DETERMINANTS OF PARTICIPATION–DECISION IN VEGETABLE VALUE CHAINS: A GENDER PERSPECTIVE

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ABSTRACT

The main theme of this paper was to analyze the determinants of participation decision in Dugda district, Ethiopia with a specific focus on gender in onion and tomato value chain. A very large number of respondents at all stages of the value chain were interviewed. The analysis was made with the help of econometric models (Probit model). The findings revealed that for male-headed farmers, age of the respondents was a factor that hampers participation decision. Age of the respondent and distance from the nearest market were hindering decision to participate in marketing for FHH[5] and MHH[6]. Except marketing experience, all determinant factors of participation decision in MHH also determined FHH wholesaler actors. Distance from the nearest market, educational level, age of the respondent and ownership of mobile was inversely related to participation decision in female retailers. As a whole, the gender disparity was tilted towards male respondents. Therefore, to support the performance of the whole value chain and bring benefits to the entire community, special interventions should focus on women actors (producers, wholesalers and retailers) in the value chain.

Keywords: Female-headed, Gender perspective, Male-headed, Onion, women Participation, Tomato, Value chain

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[5] Female-headed household (the head of the household is woman or the house is headed by a woman)
[6] Male-head of the household (the head of the household is man or the house is headed by a man)

Introduction

Participation of female and male headed farmers in the market makes a substantial contribution to rural income growth and creates income diversification. Women and men become involved at different stages of the value chain as producers, wholesalers, retailers and consumers. In developing countries, participation in agricultural markets by men and women actors is a significant approach for reduction of poverty and alleviation of hunger (Heltberg and Tarp, 2002). Participation in agricultural markets takes away opportunities basic for improving income, livelihoods and sustainable development for female and male headed vegetable farmers (Bienabe et al., 2004). However, it is a challenge for farmers to participate profitably and sustainably in supply chains (Ortmarm, 2001).

Among 17 potential onion and/or tomato producing "kebeles" in the study district, only 21% of households were engaged in production. Despite this, there is a limited empirical evidence to inform policy makers on determinants of level of participation and decision in male and female headed actors on vegetable value chain. Understanding of socio-economic, psychological and demographic factors that affect both men and women market participation-decision and level of participation would provide a basis for policy makers to develop appropriate policy measures. It will help ensure that female and male headed vegetable actors improve their participation and increase agricultural production. This facilitates the nation's economic growth, alleviation of poverty and sustainable development to attain the future target of joining the world's 'middle-income' group of countries.

Participation decision in onion and tomato value chain is hypothesized to be affected by socio-economic, psychological, institutional, and demographic characteristics of the actors. Each value chain actor is different in many aspects: resource ownership, market orientation, access to services and markets which contribute to different decision-making behavior. Many studies were conducted in the past on marketing/ production participation-decision. Nevertheless, none of these studies attempted to identify determinants of participation-decision in onion and/or tomato value chain that focused on gender questions in Ethiopia. The objective of this paper is, therefore, to identify the determinants of participation-decision of men and women actors in the chain.

Methodology

The study was conducted in Dugda *district*, Ethiopia. Formal survey was conducted with onion and/or tomato value chain actors such as producers, wholesalers and retailers. Formal survey for producers was conducted in Dugda district in eight different Kebeles while six cities/towns (Meki, Adama, Modjo, Bishoftu, Dukem and Addis Ababa) were identified for wholesalers and retailers survey.

Producers' survey

Multistage sampling technique was used to draw the sampling units of the study. At the first stage, Dugda district were purposively selected due to extensive coverage and production of onion and tomato. Melkasa Agricultural Research Center has released improved onion and tomato varieties particularly for the study district and improved agricultural inputs utilization as well as wide demonstrations on onion and tomato in Dugda. Dugda district has 39 kebeles and out of which 16 kebeles are major growers of onion and tomato. In the second stage, eight kebeles in the district were selected randomly. Of which 50 percent of the potential area were covered by the sample. The sampling frame of this study was freshly prepared in consultation with Development Agents of the selected kebeles and it was include the producers of onion or tomato or both in the kebeles of Dugda district. The third stage of the sampling procedure, respective sampling frame was stratified as male-headed and female-headed households. Finally, the number of respondents was determined by using probability proportional to size sampling procedure. Then the predetermined size of the sample farmers from each kebele was randomly selected using systematic random sampling technique.

