Innovation platform for improving rice marketing decisions among smallholder farmers in Homa-Bay County, Kenya
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Abstract: Smallholder farmers are normally faced with making a decision on market participation and consequently choosing the appropriate marketing channel for their agricultural produce. This study focuses on how a multi-stakeholder innovation platform approach for improving the uptake of System of Rice Intensification and rice productivity influences marketing decisions among smallholder rice farmers. The study relies on primary data collected from 102 households in Homa-Bay County, Kenya. Logistic and multinomial logistic regression models were used in the analysis. The practice of system of rice intensification, membership to farmer groups, frequency of access to extension services, distance to the nearest market and access to transportation facilities were important determinants to market participation among farmers. A farmers’ choice of marketing channel was commonly influenced by size of land under rice cultivation, access to transport facilities and whether rice was to be sold collectively or individually. We therefore conclude that the multi-stakeholder innovation platform approach improves decision making in marketing. We thus recommend that governments embrace multi-stakeholder Innovation Platforms as a framework for

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PUBLIC INTEREST STATEMENT
The fact that the Sustainable Development Goals are not to be met is not due to a lack of appropriate technologies or the lack of scientific expertise—but rather the very low rate of adoption of technologies. With this, we do not say that the scientific community is “off the hook” and we can blame the small scale subsistence farmer for their rather lethargic adoption rates—it is most probably our own limited understanding of the adoption/innovation process and the incentives for investment and production beyond the household’s immediate needs. In this paper, we examine how decision-making in marketing can be improved through the multi-stakeholder innovation platform approach in the context of smallholder rice farming. Specifically, we explore how innovation platform activities such as trainings, extension reinforcement, improving market information and transport access and other activities influence rice market participation and choice of markets.
improving farmer participation in rice markets and improving decision making when approaching available markets.

Key words: Innovation platform; market participation; rice; decision making; Kenya

Subjects: Rural Development; Production; Operations & Information Management; Management of Technology & Innovation; Marketing

1. Introduction and background

Participation in markets can be an effective route for rural smallholder farmers to move out of abject poverty and increase income (Fischer & Qaim, 2012; Mango et al., 2017). Markets play a significant role in economic development. Availability of markets for commodities, for example, agricultural commodities, such as rice, beans, vegetables and maize, allows for specialization of production, which in turn increases productivity and efficiency (Atera et al., 2018). Well-functioning markets lead to efficient allocation of scarce resources and maximization of the general welfare of society (Fischer & Qaim, 2012). The trade theory postulates that if households participate in markets by selling surplus of what they produce on a comparative advantage, they are set to benefit not only from the direct welfare gains but also from opportunities that emerge from economies of large-scale production (Zamasiya et al., 2014). Indeed, they will also benefit from technological change effects; improved flow of ideas and from trade-based interactions (Abafita et al., 2016). Moreover, choice of a marketing channel is considered one of the key ingredients to successful marketing of both agricultural and non-agricultural products (Gollin, 2014). This is so because different channels are characterized by different benefits (profitability) and costs. According to Amare et al. (2019) marketing channel used when selling the product has a bearing on the profit farmers may make. Therefore, marketing channel choice decisions are very important especially in a liberalized market economy like Kenya where there are alternative marketing channels and therefore open to seller’s choice.

This paper did set out to analyse how innovation platform activities in Oluch rice irrigation scheme in Homa Bay County have influenced marketing decisions amongst smallholder farmers. The platform have embarked, since 2017, on a number of activities meant to improve smallholder farmers’ livelihoods which include capacity building farmers to improve their operations and decision making amongst others. A lot has been done also in line with linking farmers to lucrative markets, making market information available to farmers. Understanding to what extent activities of the innovation platform have influenced marketing decisions is of importance as this can be useful in reinforcing actions to enable farmers to reap maximum benefits from the markets. Decisions considered in this paper include both decisions on participation in markets and on choices of marketing channels used by the smallholder farmers.

The paper however pays attention to variables influenced by the innovation platform activities since 2017. Specifically, this paper tries to reveal on how decision making in marketing can improve through the multi-stakeholder innovation platform approach. In this paper we explore how innovation platform activities such as trainings, extension reinforcement, improving market information and transport access and other activities are influencing rice market participation and choice of market. This paper will have a bias on rice as it is one of the commodities farmers benefit a lot from in Oluch rice irrigation scheme, Homa Bay County, Kenya.

