



## **Full Length Research Article**

### **INFORMATION AS A SOLUTION TO PRICE DISPARITY IN AGRICULTURAL MARKETS: EVIDENCE FROM A PILOT EXPERIMENT AMONG SMALL SCALE IRISH POTATO FARMERS IN MUSANZE DISTRICT, RWANDA**

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#### **ABSTRACT**

This study seeks to investigate the role of price information in reducing the price disparities of Irish potatoes among small scale farmers in Musanze, Rwanda. A baseline survey is first undertaken to establish the characteristics of the farmers as well as the degree of price disparities. It then applies a pilot randomized control experiment using three treatment and three control groups where the intervention is sending price information to farmers via the mobile phone. The results show that the effect of the treatment on price disparities was insignificant which is mainly attributed to the low take-up rate for price information. With the treatment effect when treatment is combined with discussion in village meetings being significant at 10%, the study concludes that price information can reduce price disparities.

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#### **INTRODUCTION**

In most developing countries, market information is a public good provided by a government department which generally involve the regular collection of commodity prices and supply conditions from major market centers, sending the information to a centralized data processing center, usually housed in the Ministry of Agriculture or Trade, where it is collated before being disseminated back to a range of clients (Ferris *et al.*, 2008). Agricultural markets in Africa face numerous market information asymmetries on the side of the farmer due to the fact that it is dominated by small scale producers. Ferreri, (2004) asserts that, while rural farmers have little access to updated price information, traders that constantly travel between rural areas and the market centers are naturally relatively well informed about the prevailing market prices. These traders present themselves as middlemen who act as a link between the farmer and the customer of agricultural produce (see Oguoma, Nkwocha and. Ibeawuchi, 2010). In Niger, as in many other African countries, farmers sell their produce directly to middlemen who in turn sell the produce to wholesalers (Aker, 2008).

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Middlemen are seen to distort the market for agricultural produce because they mark-up prices to cover for transport and storage costs in addition to their profits which make the customer prices very high. However, these high prices are hardly passed on to farmers with the middlemen getting the lion's share of the produce. Okunmadewa (nd) argues that the negotiating power of the farmers in determining prices for their produce could be improved through prompt dissemination of price information or agricultural marketing information since an informed farmer is in a better position to ask for a better farm gate price. However access to information and mobility remain a major challenge in the marketing of agricultural produce and particularly in the widening gap between farm gate and retail prices. According to Ferris *et. al.*, (2008), the dissemination of prices and market news could be achieved through various media options including radio, newspapers, internet, email, mobile phone and notice boards to farmers, traders, and other stakeholders including consumers. The huge disparity between farm gate price and market price of agricultural produce affects the viability of agriculture as a means of livelihood for rural communities who depend on agriculture for survival. Rwanda is one of the most densely populated countries in Africa and depends highly on agriculture to feed its population like many other African

countries. In 2011, the ministry of Agriculture in collaboration with the World Bank initiated an ICT platform E-Soko to address the market information asymmetry problem among farmers. The reasoning behind the E-soko concept is that farmers are able to bargain for better prices for their produce if they were aware of market prices for their goods. However, the question of the take-up and usage of information disseminated through this platform is not known. The main objective of this study is therefore to investigate the role of price information in reducing the price disparities of Irish potatoes among small scale farmers in Musanze, Rwanda. Specifically, the study seeks to (1) establish the Irish potato prices faced by farmers; (2) identify the degree of price disparities for Irish potatoes; (3) assess the price information available to Irish potato farmers; (4) investigate the level of price information take-up among the farmers; and (5) evaluate the degree to which price information impact on price volatility 6) Assess effects of price disparities on farmers' welfare.

### Literature Review

Mitchell (2011) associates the problem of price volatility with the fact that the middlemen have more information than the farmers about the market conditions giving them undue market power. He further argues that if farmers have better access to market information, they would be in a better position to make better production decisions since the farmer would be more risk averse. Mitchell (2011) proposes a two period model where a farmer and a middleman trade with each other but where the middleman is more informed about the market prices. The farmer encounters two types of middlemen; a good middleman who shares the profit equally with the farmer and a bad one who seeks to maximize his gain. The farmer has an option to go to the market but is hindered to go to the market by the high transport costs. He concludes that market information causes farmers to make better choices between the two types of middlemen and the bad middleman to behave better.