To determine the required sample size, this study was applied a formula developed by Yamane (1967) provided below, at 95 percent confidence level and 10 percent non-response rate.

$$n = \frac{N}{1 + N(e)^2}$$

n= sample size for the research use

N= total number of household heads producing onion and/or tomato vegetables

e= margin of errors at 5percent and 10 percent non-response rate

Out of the total 188 female-headed households and 1032 male-headed households' producers, 100 FHH and 280 FHH representative onion and/or tomato farmers were selected using simple random sampling methods. To select non-participant producers, the same procedure was followed as producers. To this effect, 62 FHH and 324 MHH non-participants were selected out of 462 FHH and 2402 MHH non-participants, respectively. Interviews were conducted from November to May 2013 using structured questionnaire by trained interviewers.

Wholesaler's survey

To conduct formal survey with traders, sample frame was developed by taking a count of vegetable (tomato and onion) retailers and wholesalers in the six main open markets; Meki, Adama, Modjo, Bishoftu, Dukem and Addis Ababa. These cities/towns were purposively selected, due to the high proportion of onion and/or tomato flow. The number of vegetable retailers' and wholesalers' in Meki, Adama, Modjo, Bishoftu, Dukem and Addis Ababa was estimated. After estimating the number of retailers and wholesalers, the sampling frame was stratified as MHH and FHH retailers and wholesalers. Finally, a proportion to size was taken. Finally, out of the 400 household heads tomato and onion wholesalers, 293 household heads (261 MHH and 32 FHH) tomato and onion wholesalers were selected. Regarding non-participant wholesalers, out of the 235 household heads, 173 (131 MHH and 42 FHH) were selected. A total of 466 wholesale household heads were randomly sampled and interviews were conducted in April 2013 using structured questionnaire by trained interviewers.

Retailers' survey

Same procedures were followed to select retailers. Out of the 935 vegetable retailers, a total of 308 retailers were selected which is 42 MHH and 266 FHH retailers were selected. All of these actors were selected on market day, Saturday and Thursday. After estimating the number of these actors, a proportion to size were taken and simple random sampling was employed to select actors. Interviews were conducted in April 2013 using structured questionnaire by trained interviewers. In the case of retailers, some retailers trading only tomato, others trading only onion and others trading both tomato and onion were considered participant retailers. As it is mentioned in producers sample determination, sample size was determined using a simplified

formula provided by Yamane (1967). Both licensed and unlicensed traders were included in the traders' survey.

Data analysis

Data analysis employed descriptive statistics (such as percentage and mean comparison), t-test, chi-square, Probit, to identify the determinants of participation decision of actors (farmers, wholesalers and retailers). An econometric Software known as STATA window-12 was employed.

In the first-stage (Probit), farmers and traders make a discrete decision whether or not to participate in onion and/or tomato production and trading. Before running the models, it was necessary to test multicolinearity problem among continuous variables and check associations among discrete and dummy variables, which seriously affects the parameter estimates. There are two measures that are often suggested to test the existence of multicollinearity (Gujarati, 2003). Namely: VIF (variance inflation factor) and Contingency coefficients. The results showed that multicollinearity absence of serious multicollinearity problem among independent continuous variables.

Hypothesis of the study and Theoretical relationships of variables

Definition	Symbol	Type of Variable	Hypothesized Sign
Participation decision: respondents who participate in onion and/or tomato production in 20011/12. (1= yes and = 0 otherwise)	PARTD	Dummy	Dependent
Level of Participation: Quantity of vegetables produced in quintals 2011/2012 production season.	LEVPA	Continuous	Dependent
Respondents age (Years)	AGEHH	Continuous	(+)
Education level of household head (1= illiterate, 2= read & write, 3= primary 1st cycle,4= primary 2nd cycle,5= Secondary 1st cycle...	EDUCA	Discreet	(+)

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235

6=preparatory,7=higher)