2. Economic importance of rice in Kenya

Rice cultivation was introduced in Kenya 1907 from Asia (Food and Agriculture Organization (FAO), 2015). Rice is the third most important cereal crop after maize and wheat (Short et al., 2012). Though many regions grow the crop for domestic consumption, Kenya for a long time regarded rice as a cash crop. This long held perception is, however, rapidly changing, with many communities now appreciating the importance of rice as a food crop for domestic consumption in addition to being a cash crop for income generation (Onyango, 2014). This change in perception has greatly influenced the balance between production and consumption of rice in many African countries, Kenya included.
There are a number of different estimates for rice production and area in Kenya. The two most often cited estimates for rice production, area and yield in Kenya are those of the MOA and those of the National Irrigation Board (NIB) for rice produced on its irrigation (Monitoring African Food and Agricultural Policies (MAFAP), 2013; Short et al., 2012). 95% of the rice in Kenya is grown under irrigation in paddy schemes managed by NIB and the remaining 5% is from rain-fed rice farming (Evans et al., 2018). This appears to be changing as Ministry of Agriculture (MOA) observes that about 80% of the rice grown in Kenya is from irrigation schemes established by the government and that about 20% of rice is produced under rain-fed conditions (Onyango, 2014).

The Consumer Price Index (CPI) expenditure weights for rice indicate its relative importance for different groups of consumers. For low income consumers in Nairobi, rice accounts for 3.9% of food expenditure compared to 11.5% and 10.7% for maize and wheat respectively. Expenditure on rice is 4.8% of food expenditure in other urban areas compared to 13.5% for maize and 9.7% for wheat (Short et al., 2012). Rice accounts for even lower expenditure for rural consumers. Mwea rice farmers in the 1980s sold most of the rice and relied on maize and beans they cultivated off the scheme for their own consumption. They considered rice as a cash crop consumed by people in urban areas. Though the consumption is lower in rural areas compared to urban areas, that of rural areas are rising steadily. Per capita rice consumption in Kenya is estimated to be 10–18 kg per capita per year (Kenya Bureau of Statistics, 2016). The annual rise in rate of consumption is increasing at the rate of 12% compared to wheat (4%) and maize (1%). The changes are attributed to eating habits. The demand for rice is therefore expected to rise (Atera et al., 2018).

In addition rice has many other different uses. The crop is considered also a valuable feed for livestock. It can be used to make poultry feed and it can also be used in integrated crop-livestock systems (Onyango, 2014). It is evident that rice as a crop can be very useful for the poor communities. For the same reasons the innovation platform in Oluch irrigation scheme has been pushing for farmers to adopt rice for them to benefit from its multiple uses. However, proper marketing decisions in rice will complete the equation. Rice as a multi-purpose crop is therefore a marketable crop in Kenya and has the potential to improve household income when sold.

3. Multi-stakeholder innovation platforms for market development

Development research in Africa has centred mainly on smallholder commercialization as a way of ensuring food security and economic growth. Agriculture in most African economies is on smallholder basis. In sub-Saharan Africa, Asia and the Pacific, the agriculture-dependent population is over 60%, while in Latin America and high income economies the proportions are estimated at 18% and 4%, respectively (World Bank, 2006). Most of the smallholder farmers in sub-Saharan Africa are confronted with multifaceted challenges. These problems require several interventions such as institutional reforms that facilitate efficient rural service delivery, development of markets, creation of physical infrastructure and government policies that are supportive while ensuring a stable and conducive political environment. Smallholder farmers require systems that are responsive to their needs: access to markets, market information, market intelligence and effective farmer organization as the agricultural sector in developing countries transforms towards commercialization.

In an attempt to address the weak linkages among the rice value chain actors as well as increase in rice production, Egerton University in collaboration with the Kenya Ministry of Agriculture, Kenya Agricultural and Livestock Research Organization, Lake Basin Development authority and other stakeholders established Oluch Rice Innovation platform in Homa Bay County.