Svensson and Drott (2010) estimates the impact on agricultural market outcomes of providing small-scale farmers with access to market price information a simple general equilibrium model of the agricultural economy and data from a natural experiment in Uganda and that farmers that could access information were more likely to be involved in market exchange; sold a higher share of output and benefitted from higher farm-gate prices. Farmers that were less likely to access information faced lower prices and were less likely to sell their surplus on the market. The results indicate that the access to price information reduced market failures due to asymmetric information between farmers and traders, and led to increased market activity and incomes for informed farmers, but also resulted in an increased dispersion in revenues between informed and uninformed farmers. They conclude that by improving the access to information, ICTs may help poorly functioning markets work better, improve farmers' bargaining positions, and thereby increase the incomes of the poor. A study Ferris et. al (2006), examines how farmers access and use market information improves their market decision making in Uganda. The results indicate that for up to 52 percent of farmers receiving Market Information Services (MIS), this had

a positive impact on their business. The evidence from the survey showed that once farmers received market information, they were able to understand and use this data to monitor market changes and to apply this information to a range of marketing decisions. Okunmadewa (nd) examines the role marketing research in enhancing farm gate prices. He argues that the challenge of transportation cost, storage facilities, and information flow largely explains the low prices that farmers receive for their produce due to limited bargaining power but these same factors, on the other side puts middle men at an advantage as they are able to invest in relieving these constraints, and able to move the products to the market and sell at relatively higher prices (much more than value added price). This explains the huge disparity between farm gate price and retail/final market price of agricultural produce.

### Irish Potato Farming and Price Disparities in Rwanda

Irish potato is among top products in Rwanda that generate income for farmers. The Western and Eastern provinces are the major Irish potatoes producing regions in Rwanda. According to the Ministry of Agriculture and Natural Resources (2014) the production per hectare is still low with some farmers producing 9 or 10 tons per hectare. The ministry has encouraged the farmers to join cooperatives so that through training they can increase the production to at least 40 tons per hectare," he said, adding that Irish potato production has reached 80 tons per hectare in some countries like the Netherlands. Increasing the production of Irish potatoes is seen as one way of fighting hunger and hence improving the welfare of the Rwandan rural population. Other welfare enhancing attributes of Irish potato farming include creation of job opportunities in potatoes value chain, research and development, seeds multiplication, cultivation, distribution, transformation and consumption of the crop. As reported by the Rwanda Price Bulletin (2014), staple food prices are usually lower after the harvest seasons in January-February and in July-August and higher during the lean period in October- November and May-June. however, in 2013 the price of Irish potatoes in Northern and Western provinces markets remained high for four straight months when a kilogramme of Irish potatoes costed Rwf170 in June and July and rose to Rwf220 in August settling at between Rwf250 and Rwf 300 in some markets like Musanze and Rubavu market.

According to Rwanda Development Bank (nd) changes in agricultural prices on the local market result into low gains for farmers which makes agriculture to is perceived by financial institutions as a highly risky area for financing hence instability in prices of agricultural products is restraining financial institutions from extending credit to farmers, thus lowering production. Agricultural prices are usually determined by middlemen who offer lower prices to farmers leading to low production. Often the prices offered by middlemen do not even cover the cost of inputs (The New Times, nd). Usually, farmers who belong to cooperatives get better prices because of collective bargaining. According to Concern (nd) encouraging farmers to have direct access to markets would strengthen value chain and curtail such challenges. The government of Rwanda has realized the potential of Irish potatoes in addressing food security problems and has directed a lot of efforts to boosting the productivity of

Irish potatoes Most of the efforts have focused on increasing farm yields by organizing farmers into cooperatives through which farmers access better seeds, farm inputs and training. However, there have been little efforts to address the fluctuations in the prices of Irish potatoes. Again not much is known about the marketing channels of Irish potatoes in Rwanda.