Definition	Symbol	Type of Variable	Hypothesized Sign
Family Labour (man equivalent).	LABOR	Continuous	(+)
Land hold of household(Hectare)	LANDH	Continuous	(+)
Utilization of credit (1=, if yes; 0=, otherwise)	CREDT	Dummy	(+)
Social participation(it is the combination of the role of leadership and frequency of participation, in score)	SOCAL	Continuous	(+)
Participation in income generating non-farm activities (1= if yes; 0= Otherwise)	NOFAR	Dummy	(+)
Distance of the respondents' house from input and output market (km)	DSTNT	Continuous	(-)
Achievement motivation (1=low, 2= medium, 3=high)	ACHIV	Discreet	(+)
Level of aspiration in score(1=low, 2= medium, 3=high)	ASPIR	Discreet	(+)
Ownership of mobile phone(1= if yes; 0= otherwise)	MOBIL	Dummy	(+)
Ownership of water pump(1=, if yes; 0=, otherwise)	H2OPM	Dummy	(+)

Definition	Symbol	Type of Variable	Hypothesized Sign
Participation decision: respondents who participate in onion and/or tomato trading in 20012/13. (1= yes; and 0 = otherwise)	PARTD	Dummy	Dependent
Level of Participation: Quantity of vegetables holding (in quintals/week).	LEVPA	continuous	Dependent
Respondents age (Years)	AGEHH	Continuous	(-)
Educational level of household head (1= illiterate, 2=read & write, 3= primary 1st cycle,4= primary 2nd cycle,5= secondary 1st cycle, 6=preparatory,7=higher)	EDUCA	Discrete	(+)
Family Labour (man equivalent)	LABOR	Continuous	(+)
Participation in social organization (1=, if yes; 0=, otherwise)	SOCAL	Dummy	(+)
Distance of the respondents' house from the nearest market (km)	DSTNT	Continuous	(-)
Experience of household in onion and/or tomato trading (years)	EXPER	Continuous	(+)
Ownership of mobile phone(1=, if yes; 0=, otherwise)	MOBIL	Dummy	(+)

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236

Table1. Symbol, definition and hypothesized sign of variables by traders

Table 2. Symbol, definition and hypothesized sign of variables by producers

Results and Discussions

Econometric Analysis Results

The econometric regression analysis was intended to examine the determinants of the probabilities of households' participation-decision in onion and/or tomato value chain in each stage of the value chain. The analysis was also undertaken separately for men and women actors in the chain. The analysis of probit model was done separately for producers, wholesalers and retailers. The first-stage probit model estimation was used to determine the probabilities of households to participate in onion and/or tomato value chain. It is summarized consecutively in Tables 3, 4 and 5.

I. Determinants of Producers' participation in onion and/or tomato production

The analysis of the first-stage probit model estimating the determinants of likelihoods of households to participate in onion and/or tomato production is given in Table 3. The probit maximum likelihood method was employed to estimate the participation-decision in onion and/or tomato production. The Table also contains the values of marginal effects. The model was highly significant with a Chi-square value of 639.90, 515.93 and 133.30 in pooled data set, MHH and FHH, respectively. This confirms that collectively the explanatory variables entered into the probit model regression explain the variations in the farmers' probability to participate. The log likelihood ratio test is used to compute the total pool significance of the explanatory variables in explaining the variations in FHH and MHH farmers' likelihood to participate in production. The log likelihood ratio analysis of the null hypothesis showed that all coefficients are jointly zero.

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237

The first stage probit model explains 60%, 62% and 62% of the variations in the likelihood of participation in pool data set, MHH and FHH, respectively. It predicts about 95% of the cases correctly.

Due to lack of variability, market information and experience in onion and/or tomato farming were excluded from the regression. The remaining potential variables proposed to affect participation in production have been entered into the model. The result indicated that eight variables in the case of FHH and MHH were found significant.