Multi-stakeholder platforms were first proposed in the context of natural resource management, where stakeholders share a common-pool resource, such as access to water in a river basin, and the platform contributes to the collective management of the resource (Mulema & Mazur, 2015; Shimeles et al., 2018). A platform has value for stakeholders, because they are, or may become, interdependent. Interdependence can create tension, conflict, manoeuvering to seek advantage and even group displacement. But it also opens opportunities for mutual understanding, building
confidence, social learning and joint action (Sartas et al., 2018). The platform makes possible actions that none of the members could have achieved on their own. Because of its complex membership and potential for conflict, a platform is likely to require facilitation and may have a lengthy initial phase of mutual learning and role definition, before it can get down to business (Misaki et al., 2018).

Most value chains do not frequently use the approach of platforms. Several studies including a recent overview of collective action for small farmer market access considered small farmer organizations without mentioning platforms (Dondofera & Grobbelaar, 2019). An exception is the study by Vellema and Nakimbuge (2012), which analyses the oil seed sub-sectoral platform in Uganda. A platform can perform three different, but interlinked, functions in a value chain. First, it can create a space for learning and joint innovation, as an innovation intermediary or broker. Second, it can perform a governance function within the value chain to improve coordination of business activities by actors and reduce transaction costs. Finally, a platform can perform advocacy functions to secure policy change or influence.

Value chain governance may be provided by: (a) market mechanisms, (b) hierarchical non-market mechanisms and (c) by non-market-based voluntary coordination between actors of a collective action type (Kilelu et al., 2017). Pamuk et al. (2014), writing from a New Institutional Economics perspective, noted that coordination provided through different non-market mechanisms can help market actors reduce transaction costs and escape the low-level equilibrium trap associated with underdeveloped economies, as a weak institutional environment and high transaction risks limit investment opportunities.

4. Research methodology

4.1. Sampling and data collection

This study makes use of cross-sectional household data collected from a survey using a questionnaire with semi structured and structured questions. The pilot study was conducted with 11 respondents purposively selected in Kimira irrigation scheme, also in Homa Bay County, which have similar characteristics as Oluch irrigation scheme. The pilot study was aimed at validating the research instrument. This is based on Kathuri and Pals (1993) suggestion that 10% yields meaningful results in a pilot study. The reliability of the instrument was determined using Cronbach alpha (Santos, 1999). The instrument attained alpha 0.7 (α ≥ 0.7) and was deemed reliable. A stratified random sampling technique was used to select smallholder rice producing farmers from 12 main rice growing blocks in Oluch irrigation scheme as respondents in the baseline survey. In total there are 369 registered water users from the 12 main rice blocks in Oluch irrigation. A list of containing the names of these 369 farmers was provided by Ward Agricultural Extension officers (WACEO) from Rangwe Sub-County Agricultural Office. Using stratified random sampling techniques, 102 smallholder farmers were selected. The response rate was a 100% given all the farmers selected responded to the questionnaires. Data collection for this study was done in 2018 through face-to-face administration of questionnaires. The survey collected information on household composition and socio-economic characteristics, cereal and legume crop production and marketing, household market participation, access to infrastructure, household incomes, ownership of land and non-land assets, crop diversification, group membership, System of Rice Intensification (SRI) adoption and practices, livestock ownership and access to agricultural inputs on credit and many other socio-economic variables.

4.2. Data analysis and econometric modelling

4.2.1. Conceptual framework: decision making in rice marketing

We employ a simple model of market participation for rice farmers in Homa-Bay County of Kenya. Apart from growing rice, each farmer considered also grows other crops for both consumption and sales. Each farmer considered is a utility maximizer, that is, derives some utility from either selling
or not selling their crops. We conceptualize decision-making as a two-step process. At the first stage, the farmer decides whether to sell or not sell their rice. If they decide not to sell, we assume that there is some utility associated with holding on to their rice, i.e., they may either consume it or give to their relatives as gift or use as seed for the next season. Without loss of generality, we normalized this utility associated with not selling to zero. In the second stage, conditional on deciding to sell, the farmer chooses the type of market to sell to. They either choose to sell to private traders, Lake Basin Development Authority (LBDA), or to private millers. We summarized the decision-making process in Figure 1 shown below:

4.2.2. Modelling rice marketing decisions

We model the decision to sell rice, and choice of market using a multivariate logistic regression and multinomial logistic regression model respectively. Our empirical specification for the logit model is of the form:

\[
\ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1X_{i1} + \beta_2X_{i2} + \ldots + \beta_nX_{in} + \epsilon_i
\]

(1)

Where \(P_i\) is the probability that the farmer \(i\) either sells or not sells their rice; \(X_{ij}\) are a vector of individual farmer explanatory variables for the decision to sell rice or not. \(\epsilon_i\) is an error term that follows a logistic distribution. The response variable in this case was a binary variable, with farmer responses of yes or no, coded as 0 or 1.