### Data and Measurement

This study uses primary data collected from Irish potato farmers and community leaders in Musanze district, Rwanda. Musanze District is one of the five Districts of the Northern Province Musanze district is divided into 15 sectors which are further divided into sixty eight cells. Each cell is further divided into between five and eleven villages (imidugundu) It has a population of 314,242 inhabitants and 70, 830 households (Republic of Rwanda, nd) Agriculture is the lifeblood of the District with at least 91% of the population is engaged in agriculture. Three types of data were corrected. The first was survey data from farmers, second was data from community leaders using in-depth interviews and the third was focus group data in four cells. The survey data was collected in two waves. The first one was the baseline which involved a sample size of 295 farmers from 7 sectors and the second one was a post treatment survey with a sample of 56 farmers.

### Sampling and External Validity

In order to determine the target population for the baseline survey, visits to the district offices revealed the number of cells per sector, number of villages per cell and number of households per cell which enabled the researcher to determine the average number of households per village which is 200 households per village on average. Records from the district further revealed the most productive sectors in terms of Irish potato farming. The target population for this study was farmers from seven sectors which are deemed to be the biggest producers of Irish potatoes in the village. Sampling frame was the households and was done through multi-stage cluster sampling 2 cells were selected from each sector by simple random sampling; 2 villages were selected from each cell by simple random sampling and 10 respondents were chosen from each village using systematic sampling. To take care of any non-responses, the actual questionnaires distributed were 300. The study used semi-structured questionnaires administered by interviewers in the local language.

For the in-depth interviews, telephone numbers for the village leaders were obtained from the cell office and each of them was scheduled for an interview. All village leaders in sampled sectors were interviewed. For the focus groups, four villages that were in the targeted sectors but were not in the survey were targeted. For the end line pilot survey, assignment to treatment and control was exogenously determined based on the baseline data already obtained where some respondents have no phones at all or do not have MTN lines which is the network that e-soko use to disseminate information.

### Treatment Sample

There were 3 treatment groups

- In some villages both the leader and farmers get the information on how to access price information through e-soko (All have MTN lines and villages were sampled for the baseline survey) – This is identified as Treatment group T1 – two villages T1a and T1b were sampled
- In some villages, the farmers got the information but the leaders did not get the information (village was in the survey sample but the leader did not have a phone) This is identified as Treatment group T2 – one village was sampled
- In some villages, the leader got the information but farmers did not get the information (Villages were not in the baseline survey sample and did not participate in focus groups) This is identified as Treatment group T3 – two villages T3a and T3b were sampled

### Control Sample

There were 3 Control groups

- In some villages, neither the village leader or the farmers got the information (village was not sampled in the baseline survey, did not participate in focus groups and leader had no phone or had a different network) - This is identified as Treatment group C1
- In some villages, neither the village leader or the farmers got the information (village was not sampled in the baseline survey but some members participate in focus groups but leader had no phone or had a different network) - This is identified as Treatment group C2
- A few of the farmers were sampled in the pilot survey who were from the treated villages but had not been treated and they represented a third control group - This is identified as Treatment group C3

### Descriptive Analysis: Baseline Data

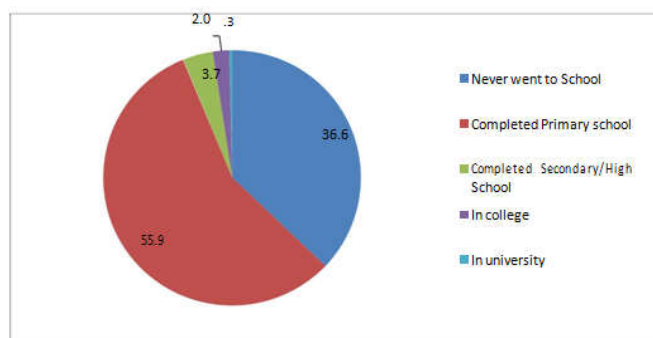
Out of the 295 farmers interviewed, 59.7% were male while 40.3 were female. Majority of them were married (85.4%), 8.5% were widowed, 4.7% were single and 1.4% were separated. The average age of the farmers in the sample was 38 years with an average household size of 6 as reported in table 1. The district is dominated by small scale farmers with an average farm size of 0.91 hectares.