Table 3. First-stage probit estimation of participation to produce onion and/or tomato

Explanatory Variable	Pooled (N=766)		MHH (N=604)		FHH (N=162)	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
AGEHH	-0.02(-2.34)**	-0.007	-0.021(2.59)***	-0.008	0.010(0.45)	0.003
GENDR	-1.45(-6.56) ***	-0.489	------	-----	____	-----
EDUCA	0.42(5.49) ***	0.166	0.386(4.73) ***	0.152	0.933(2.93)***	0.266
LABOR	0.05(0.87)	0.022	0.066(0.9)	0.026	0.164(0.97)	0.047
DSTMA	-0.10(-5.93) ***	-0.042	-0.096(-4.65) ***	-0.038	-0.165(-3.73)***	-0.047
CREDT	0.58(3.46)	0.224	0.664(3.49) ***	0.260	0.214 (0.53)	0.058
NOFAR	0.07(0.43)	0.026	-0.018(-0.1)	-0.007	0.392(1.13)	0.113
SOCAL	0.03(0.71)	0.011	0.057(1.29)	0.022	-0.165(-1.69)*	-0.047
H2OPM	1.94(11.09) ***	0.654	2.112(9.62) ***	0.705	1.387 (4.05)***	0.377
LANDH	0.20(4.41) ***	0.079	0.181(3.79) ***	0.071	0.391(2.58)***	0.111
ACHVM	0.09(2.83) ***	0.036	0.083(2.32) **	0.033	0.248(2.96)***	0.071
ASPIR	-0.11(-1.78)*	-0.046	-0.083(-1.13)	-0.033	-0.363(-2.24)**	-0.104
MOBIL	1.63(8.75) ***	0.569	1.868(7.54) ***	0.588	1.343(3.92)***	0.420
Constant	-1.85(-2.3) **	-	-3.550 (-3.67)***	-	-3.756(-1.81)*	-

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238

LR chi2(13) = 639.90 ***   LR chi2(12)= 515.93***   LR chi2(12)= 133.30***

Log likelihood = -210.98   Log likelihood= -159.09   Log likelihood=-41.14

Source: survey data, 2013. ***, ** & * represents 1%, 5% and 10% level of significance, respectively. Figures in parenthesis are z-ratios.

Contrary to the hypothesis, age of MHH is negatively associated with farmers' likelihood to participate in production and is statistically significant at less than 1% significance level. As a household head's age increases by a year, the probability of that household participating in production decreases by 0.8%. The negative association suggests that the likelihood of participation in production declines as the age of the farmer increases. The possible reason might be younger farmers are more knowledgeable and are likely to bear risks due to longer planning horizon than aged ones. Similarly, Tshiunza et al. (2001) conducted a study in Nigeria and confirmed that older farmers are inclined to produce and sell less cooking banana for the market than younger farmers.

As expected, educational level of the household is positively associated with FHH and MHH farmers' likelihood to participate in tomato and onion production. This indicates that educational level of FHH and MHH farmers' increases the probability of participating in production by 26.6% and 15.2%, respectively. Also, as expected, distance to the nearest market centre is statistically significant and negatively associated with FHH and MHH farmers' likelihood to participate in tomato and onion production. This indicates that as a farmer's distance from the nearest market centre increases by a km, FHH and MHH likelihood to participate in production decreases by 4.7% and 3.8%, respectively.

In line with prior expectation, utilization of credit by MHH is positively associated with farmers' likelihood to participate in production. The probability of participating in production increases by 26% for MHH who use credit. Ownership of water pump is positively associated with FHH and MHH household's decision to participate in production and the effect is statistically significant. This indicates that the probability of participating in onion and/or tomato production increases by 70.5% and 37.7% for MHH and FHH farmers who had water pumps, respectively. As hypothesized, ownership of mobile phone influenced the farmers' decision to participate in

onion and/or tomato production positively. This indicates that ownership of mobile phones increases the probability of participating in production by 58.8% and 42% for MHH and FHH, respectively. Land holding was found significantly associated with the hypothesized sign. As land holding increases, the probability to participate will increase by 7.1 % for MHH and 11.1% for FHH.

Level of aspiration and social participation were found significant and came up with negative signs against the expectation and these need further research. As hypothesized, the probability of participating in production increases by 7.1% for FHH and 3.3% for MHH who had high level of achievement motivation.

II. Determinants of wholesalers' participation in vegetable trading

The wholesalers' probit model has been computed with the help of maximum likelihood method. The overall model is significant at 1% probability level as indicated by the log likelihood value of -150.79. This implies that the model appears to fit well with the data (Table 4). Due to lack of variability, ownership of a mobile phone was excluded from the model.