To model the probability of adopting a given marketing channel, we used a multinomial logit regression model. The response variable was a categorical variable of three levels; Private traders, LBDA and private millers representing which marketing channel a farmer used to sell his/her rice. For a given farmer/household, the probability of choosing marketing channel \(J\) can be explained by a multinomial model (Greene, 2005) as follows:

\[
P(MktChannel) = \frac{e^{\sum_{j=1}^{K} \beta_{kj}X_{ij}}}{\sum_{j=1}^{K} e^{\sum_{j=1}^{K} \beta_{kj}X_{ij}}}
\]

\(i = \text{individual}(1, 2 \ldots 72), j = \text{categories}(\text{Privatetraders} = 1, \text{LBDA} = 2, \text{privatemillers} = 3), \)

\(k = \text{independent variables}\)

(2)

Where \(P_{ij}\) represents the probability of a marketing channel \(j\) to be chosen by rice farmer \(i\); \(X_{ij}\) are the different explanatory variables (Table 1) and \(\beta_{kj}\) are explanatory model coefficients.

The model validity, assumptions and goodness of fit for the logistic models was assessed using the Hosmer and Lemeshow test (Fagerland & Hosmer, 2012), model deviance, McFaddens likelihood ratio index (Tardiff, 1976) and the Hausman test (Knapp & Seaks, 1998). The inclusion of
Table 1. Variable definition and specification

| Variable                        | Description                                                                 | Responses                                      |
|---------------------------------|-----------------------------------------------------------------------------|------------------------------------------------|
| Marketing channel               | Indicates the channel taken by the farmer when selling his/her rice         | 1-LBDA                                         |
|                                 |                                                                             | 2-Private millers                              |
|                                 |                                                                             | 3-Private traders                              |
| Rice sold                       | Indicates whether the farmer sold his/her rice in the past 12 months.      | 1 = Yes, 0 = No                                |
| Sex                             | Indicates the gender of the household head                                 | 1 = Male, 0 = Female                           |
| Age                             | Age of household head in years                                             | Continuous                                     |
| Farmer household size           | Size of the household                                                      | Continuous                                     |
| Years of farming experience     | Number of years in the farming business                                    | Continuous                                     |
| Size of land owned              | Arable land size holding (Ha)                                              | Continuous                                     |
| Access to extension services    | Extension services access                                                  | 1 = Yes, 0 = No                                |
| Frequency of access to extension services | Extension services reception frequency per year | Count                                          |
| SRI adoption                    | Identifies whether farmer is practicing System of Rice Intensification     | 1 = Yes, 0 = No                                |
| Membership to a farmer group    | Identifies whether farmer through the innovation platform has membership to any farmer group or association | 1 = Yes, 0 = No                                |
| Training received from the IP   | Variable identifies whether farmer received any form of training from the Innovation Platform | 1 = Yes, 0 = No                                |
| Access to rice market information | Indicator variable for access to any form of rice market information     | 1 = Yes, 0 = No                                |
| Access to transport facilities  | Indicator variable for access to transport for fetching produce to the market | 1 = Yes, 0 = No                                |
| Distance to nearest market      | Distance to the nearest main market (km)                                   | Continuous                                     |
| Collective selling of rice      | Indicator variable showing how rice was sold                                | 1 = collectively; 0 = otherwise                 |
| Price of rice sold              | The price per kg at which the farmer sold their rice (USS)                 | Continuous                                     |
| Quantity of rice sold           | The amount of rice sold (kg)                                               | Continuous                                     |
| Bicycle ownership               | Whether farmer owns a bicycle                                              | 1 = Yes, 0 = No                                |
| Mobile phone ownership          | Whether farmer owns a cell phone                                           | 1 = Yes, 0 = No                                |
| Ownership of radio              | Whether farmer owns a radio                                                | 1 = Yes, 0 = No                                |

Explanatory variables into each of the regression models was guided by market participation theory, knowledge of Oluch Rice Innovation Platform and past empirical work (Siziba et al., 2011).