**Table 1. Respondents Level of Education**

| Variable    | Mean | Std. Dev. | N   |
|-------------|------|-----------|-----|
| Family Size | 6.35 | 2.29      | 273 |
| Farm Size   | 0.91 | 1.034     | 276 |
| Age         | 38.9 | 13.3      | 289 |

Source: Baseline Survey data

Most of the farmers have little or no education which is evident from figure 1. According to the statistics reported, 36.6% of the farmers never went to School while 55.9% have only primary education. The main farming activity is agriculture for consumption and sale (89%) with only 9% of the farmers doing farming purely for consumption. Irish potatoes are the main crop grown the area as shown in table 2



Source: Baseline Survey data

**Figure 1. Respondents Level of Education**

**Table 2. Main Farming Activities**

| Crops    | Farming for Consumption Only |         | Farming for Consumption and Sale |         |
|----------|------------------------------|---------|----------------------------------|---------|
|          | Frequency                    | Percent | Frequency                        | Percent |
| Potatoes | 26                           | 68.4    | 229                              | 90.2    |
| Maize    | 8                            | 21.1    | 9                                | 3.5     |
| Beans    | 2                            | 5.3     | 12                               | 4.7     |
| Others   | 2                            | 5.3     | 4                                | 1.6     |
| Total    | 38                           | 100     | 254                              | 100     |

Source: Baseline Survey data

Another important aspect of this analysis is to compare the amount of Irish potatoes harvested by the two categories mentioned above. As reported in Table 3, farmers who grow Irish Potatoes for consumption harvest 4.7 bags (equivalent to 4.7 tons) of potatoes on average per season of which 2.5 tons are consumed on average and the rest are mainly left as seed for the next season. For farmers who grow Irish Potatoes for consumption and sale, they harvest 14.5 bags (equivalent to 14.5 tons) of potatoes on average per season of which 9.8 tons are sold on average and the rest are left for consumption and seed for the next season.

**Table 3. Amount of Irish Potatoes Harvested, Consumed and Sold**

| Variable                         | Mean | Std. Dev. | N   |
|----------------------------------|------|-----------|-----|
| Harvest for Consumption          | 4.73 | 3.31      | 37  |
| Amount Consumed                  | 2.54 | 1.50      | 37  |
| Harvest for Consumption and Sale | 14.5 | 17        | 262 |
| Amount Sold                      | 9.81 | 14        | 237 |

Source: Baseline Survey data

In terms of market destination, most of the farmers revealed that they sell their crop in nearby markets where they either walk (21%); use Motorcycles or bicycles (6.8%) or public transport (5.4%). Most of the potatoes in the region are sold to traders as shown in figure 3 with 25.8% being sold to commercial customers, 11.9% being sold to retail customers and 16.5% being sold to wholesale customers.

Majority of the farmers interviewed (53%) revealed that they knew at least one trader who frequents their village and of these 77% of the farmers have sold to at least one trader in the last 5 seasons while only 23% have not sold to the traders. The study further reviews that most farmers are ignorant of the prices of Irish potatoes in the markets where traders sell their products despite the fact that it is in their neighbourhood. Only 13 (1%) of the farmers know the prices in the main market for the trader. Table 4 compares the prices farmers fetch in the

market, price given to farmers by traders and the prices that traders fetch in the main trader market.

**Table 4. Market Price and Middlemen Price Variations**

| Variable                            | Mean  | Std. Dev. | N   |
|-------------------------------------|-------|-----------|-----|
| Average price in Main Farmer Market | 121.6 | 27.1      | 203 |
| Average Price to Main Trader        | 120.6 | 29.1      | 160 |
| Average Price in Main Trader Market | 156.2 | 34.3      | 13  |