The results indicated that age of the household, educational level, distance from the nearest market, experience and participation in social organizations played a significant role in the probability of marketing participation-decision in men wholesale actors. Except experience, factors determining men participation-decision in wholesaling of onion and /or tomato also determined women participation.

The marginal effects of onion and/or tomato marketing indicate that the probability of marketing participation increases by 16.6% and 20. 8% as educational level increases in men and women, respectively. The probability of marketing participation increases by 40.7% and 49.5% as social participation increases by a member in men and women wholesalers, respectively. However, the probability of marketing participation decreases by 2.8% and 3.1%, for men and 3.4% and 13.4% for women wholesalers as household age increases by a year and a km distance away from the nearest market, respectively, confirming the hypothesis.

Contrary to prior expectation, experience of the household head is negatively associated with men wholesalers' likelihood to participate in marketing and is statistically significant at less than 1% significance level. As a household head's experience increases by a year, the probability that the household participates in marketing decreases by 2.3%. The plausible explanation for this result is that experience does not have much to do with trading as it does with farming. Similar

Explanatory Variable	Pooled (N=466)		Men (N=392)		Women (N=74)	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
AGEHH	-0.098(-6.7) ***	-0.03	-0.09(-5.86) ***	-0.028	-0.10(-2.35) **	-0.034

findings by Rehima (2006) who conducted a research in Ethiopia indicated that there is a negative and significant relationship between wholesalers experience and marketing participation decision.

Table 4. Probit estimation of participation to marketing of onion and/or tomato (wholesalers)

GENDR	0.764(3.41) ***	0.28	------	------	--------	-----
EDUCA	0.559(8.32) ***	0.19	0.55(7.46) ***	0.166	0.58 (3.44) ***	0.208
LABOR	-0.042(-0.63)	-0.01	-0.08 (-1.06)	-0.023	0.16(0.78)	0.055
DSTMA	-0.135(-2.71) ***	-0.05	-0.10 (-1.92) **	-0.031	-0.37(-2.32) **	-0.134
EXPER	-0.071(-4.34) ***	-0.02	-0.08(-4.28) ***	-0.023	-0.06(-1.33)	-0.022
SOCAL	1.248(6.98) ***	0.44	1.21(6.28) ***	0.407	1.60(2.76) ***	0.495
Constant	2.027(-2.76) ***	----	2.64 (3.34) ***	-	1.81(0.88)	-

LR chi2(7)   = 313.18***   LR chi2(6)   = 247.09***   LR chi2 (6)   = 57.17 ***

Log likelihood = -150.79   Log likelihood   =-126.20   Log likelihood=   -22.03

Source: survey data, 2013. ***, ** & *, represents 1%, 5% and 10% level of significance, respectively. Figures in parenthesis are z-ratios.

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242

III Determinants of retailers' participation in vegetable trading

The retailers' Probit model results are presented in Table 5. The analysis was done for men and women separately. The Probit model was statistically significant with a Chi-square value of 39.02 in men and 53.70 in women, and 95% of the observed outcomes are correctly predicted. In the first stage, Probit maximum likelihood method was applied to compute the decision to participate in onion and/or tomato market. Out of the potential variables, a total of seven predicted variables (five continuous and three discrete) were selected and included in to the Probit model. It has been found that seven variables in the case of women retailers and pooled data set and one variable in the case of men retailers were found significant.

Table 5. Probit estimation of participation in marketing of onion and/or tomato (Retail actors)