5. Results and discussions

5.1. Descriptive results

The study findings indicate that smallholder rice farming in Oluch irrigation scheme was commonly practiced by men (70%), most of who were about 50 years of age (Table 2). This implies that household heads were more involved in rice farming. Moreover, farmers were from households of at least five members on average and generally had a vast amount of experience in farming, approximately 20 years. However, farming was highly variable (SD = 12.19) indicating that there...
were also relatively young and inexperienced farmers. On average, a smallholder farmer in the scheme owns about 1.7 ha of land.

It is notable that most farmers live about 4.4 kilometres to the nearest market and while having access to extension services (76%), only receive about three extension service visits a year. Although slightly variable (SD = 2.8), this observation can be understood by examining both farmer availability and the presence of extension officers as these influence these figures. The proximity of rice farmers to markets is evidence of the link created through the innovation platform which helps them to reduce marketing costs hence improving marketing margins. Regarding rice productivity, the farmers sold an average of 173 kgs of rice at about Ksh.130 per kg in the last season. The findings indicate that both prices and quantity of rice sold is highly variable among farmers, an evidence of potential variability in market participation decision making and differences in marketing channels adopted. This is particularly surprising when most farmers have access to market information (97%) and access to mobile phones (75%) and radio (74%).

Since the launch of the innovation platform, a high proportion of farmers (90%) have adopted SRI, owing to potential benefits and perhaps the high level of access to extension services reported by farmers. Less than half of the farmers indicated they had access to transport facilities (42%)
and while 86% belonged to a membership group, only 47% indicated they sold rice collectively. This finding perhaps reflects decision making is not entirely straightforward.

5.2. Market decisions among smallholder rice farmers

Figure 2 summaries the rice marketing decisions of the smallholder farmers. From the findings, rice market participation was found to be high (65%). The most preferred channel of selling rice by the farmers according to findings is to private traders (45%), followed by private millers and the least preferred was LBDA.

The level of market participation in rice markets is not surprising since the stakeholders in the Innovation Platform especially the Ministry of Agriculture Homa-Bay has been hugely involved in linking farmers to a variety of rice markets. In terms of marketing channels used, the results however show an unexpected trend. During the survey, farmers were asked to give prices at which they sold their rice produce quoting the price per kilogram sold. We then computed average prices offered to farmers by marketing channel and results show a rather opposite trend. Average prices (in US$) offered in the three different markets according to the results are as follows: Private traders (26 cents/kg), private millers (30 cents/kg) and LBDA (32 cents/kg). Results thus indicate that to some extent, some other factors other than price could be affecting choice of marketing channel by the rice farmer. Some factors could be constraining farmers to access marketing channels that offer higher prices, thereby forcing them to sell to private traders. We thus employed the multinomial logit regression results to understand what factors explain the variability in choice of marketing channel used by farmers.

5.2.1. Modelling market participation decision-making

The logistic regression model results (Table 3) show that extension reception frequency, transport access, distance to the nearest main market, group membership, trainings from the innovation platform and System of Rice Intensification practice significantly influences the decision to participate in the rice market. Odds ratios show the predicted change in odds for a unit increase in the corresponding explanatory variable.

Results from the analysis show that for the smallholder rice farmers, the odds of participating in rice markets was 18% higher for every additional visit from an extension officer all other variables held constant. In this study, this was a proxy for measuring training by extension agents. In fact, this is unsurprising given the variable number of extension visits received by farmers. This result shows that the work of the innovation platform in reinforcing extension service delivery is working so well in improving participation in rice markets. Improved extension is influencing farmers positively to
participate in rice markets. The results are however, similar to findings by Alene et al. (2008) who concluded that input use and extension increase the odds of participation in commodity markets.

Transport access and distance to the main market were significant predictor variables in explaining rice marketing participation. Farmers who had access to transport were 2.6 times more likely to participate in markets than their counterparts who had no access. On the other hand, for every kilometre further away from the nearest main market, the odds of market participation decreased by 22%. These findings indicate however, that innovation platform activities are bringing good results in reducing transaction costs in Homa-Bay County, local transport services are improving and nearby markets are successfully linked to the farmers a move which is improving rice marketing. In accord with previous findings (Ohen et al., 2013), access to transport services, lower transaction costs and lesser distances travelled to the market reduce transaction costs thus increasing the likelihood of participating in the market. Household with access to transport are more likely to secure means of delivering their produce in time to markets of their choice as compared to farmers without access to transport. According to Siziba et al. (2011) access to such information reduces smallholder farmers risk perceptions and improves the likelihood of participating in the rice market.