Source: Baseline Survey data

The results reveal no difference between prices farmers get from the market and the prices that farmers get from traders on average. For farmers who indicated that they know the prices of the main market where traders sell their potatoes, they reported an average of 156 Rwf per kilo which is much higher than what farmers get for their produce. It is clear that the prices offered to farmers are 22.4% lower than the prices they fetch in the market. Given that most of the markets are within the vicinity traders the middlemen erode farmers' profits. Only 27% have some source of market information where the main source of information to farmers is visit to markets followed by traders. Both media and the Ministry for Agriculture play a very small role in disseminating market information. Of the 16% farmers who belong to cooperatives, cooperatives help them in corrective bargaining. From the baseline data it is established that indeed there exists price disparities in the market for Irish potatoes which is mainly associated to lack of information on market prices. Although the farmers indicate that the Ministry of Agriculture does very little in assisting farmers to get market information there is an e-marketing program by the Ministry of Agriculture whose role is to inform farmers about the average price of different agricultural commodities across 61 markets in the country. From the results of focus group discussions, most farmers have never heard of e-soko. The few who have heard of e-soko have heard it from media but have not been able to benefit from it since it is not user-friendly.

## Randomized Control Trial Pilot Study

### Empirical Strategy

The study applies a randomized control experimental design in which the farmers are randomly assigned to the treatment group and control group. The study uses the Ministry of Agriculture managed market information platform called e-soko. The platform provides information on agricultural commodities in 61 markets around the country and is updated weekly. With an already existing source of price information through e-soko, the first intervention is to inform the farmers how they can access the platform to get the information. This is done by sending messages through mobile phones to both farmers and leaders on how to access price information for Irish potatoes for various markets through the mobile phone. The second intervention is to encourage them to work as a community to bargain for better prices or to access better markets. Messages were sent in two waves just before the monthly community meetings which happen every last Saturday of the month. The first wave was done on the week of 24<sup>th</sup> May 2014 targeting the meetings for 31<sup>st</sup> May 2014. The second wave was done on the last week of June 2014 targeting the June community meetings.

**Model Specification**

The study seeks to establish the impact of price information on price disparities. In this case the study estimates the difference between  $P_{1i}$  which is the producer price after the farmer receives market information and  $P_{0i}$  the price before the farmer receive market information (price in baseline data). The study seeks to measure the average treatment effects where

$$E(P_{1i}/d=1) - E(P_{0i}/d=0) \dots \dots \dots (1)$$

To estimate the treatment effect, a regression model is specified as

$$P_i = \gamma + \alpha d_i + \epsilon_i \dots \dots \dots (2)$$

Where the difference in the price faced by farmers is a function of the market information which makes the farmer bargain for better prices.

**Descriptive Analysis – End line Pilot Study**

A total sample of 56 respondents was identified for the pilot end line survey from seven villages using multi-stage sampling. This included both farmers and the village leaders. Out of these only questionnaires were administered representing 94% response rate. Table 5 shows the distribution of the respondents according to the treatment and control groups. There were more males (73.6%) than females (26.4%) in the sample as shown in the table 5.

**Table 5. Distribution of Sample into Treatment and Control groups**

|                   | Total sample |         | Male      | Female    |
|-------------------|--------------|---------|-----------|-----------|
| Sample groups     | Frequency    | Percent | Frequency | Frequency |
| Treatment Group 1 | 19           | 35.8    | 15        | 4         |
| Treatment Group 2 | 4            | 7.5     | 3         | 1         |
| Treatment Group 3 | 14           | 26.4    | 11        | 4         |
| Control Group 1   | 7            | 13.2    | 4         | 3         |
| Control Group 2   | 6            | 11.3    | 3         | 3         |
| Control Group 3   | 3            | 5.7     | 3         | 0         |
| Total             | 53           | 100.0   | 39        | 15        |

Source: Pilot Survey data

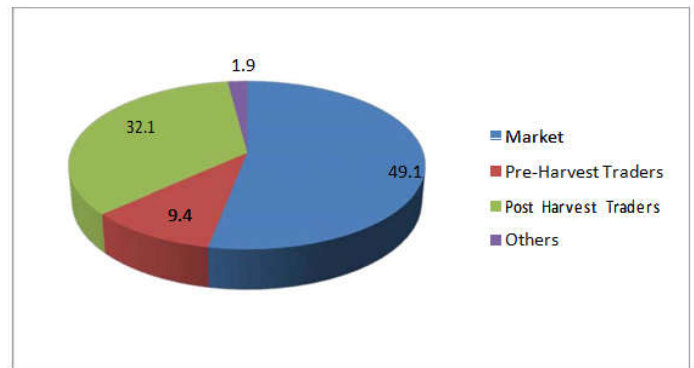
Majority of them were married (92.5%) with the remaining 7.5% being single, engaged or widowed. The average age of the farmers in the sample was 39.6 years with an average household size of 7. In terms of education, 15% of the respondents never went to school, 64% completed primary School while 21% completed secondary school. The average farm size in the sample is 1.04 hectares of which 0.7 hectares are dedicated to potatoes on average. The average yield of Irish potatoes is 20.59 bags as reported in Table 6. Of that an average of 3.75 bags are consumed while 14.72 bags are sold on average and 2.46 are left for seed.

