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Towards high value markets: a case study of smallholder vegetable farmers in Indonesia

RESEARCH ARTICLE

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Abstract

The expansion of modern markets has significant implications for agriculture in many developing countries that provides both opportunities and challenges for smallholder farmers. The purpose of this paper is to analyse key determinants affecting farmers' participation in high value markets, compared to traditional market. Face to face interviews based on a questionnaire were conducted with a sample of 126 smallholder vegetable farmers in the Manokwari region. Binary logistic regression and bivariate correlation analysis were used in this study. The results suggested that age, education level, vegetables cultivated area and membership in farmer groups/cooperatives were the key determinants that had significant effects on the smallholder farmers' decision about marketing channel participation. In addition, the income generated from vegetable farming was positively correlated to high value market participation. Some implications that need to be prioritized in agricultural development strategies include improving technical innovations and empowering collective actions through cooperatives or farmer groups.

Keywords: Indonesia, high value market, market channel decisions, traditional market, vegetable farmers
JEL code: Q13

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1. Introduction

Agrifood systems in developing countries, including Indonesia, are rapidly changing towards high value markets (Imami *et al.*, 2013; Reardon *et al.,* 2012). The development of global food retailers has taken place in this country for more than two decades. Moreover, modern food markets in Indonesia are currently not only being developed in major cities, but have also been mushrooming into provincial cities, and reaching rural and distant communities (Suryadarma *et al.*, 2010). For small-scale farmers, this phenomenon could present better economic opportunities (e.g. increased incomes, productivity and welfare) however it can also bring some challenges (e.g. higher product standards and quality requirements).

A number of previous studies have attempted to investigate smallholder participation in modern market channels. While some studies concluded that smallholder farmers would get obvious economic opportunities from being linked to high value markets (Hernandez *et al.,* 2007; Miyata *et al.,* 2009; Rao and Qaim, 2011), other studies found that there were challenges limiting smallholder farmers' participation (Boselie *et al.,* 2003; Reardon *et al.,* 2009).

There have been no clear conclusions about whether smallholder farmers can effectively participate in high value market chains. According to Reardon *et al.* (2009), in the dual-scale case, modern food markets are likely to source from commercial and large farmers, and exclude smallholder farmers.

Linking smallholder farmers to high value markets is crucial for the Indonesian economic development agenda. This is because the majority of Indonesian people depend on agriculture for their living. According to the 2013 Indonesian Agriculture Census, total agricultural households had reached 25.75 million, and 55.33% were engaged in small scale farming activities (Statistics Indonesia, 2014). In addition, approximately 85.14% of smallholder farmers in Indonesia live in rural areas (Ministry of Agriculture, 2014) with associated problems such as limited access to farm assets, infrastructure, markets, and institutional support. These fundamental issues often reduce smallholder farmers' abilities to escape from poverty. Thus, considering the growth of agrifood market transformation throughout the country, participation of smallholder farmers in high value markets can be a significant alternative for rural development and poverty alleviation strategies.

Literature regarding smallholder farmer participation in high value markets in the Indonesian context is still limited. Previous studies have investigated the importance of smallholder farmer participation, and its implication for farmer welfare (Simmons *et al.,* 2005), and changes and consequences of the emergence of modern food retailers for the agricultural supply chain (Chowdhury *et al.,* 2005). However, these studies took place in West Indonesian regions that are more developed in terms of accessibility of production inputs and basic infrastructure, such as transportation, information, and communication technologies.

There is very limited information available regarding the linkages between modern food markets and smallholder farmers in underdeveloped regions, especially in the eastern part of Indonesia. Therefore, this study focuses on smallholder vegetable farmers in the Manokwari region, Papua Barat province of eastern Indonesia. In this region, even though traditional market channels are still dominant, modern retail store formats are also emerging rapidly. Modern market formats in the Manokwari region have emerged since the early 2000s, despite being dominated only by home-grown supermarkets and food stores (Ministry of Agriculture, 2014). Since 2010, the modern food retail sector, taking the format of supermarkets, has started growing in the city of Manokwari. This situation brings new opportunities for smallholder farmers to be involved in the growing modern market channels. Therefore, the purpose of this research is to analyse the key factors affecting smallholder farmers' participation in high value markets, compared to the traditional market in Indonesia and Manokwari region in particular. This study also describes the current situation of Indonesian vegetable growers and markets, and analyses the impact of market participation on farmers' income.