One of the key roles of the Innovation Platforms is to encourage farmers to collaborate with other stakeholders through farmer associations and other social groups were found to influence market participation. Group membership can be regarded as a proxy for access to social capital and/or indigenous technical knowledge. The odds of market participation were found to be 2.5 times higher for farmers who had access to social capital when compared to those without access. The result also complements the role of Innovation Platform in encouraging farmers to work hand in hand with farmer associations for them to benefit from social capital and other benefits associated with working in groups. Social capital is helping in moulding farmer decisions, farmers are becoming more market oriented than production oriented.
Another main function of the Innovation Platform through extension services reinforcement is to offer training to farmers mainly production and market related training. Three quarters of the farmers surveyed reported to have received proper training from the platform at the time of the survey. Trainings through the innovation platform were found to be significant in influencing market participation. Education from the trainings was found to increase the odds of participating in the rice market. Education and awareness improve decision making for the farmer and as result the farmers can conceptualize marketing issues, resulting in them participating in markets to improve their income.

The uptake of SRI practice among smallholder farmers additionally explained their likelihood of market participation. Farmers who practised SRI were about 6 times more likely to sell their produce than compared to their colleagues who have not adopted SRI. This can be explained by the fact that through SRI adoption, farmers realize relatively higher output when compared to non-adopters which leaves them with surpluses for sale. As in previous studies (Nyamai et al., 2012) With surpluses farmers are more likely to participate in rice markets.

5.2.2. Choice of marketing channel: multinomial logistic regression results

We used a multinomial logit regression model (Table 4) to explain differences in choices regarding available markets for rice. For the three-level response variable (marketing channel), private traders were treated as the reference group. Therefore, we sought to model the probability of choice of marketing channel 2 (Private millers) and 3 (LBDA) relative to private traders. From the findings, land size, transport access and selling rice collectively influenced significantly decisions by household to sell through LBDA and through private mills. In addition, age of farmer and possession of a mobile phone were important determinants of choice of a given marketing channel. Access to training through the innovation platform and practicing SRI influenced significantly the decision to sell through the channel of private millers relative to private traders.

Table 4. Choice of marketing channel model results

| Predictor variables                        | LBDA |              | Private millers |              |
|-------------------------------------------|------|--------------|-----------------|--------------|
|                                           | Estimate | Std. Err. | p value | Estimate | Std. Err. | p value |
| Sex                                       | -0.6439 | 1.1736 | 0.583 | 1.0407 | 0.9801 | 0.288 |
| Age                                       | -5.8674 | 2.2828 | 0.010** | -5.8674 | 2.2828 | 0.010** |
| Experience in farming (years)             | 0.0098 | 0.0573 | 0.603 | 0.0024 | 0.0471 | 0.960 |
| Size of land owned                        | 0.9821 | 0.5793 | 0.090* | 1.0532 | 0.4705 | 0.025** |
| Adoption of SRI                           | 22.0765 | 1883.5 | 0.991 | 3.6404 | 1.8956 | 0.073* |
| Access to transport facilities            | 2.3072 | 1.2308 | 0.061* | 1.6017 | 0.8897 | 0.072* |
| Access to market information              | -0.6446 | 1.1408 | 0.572 | -0.4919 | 0.9237 | 0.594 |
| Membership to farmer group                | 0.3879 | 1.4700 | 0.792 | 0.1928 | 1.2148 | 0.874 |
| Access to extension services              | -2.3884 | 1.9670 | 0.225 | 0.2953 | 1.3266 | 0.824 |
| Predictor variables                        | LBDA          | Private millers |
|-------------------------------------------|---------------|-----------------|
|                                           | Estimate      | Std. Err. | p value | Estimate      | Std. Err. | p value |
| Training received from the IP             | 0.3978        | 1.5000     | 0.789   | 1.8104        | 1.0572     | 0.087*  |
| Rice sold collectively                    | 2.2115        | 1.0661     | 0.038** | 1.6431        | 0.8411     | 0.051*  |
| Price of rice (/kg)                       | 0.0161        | 0.0141     | 0.255   | 0.0142        | 0.0111     | 0.201   |
| Distance to nearest market (kms)          | 0.0872        | 0.0626     | 0.163   | 0.0467        | 0.0546     | 0.392   |
| Quantity of rice sold                     | −0.0075       | 0.0049     | 0.127   | −0.0045       | 0.0027     | 0.100   |
| Mobile phone ownership                    | −3.5674       | 1.6101     | 0.027** | −0.9182       | 1.1939     | 0.442   |
| Ownership of radio                        | 1.1347        | 1.6394     | 0.489   | −0.3667       | 1.2396     | 0.767   |