**Table 6. Distribution of Harvested Potatoes among different uses**

| Variable         | Mean  | Std. Deviation | N  |
|------------------|-------|----------------|----|
| Amount Harvested | 20.59 | 19.37          | 51 |
| Amount Consumed  | 3.75  | 2.48           | 51 |
| Amount Sold      | 14.72 | 15.98          | 50 |
| Amount for Seed  | 2.46  | 3.40           | 52 |

Source: Pilot Survey data

There are three kinds of marketing channels used by farmers in the last season as shown in Figure 2



**Figure 2. Marketing Channels used by farmers in the last season**

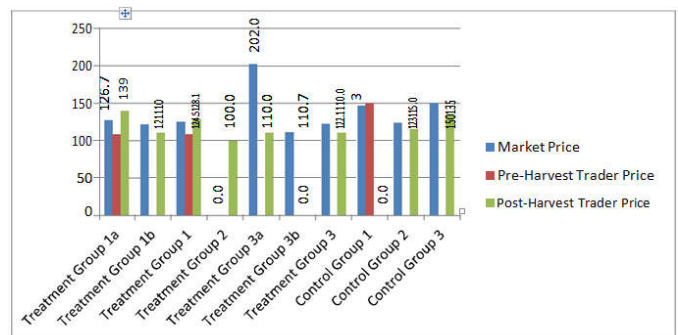
Most of the farmers sold their potatoes straight to markets (49.1%), while 32.1% sold to Post harvest traders. Only 9.4% of the farmers sold to pre-harvest traders as is evident from figure 6. Different marketing channels attracted different prices as shown in Table 7.

**Table 7. Average Prices for Different Marketing Channels**

| Variable                   | Mean   | Std. Deviation | N  |
|----------------------------|--------|----------------|----|
| Market Price               | 128.34 | 27.87          | 29 |
| Pre-Harvest Trader Prices  | 134.38 | 26.78          | 8  |
| Post-Harvest Trader Prices | 119.47 | 17.94          | 19 |

Source: Pilot Survey data

Comparing the prices of different marketing channels, Pre-harvest traders offered the best prices though only 9.4% of farmers used them. The market prices were 7% higher than the post harvest trader prices although the traders sell in the same markets that farmers sold to. Figure 3 compares the prices for different treatment and control groups. In treatment group 1, the farmers who used post harvest traders got better prices on average than those who sold to the market. Treatment group 2 only sold to post harvest traders. For treatment group 3, the farmers who sold their potatoes to the market prices fetched better prices than those who sold to post-harvest traders. In the control groups, farmers who sold to the markets got better prices than those who sold to traders and their prices were indeed better than treatment group 1 on average.