2. Literature review

Various studies have investigated a variety of determinants that affect smallholder farmers' decisions to be involved in modern market channels (Neven *et al.*, 2009; Reardon *et al.*, 2009; Schipmann and Qaim, 2010). These studies have conceptualised the decisions of smallholder farmers to participate in modern market chains as 'technology adoption of product marketing'.

Schipmann and Qaim (2010) identified three possible aspects/factors that influence farmers' decision making to participate in high value markets, including the personal and household aspect, the farm and household aspect and the contextual aspect. Personal and household aspects relate to the demographic variables of farmers such as education, age, farming experience and household size (Miyata *et al.*, 2009; Schipmann and Qaim, 2010). The influence of demographic variables, incentives and capacity on smallholder farmers' participation in high value markets has not been uniforms across different industries and countries (Blandon *et al.*, 2009; Miyata *et al.*, 2009; Neven *et al.*, 2009; Rao *et al.*, 2012). While some studies show that farmers who supply high value markets have a higher education level than traditional market suppliers (Neven *et al.*, 2009; Rao and Qaim, 2011; Schipmann and Qaim, 2010), others found that there was no correlation between level of education and market participation (Hernandez *et al.*, 2007; Blandon *et al*., 2010). Regarding farmer age, some studies provide information that younger farmers tend to be modern market suppliers (Blandon *et al*., 2010; Hernandez *et al.*, 2007; Schipmann and Qaim, 2010). However, Neven *et al.* (2009) claimed that there is no association between age and market channel choice of smallholder farmers. Household was another aspect in determining farmer marketing decision. Hernandez *et al.* (2007) and Rao and Qaim (2011) found that household size has a negative correlation with the farmers' adoption of modern market chains. Miyata *et al.* (2009) however found that household size was not different between modern and traditional market suppliers.

Farm aspects include farm size, land ownership and irrigation (Schipmann and Qaim, 2010). Neven *et al.* (2009) found that smallholder farmers who owned relatively large farms are likely to sell produce to supermarkets. This finding is similar to cases such as sweet peppers in Thailand (Schipmann and Qaim, 2010), vegetable growers in China (Wang, Zhang, and Wu, 2011), and vegetable farmers in Kenya (Ismail *et al.*, 2013). Conversely, in some cases, farm size has no significant effect on the decision of smallholder farmers to participate in high value markets, such as the tomato growers in Guatemala (Hernandez *et al.*, 2007), apple growers in China (Miyata *et al.*, 2009) and fresh fruit and vegetable farmers in Honduras (Blandon *et al.*, 2009). Having a larger farm area allows farmers to cultivate larger crop areas for selling to modern market chains. The influence of irrigation on the marketing decision of smallholder farmers is found to be various in different studies. Hernandez *et al.* (2007) state that irrigation technology applied by smallholder tomato growers in Guatemala correlated to the decision to participate in modern market supply chains. This is similar to the study of vegetable farmers in Kenya (Neven *et al.*, 2009), indicating that the irrigation infrastructure has a significant effect on market channel adoption. Conversely, studies of Miyata *et al.* (2009) in China, Blandon *et al.* (2009) in Honduras, and Rao *et al.* (2012) in Kenya found that irrigation technology had no influence on farmers' decisions to participate in high value market chains.