Prob > chi2 = 0.0018***; Pseudo R2 = 39.41%
*p value significant at 10%; **p value significant at 5%; ***p value significant at 1%

Land size was found to influence decision to sell rice produced through LBDA and private millers relative to private traders. The results imply that farmers with more acreage under rice farming were 2.7 times more likely to sell output through LBDA and 2.9 (exp(0.9821)) times more likely to sell through private millers relative to Private traders, holding all other variables constant. This could be probably because farmers with large sizes of land are more likely to produce more output and hence they tend to rely on stable marketing channels as compared to unreliable private traders. The logic of the result is consistent with that of Tanguy et al., (2007) who reported that poorer households are less likely to participate in proper marketing channels.

Transport access also favoured the choice of LBDA and private millers as preferred marketing channels relative to private traders. From the model, the preference for these two marketing channels was at least 4.9 times (exp (1.60)) higher than that of private traders. This could be farmers with access to transport can deliver their produce to markets of their choice, especially if they offer better returns. Those without access are more likely to be left stranded and they may end up selling to village based private traders who more often offer lower returns.

Results also show that age of the farmer influenced the choice of a marketing channel. Younger farmers were more likely to sell their produce through LBDA relative to private traders. Perhaps, younger farmers are more proactive in finding better markets for their produce, unlike their older counterparts who as a result of not producing much, end up relying on private traders who normally go round in the villages on foot or bicycle looking for products (World, 2013). The aged are less likely to hustle to deliver their produce to distant markets so they tend to wait for private traders.

With regards to approach to selling rice, results reveal that rice farmers who sell their output collectively are more likely to sell their commodity through LBDA or private millers relative to private traders. The coefficients however reveal that LBDA will be preferred most as compared to private millers. The results imply that if farmers decide to sell collectively, they tend to approach markets that can buy large quantities of output. Private traders cannot buy all their produce in most cases and if they buy, they may not offer competitive prices. Since the innovation platform has been promoting collective marketing in Homa-Bay this result also implies that through the platform farmers have been urged to secure reliable markets for their produce for greater profits.
6. Conclusions and policy recommendations

6.1. Conclusions

This study has revealed some important information concerning the role of innovation platforms in improving decision making in marketing. Our findings show that extension, access to transport, interactive learning through the innovation platform, System of Rice Intensification (SRI) practice, group membership, distance travelled to the nearest main market, age, land size and use of cell phones influence smallholder rice marketing decisions. Decision making in rice has been highly improved through the innovation platform. We can conclude that market participation and choice of marketing channels has been greatly improved through the following:

(i) Linking farmers to markets, and advocating for decentralization of markets has improved market access as farmers now travel shorter distances to sell their rice output.

(ii) Training farmers in production, marketing and post-harvest handling have improved both market participation and choice of marketing channels.

(iii) Improved extension delivery, transport access and access to social capital are some of the drivers of improved marketing decisions. Improved extension through the platform, access to transport services through linkages to transport services from the platform and access to social capital from farmer groups have greatly improved farmer decision making in marketing. Levels of market participation have improved and farmers’ ability to weigh marketing options has been greatly enhanced as well.

The innovation platform through effective extension, training, access to transport services and market information has; improved physical access to markets, helped in removing institutional and policy-related barriers to markets and improved farmers’ capacities. This has improved information flow which then is promoting market participation and confidence in markets.
6.2. Recommendations
Participation in multi-stakeholder innovation platform activities highly influences marketing decisions. Market participation is enhanced as well as decisions on choice of markets to rely on improved. We thus recommend that governments embrace multi-stakeholder Innovation Platforms as a framework to improving farmer participation in rice markets and improving decision making when approaching available markets. This is important considering the role of markets in economic development. Improving participation in markets can help farmers move out of abject poverty and increase their income.

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