fluctuation due imbalance between supply and demand. Only decision-makers should intervene in stabilization of price through the establishment of price ceiling and price floor. This is explained by the cobweb theory suggests that prices can become stuck in a cycle of ever-increasing volatility. For example, if prices fall, many farmers will go out of business, the next year supply will fall. This causes price to increase. However, this higher price acts as incentive for greater supply. Therefore, next year supply increases and prices plummet again (Pashigian, 2008). Stabilization of prices of essential agricultural commodities continues to be an area of major concern for policy makers. The last solution given is the creation of buffer stock zones in agro ecological region. It was presented by (44.1%). Having proper buffer stock zones farmers will be able to preserve their surplus and hence balance price through season.

Measures to control agricultural products price fluctuations

It was found that the majority of respondent (100%) said that the first major solution to address the problem of agricultural product price fluctuations is crop insurance and agricultural price control through makers by considering the whole value chain especially from the price of inputs. Provision of subsidies should be one of the best ways in stabilizing prices and gaining control over the market and the economy of the country at larger. The second solution is control of middlemen in agriculture sector, this is because middlemen in value chain they directly became the price makers and price change accordingly. (80.9%) respondents identified intermediaries. The fourth solution is the control of market instability in all agro ecological zones and at all regional and district markets which is represented by (77.7%). The fifth major solution with (62.8%) to address this problem is the improvement and increase of infrastructures as well to overcome the problem of loses both in storage and in transport. The fourth solution to address price fluctuation is the improvement of farming system with (58.5%). This is because if farmers continue to practice the agriculture in subsistence agriculture the policy makers should not be able to control price fluctuation either production should be supplied at the same time or should be absent at the same time that cause price fluctuation. Smallholder farmers undertake the majority of agriculture and price volatility affects their livelihoods and access to market goods and services. Seasonal changes in management practices also affect the productivity of the farming households and can have adverse effect on their welfare. Changes in both market prices and productivity have a potential effect on both food security and nutrition in a country where about 51% of the calories are obtained from the products bought from the market (Benson *et al*, 2008).

Only decision-makers should intervene in stabilization of price through the establishment of price ceiling and price floor. Therefore, it is necessary to encourage population's participation in the agricultural production through the reduction of taxes on locally produced products, which will allow price lowering and demand increase (Mitchell, 2010). Government of both importing and exporting can, can within given limits, use trade policies to protect their domestic market. However, using use trade policies to stabilize domestic market could mean aggravating volatility on international market (Tangermann, 2011). In an attempt to stabilize prices volatility, Government agency may buy grain when prices are low and prices when are high. Stocks can have a more direct and immediate impact in reducing excessive volatility to occur in agricultural commodity market.

This is explained by the cobweb theory suggests that prices can become stuck in a cycle of ever-increasing volatility. For example, if prices fall, many farmers will go out of business, the next year supply will fall. This

causes price to increase. However, this higher price acts as incentive for greater supply. Therefore, next year supply increases and prices plummet again (Pashigian, 2008). Stabilization of prices of essential agricultural commodities continues to be an area of major concern for policy makers.

The last solution given is the creation of buffer stock zones in agro ecological region. It was presented by (44.1%). Having proper buffer stock zones farmers will be able to preserve their surplus and hence balance price through season. Better marketing infrastructures not only reduce transport costs but also minimizes short-term food price volatility and facilitates market transmission. Improving rural market roads and market facilities such as warehouses is also important in linking smallholders to market; thus increase market supply and contribute to more stable prices (FAO et al., 2011). Increasing public investment in port and transport infrastructures has the potential to reduce price volatility but it would take a long time for this to make major impact in developing countries.

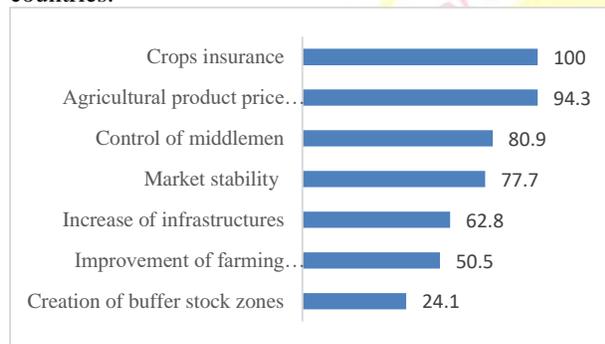


Figure 2. Measures to control agricultural products price fluctuations

CONCLUSION

The results of the study indicated that the well-being, increase of income of smallholder farmers depend on the stability of price of their produce. The results from the regression analysis indicated various factors influencing price fluctuation of agricultural production including type of market, seasonal production, climate condition change, middlemen, farm inputs price, nature of product, price of petroleum, and political instability. The results of the study also indicated that the effect of good price on farmers 'lifestyle change through the increased farmer' income, improved farmers livelihood, reduced the youth migration, increased savings, and the effective utilization of farm inputs. The study also revealed different measures for price fluctuation control; these include provision of subsidies to farmers, government price control, improvement of infrastructures, control and regulation of middlemen in agriculture sector, improvement of farming system, and creation of buffer stock zone in agro-ecological regions.

RECOMMENDATIONS

After the study some recommendations were given:

Price of agricultural products is very low compared to the cost of production, which causes loss of produce. Therefore, crops insurance, contract farming with public and private sectors, production support, Buffer stock and security fund should be enhanced in agriculture sector as well as to stabilize price.

A consultative decision-making approach that brings together supply chain stakeholders and government actors is necessary, as well as to enhance agricultural products marketing and price negotiations between producers and buyers.

Government policy makers needs to improve the capacity of farmers especially in postharvest handling, market survey in order to facilitate farmers to manage the produce and stock food in case of crisis or price fluctuation especially during harvesting period.

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