Contextual aspects relate to access to services and road conditions (Schipmann and Qaim, 2010). In the developing countries, the distance to marketplaces is also an important factor for farmers in terms of product delivery. Some studies have looked at how the distance or location of a farm can encourage smallholder farmers to participate in high value market chains. Miyata *et al.* (2009) found that distance is a strong explanatory variable determining smallholder farmers' decisions to participate in such chains. Smallholder producers who live near the major village significantly tend to sell to high value markets. Similarly, Rao and Qaim (2011), incorporating farmers' access to the main road as a predictor in their analysis, found that it gave an advantage for vegetable producers to supply supermarkets that demand a stricter schedule of delivery.

Reardon *et al.* (2009) and Pascucci (2011) provide alternative frameworks categorising the determinants of market decisions into (1) the incentives in the modern market channels, and (2) the capacity of smallholder farmers to adopt the technology.

Regarding the incentive factors, there are two aspects that should be considered by smallholder farmers. The first aspect relates to the net premium prices paid by high value markets, which are relatively higher than the price paid by wholesalers in traditional market channels (Reardon *et al.*, 2009). For example, Neven *et al.* (2009) found that supermarkets in Kenya paid horticultural suppliers about 10-20% more than what they got in the traditional market. Likewise, nearly 60% of smallholder vegetable producers supplying supermarket chains in Honduras received higher prices than from traditional market channels (Blandon *et al.*, 2009).

The second aspect of incentive factors is the relative risk and cost. Reardon *et al.* (2009) emphasised that farmers should also consider the possibilities of risk and the cost of farm production and post-harvest handling technologies to deal with the quality and transactional requirements needed by modern market channels. Blandon *et al.* (2009) included the farmers' perception of risk as an independent variable in the farmers' participation model, and revealed that the perceived risk of low quality causing product rejections significantly influenced smallholder farmers' market decisions. However, the perceived risk of product losses due to bad weather or pests was not found to be an important factor. Moreover, smallholder farmers often experience additional costs derived from barriers of entry to high value markets. Reardon *et al.* (2009) highlighted that these costs reduce smallholder farmers' choice of participation in supermarket channels. In addition, transaction costs derived from poor transportation and communication conditions can also affect smallholder farmers' adoption of modern market channels (Rao and Qaim, 2011). Smallholder farmers living further from urban areas and cities, with poor access to transportation and communication, face high additional costs and are less likely to be offered contracts by modern food markets (Barrett *et al.*, 2011).

The second set of determinants of farmers' marketing decision is farmers' capacity. The capacity variables refer to investments of various forms of capital by farmers to access high value markets, including physical farm assets, collective capital, and institutional capital (Reardon *et al.*, 2009). Physical capital can include land and non-land assets, such as equipment and irrigation that is needed to meet quality and consistency requirements of the high value markets.

The emergence of new procurement practices of high value markets forces actors along the supply channels, including farmers, to make investments in social or collective capital. Farmers' organizations or cooperatives can also play crucial roles in facilitating smallholder farmers to gain access to modern markets by investing in collective capital such as warehouses and vehicles (Pascucci, 2011; Reardon *et al.*, 2009). These collective investments can help smallholder farmers to reduce transaction costs (Hellin *et al.,* 2009). The involvement in farmer organizations provided a higher chance for smallholder vegetable growers to access supermarket channels in Kenya (Ismail *et al.*, 2013). However, the case of tomato growers in Guatemala (Hernandez *et al.,* 2007) provided an opposite finding. The effect of farmer organization was significant, but negative. In this case these organizations were not marketing organizations, but just provided technical assistance and training.

Furthermore, smallholder farmers also need to invest in institutional capital. This capital is associated with the embodied relationships between farmers and institutions such as companies, non-government organizations (NGOs) and the government (Reardon *et al.*, 2005).

Previous studies have also identified several key challenges for farmers' participation in high value markets such as limited access to market information, poor basic infrastructure (transport and communication) in rural areas, low bargaining position due to the low volumes of outputs supplied and lack of physical, financial and human capital (Barrett *et al.*, 2011; Berdegue *et al.,* 2005; Blandon *et al.,* 2009; Irianto and Herwanto, 2009; Neven *et al.*, 2009; Reardon *et al.*, 2009). These barriers, contributing to the exclusion of smallholder farmers, can vary from case to case.