Variables	Pooled (N=308)		Men (N=42)		Women (N=266)	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
AGEHH	-0.03(-2.72) ***	-0.010	-0.08(-1.03)	-0.031	-0.02(-2.43) **	-0.009
GENDR	-0.44(-1.88) *	-0.171	------	----	------	-----
EDUCA	-0.01(-0.14)	-0.003	1.75(2.56) ***	0.683	-0.16(-2.14) **	-0.053
LABOR	0.21(2.73) ***	0.081	0.66(1.5)	0.256	0.17(2.01) **	0.062
DSTMA	-0.14(-3.46) ***	-0.052	-0.11(-0.95)	-0.042	-0.12(-2.7) ***	-0.047
EXPER	0.03(2.65) ***	0.013	0.01(0.06)	0.002	0.03 (2.12) **	0.010
MOBIL	-0.36(-2.26) ***	-0.135	1.22(1.09)	0.449	-0.37(-2.16) **	-0.135
SOCAL	0.68(3.89) ***	0.262	1.08(1.31)	0.386	0.68(3.6) ***	0.264
Constant	0.66(1.52)	-	-5.91(-1.73) ***	-	1.16(2.4) **	-
LR chi2(8) = 66.78***			LR chi2(7) = 39.02***		LR chi2(7) = 53.70***	
Log likelihood =-173.40			Log likelihood=-9.41		Log likelihood= -148.74	

Source: survey data, 2013. ***&**, represents 1% and 5% level of significance, respectively. Figures in parenthesis are z-ratios.

As hypothesized, age of the respondents, experience, distance from the nearest market, family labour and social participation influenced women retailers' decision to participate in tomato and/or onion marketing significantly. In contrast to prior expectation, educational level of the household and ownership of a mobile phone influenced women retailers' marketing participation negatively. The plausible explanation for this result is that educational level and ownership of a mobile phone are directly related to retailers getting educated and becoming financially better off. Thus, they may get out from the retailing business activity because retailing is considered by the community as a low status job. This is consistent with the findings of Neema et al. (2013), Biggs and Shah (2006) reported that better educated women entrepreneurs are more likely to engage in big business than entrepreneurs with low levels of education.

The probability of marketing participation in women retailers decreases by 0.9%, 5.3%, 4.7%, and 13.5% as household age increases by a year, education increases by one level, distance away from the nearest market goes up by one kilometre and household heads' have a mobile phone, respectively. As women retailer's experience, family labour and membership in social organizations increases, probability to participate in tomato and/or onion marketing increased by 6.2%, 1%, and 26.4%, respectively. As expected, educational level of the household head influenced men retailers' marketing participation positively. The marginal effect of educational level indicates that the probability of marketing participation increases by 68.3% as man's education increases by one level.

Conclusions and Policy Implications

This paper aimed at providing a deeper understanding of onion and tomato value chain in Ethiopia with a specific focus on gender. In this study, determinants of onion and tomato farmers', wholesalers' and retailers' participation-decision have been analyzed using probit. Onion and tomato are major crops helping to enhance Ethiopia's economic growth. Gender difference has a significant impact on production and marketing participation-decision in each value chain stages. Results from the field data shows that women farmers and wholesalers had lower participation in production and marketing compared with men counterparts. This indicated that, production and wholesale chains were dominated by men, whereas retailing chain was

dominated by women actors, implying there were gender disparities in the various value segments. As a whole, among all other actors in onion and tomato value chain, the gender disparity tilted towards men's favour.

Based on the empirical conclusions of the study, the following recommendations have been forwarded:

The result of the study confirmed that gender disparity titles towards men respondents. This means that interventions targeting women actors would only be confined to retailers where women respondents were the majority in the onion and tomato value chain. A possible justification for this is that female-headed households have resource constraints, thus affecting their participation in production and wholesale activities. Besides, they are highly responsible in relation to securing food for the family. To support the performance of the whole value chain and bring benefits to the entire community, special interventions should focus on women actors (producers, wholesalers and retailers) in the value chain. This suggests that improved women actors participation in production and marketing, might increase the impact of policy interventions that intended to improve market access. Age of the farmers is a factor that is hampering participation-decision. This suggests that the likelihood of participation in production declines as age of farmers increases. Therefore, it is imperative to conduct periodic experience-sharing among young and old age producers.

Generally, findings of the study lend support to the advocacy for policies that encourage investment in public infrastructure, extension services and training, arranging field visits, and sharing experiences. Farmers' production as well as marketing through greater opportunities for education and training would have positive result to increase vegetable value chain actors' participation-decision. In order to realize the country's long-term vision of food security and achieve agricultural and rural development, all the determinants of participation-decision that were analyzed above should be considered by policy makers as a springboard for intervention measures.

Acknowledgement

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