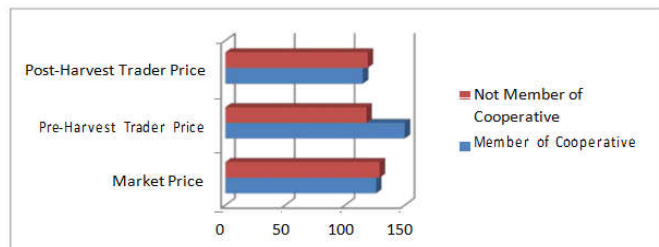


Source: Pilot Survey data

**Figure 3. Average Prices for Different Marketing Channels – Treatment and Control Samples**



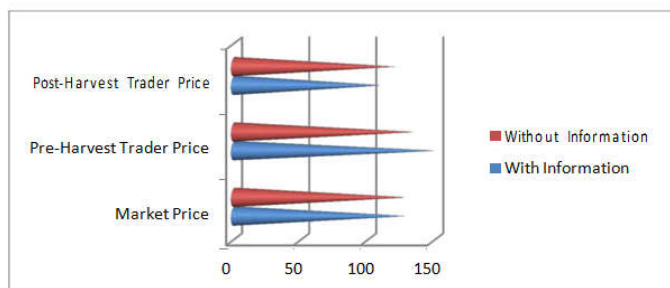
Most of the farmers are not members of cooperatives. Only 24.5% of those sampled are in cooperatives while 75.5% are not. There is no much difference between the prices farmers that are members of cooperatives got and those that farmers who are non-members got especially for those who sold to markets and those who sold to post harvest traders as shown by Figure 4



Source: Pilot Survey data

Figure 4. Average Prices for Different Marketing Channels – Cooperative Members and Non-Members

This may be attributed to the fact that cooperatives do not give members price information as reported by respondents. Among the 7 villages sampled respondents in 4 of the villages indicated that they had discussed in their village meetings on how to get better prices for their potatoes. Most of the discussions were initiated by the village leaders. However when specific price information sent to both farmers and leaders was displayed, only one leader admitted to have received the message and he discussed it with his village members. None of the farmers indicated that they had received any message. Figure 5 compares the prices of members who received price information with those who did not receive price information.



Source: Pilot Survey data

Figure 5. Average Prices for Different Marketing Channels – With and Without Price information

The results show no evidence of better prices with price information. For market prices, the prices for both groups are all the same, for Post harvest trader prices, those for farmers with information are lower while for the pre-harvest traders prices for farmers with information are higher. It is also important to compare the sales revenue for each of the groups and the results are presented in Table 8.

**Sales Revenue from different marketing channels**

Comparing the sales revenue of different marketing channels, Pre-harvest traders received the highest revenue, Rwf. 18,684 which is approximately \$27 and matches with the high price

they got for their products. The sales volume from market prices was Rwf. 1,863 approximately \$2.7 which was the lowest being only 10% of that from Pre-harvest trader prices. Sales revenue from Post-harvest traders was slightly higher at 2,057 which is approximately \$3 higher than the post harvest trader prices although the traders sell in the same markets that farmers sold to.

Table 8. Average Sales Revenue for Different Marketing Channels

| Variable                                    | Mean     | Std. Deviation | N  |
|---|----------|----------------|----|
| Sales Revenue at Market Price               | 1,863.9  | 2734.9         | 29 |
| Sales Revenue at Pre-Harvest Trader Prices  | 18,684.4 | 7106.9         | 8  |
| Sales Revenue at Post-Harvest Trader Prices | 2,057.1  | 2138.8         | 19 |

Source: Pilot Survey data

**Empirical Analysis**

The main aim of the study was to estimate the impact of information on price disparities. In this case the study estimates the difference between P1i which is the producer price after the farmer receives market information and P1i the price before the farmer receive market information (price in baseline data). Table 9 presents the summary statistics of the two prices and the price difference. On average, post-treatment prices were slightly higher than the pre-treatment prices with a difference of 0.76. This is suggestive of an improvement in prices due to price information.

Table 9. Summary statistics of Different Prices

| Variable             | Mean  | Std. Deviation | N  |
|----------------------|-------|----------------|----|
| Pre-treatment Price  | 124.5 | 28.4           | 29 |
| Post-treatment Price | 125.6 | 25.1           | 48 |
| Price Difference     | -0.76 | 35.6           | 17 |

Source: Pilot Survey data

**Regression Analysis**

The study seeks to measure the average treatment effects where

$$E(P_i/d = 1) - E(P_i/d = 0) \dots \dots \dots (1)$$

To estimate the treatment effect, a regression model is specified as

$$P_i = \gamma + \alpha d_i + \epsilon_i \dots \dots \dots (2)$$

Where the difference in the price faced by farmers is a function of the market information which makes the farmer bargain for better prices. Before investigating the sources of price variations, it is important to establish the main determinants of farmer prices. This is done by regressing the post-treatment price against individual covariates that are deemed to have an effect on the farmer prices. These include the age of the farmer, education level of farmer, amount of potatoes harvested, amount of potatoes sold. The analysis takes a stepwise regression approach where the price difference is regressed against individual covariates that are deemed to have an effect on the price differences.

**Table 10. Determinants of Farmer Prices**

| Variable                        | Coefficient | t-statistic | t-statistic | R-Squared |
|---------------------------------|-------------|-------------|-------------|-----------|
| Age of Farmer                   | 0.236       | 0.83        | 0.412       | 0.015     |
| Level of Education              | 9.319       | 1.64        | 0.108*      | 0.055     |
| No. of Bags Harvested           | 0.491       | 2.63        | 0.011***    | 0.131     |
| No. of Bags Sold                | 0.602       | 2.59        | 0.013***    | 0.127     |
| Coop membership                 | 5.167       | 0.60        | 0.554       | 0.007     |
| Information at village meetings | -2.548      | -0.23       | 0.819       | 0.001     |
| Treatment                       | -2.656      | -0.35       | 0.727       | 0.002     |

Source: From OLS using Stata 10 \*\*\*, \*\*, and \* denote Significance levels at 1%, 5% and 10% respectively based on t-statistics; N = 48

**Table 11. Sources of Price Disparities**

| Variable                        | Coefficient     | t-statistic | P-value  | R-Squared |
|---------------------------------|-----------------|-------------|----------|-----------|
| Level of Education              | 11.125 (17.11)  | 0.65        | 0.526    | 0.027     |
| No. of Bags Harvested           | 0.328 (0.403)   | 0.81        | 0.429    | 0.042     |
| No. of Bags Sold                | 0.466 (0.509)   | 0.92        | 0.374    | 0.053     |
| Information at village meetings | -20.928 (22.07) | -0.95       | 0.358    | 0.056     |
| Treatment                       | -28.788 (19.02) | -1.51       | 0.151    | 0.132     |
| Treatment + Level of Education  | -27.362 (20.68) | -1.32       | 0.207    | 0.136     |
| Treatment + Bags harvested      | -28.036 (19.31) | -1.45       | 0.169    | 0.168     |
| Treatment + Bags sold           | -27.087 (19.40) | -1.40       | 0.184    | 0.169     |
| Treatment + Village meeting     | -31.157 (18.90) | -1.65       | 0.122*** | 0.210     |
| Treatment + all covariates1     | -34.683 (22.99) | -1.51       | 0.160    | 0.259     |
| Treatment + all covariates2     | -33.170 (21.76) | -1.52       | 0.153    | 0.251     |
| Treatment + all covariates3     | -33.642 (21.64) | -1.55       | 0.146    | 0.256     |

Source: From OLS using Stata 10 \*\*\*, \*\*, and \* denote Significance levels at 1%, 5% and 10% respectively based on t-statistics; N = 48

These include the age of the farmer, education level of farmer amount of potatoes harvested, amount of potatoes sold. From the analysis, the most significant factors that determine prices are the amount of potatoes harvested and sold with a marginal effect of 0.491 and 0.602 respectively which are significant at 1%. The level of education was also significant at 10%. Information is seen to have a negative effect on price although it is not significant. This is both in terms of information sent straight to respondents and that passed at village meetings. This may be associated to the low take-up of information both at the personal level and village meeting level. Membership to cooperative as well as age of farmer is not significant determinants of potato prices. The main objective of this study is to determine the effect of information on price disparities. This analysis only considers factors that are found significant as determinants of potato prices. The OLS results are reported in Table 11. Examining the results of the simple regression models, most of the variables that are thought as sources of price disparities are insignificant. The treatment effect is negative implying that information is likely to reduce price disparities. However, the effects are insignificant which can be attributed to the low take-up of price information. The results from the multivariate regression models, all treatment effects report a negative sign and only the model that combines treatment and discussion at village meetings are significant at 10% significant level. This implies that price information sent to respondents could only be effective when discussed at the village levels.

## Conclusion

From the results of this study, it is evident that the take-up rate for price information was very low. This is the main reason why the effect of the treatment on price disparities was

insignificant. Given that the treatment effect when treatment is combined with discussion in village meetings is significant at 10%, the study concludes that price information can reduce price disparities.

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