In line with the literature, the framework used in this study captured farmers' demographics (age, education, experience, family size), farm characteristics (farm size, irrigation, livestock ownership), marketing characteristics (average price, income, market information, transportation, distance to supermarkets) and institutional characteristics (access to credit, extension services, farmer's organization membership) as independent variables in analysing the determinants affecting market channel choice of smallholder vegetable farmers in eastern Indonesia. The theoretical framework is shown in Figure 1.

3. Methodology

3.1 Data and methods

This study utilised a quantitative approach to achieve the research aim. A structured survey was used as the primary data collection that was carried out over the period September to October 2014. The survey was conducted in three sub-districts; Prafi, Manokwari Selatan and Manokwari Barat (Figure 2). These sub-districts were selected because of their high production of vegetables complemented with agro-climatic conditions that were favourable for growing an array of non-perennial vegetables.

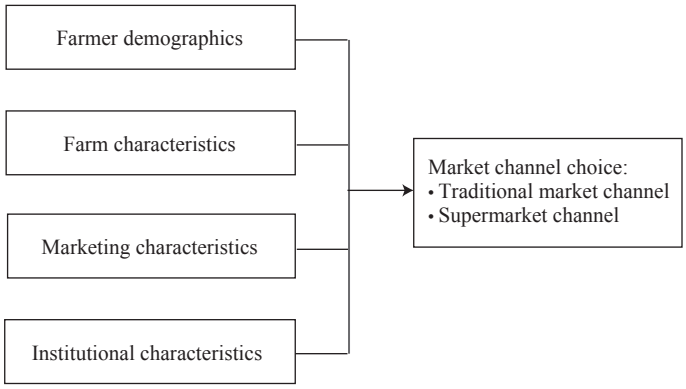

Figure 1. Theoretical framework.

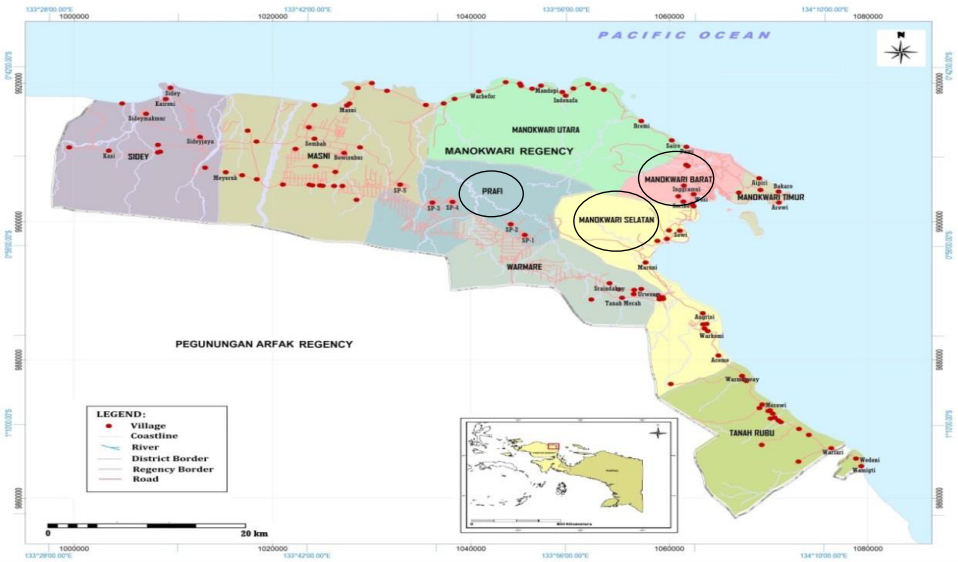

Figure 2. Map of Manokwari region showing the study sites.

Therefore, a two stage non-probability sampling method was used for data collection i.e. purposive and convenience sampling techniques. Purposive sampling helped identified the sub-districts where high production of vegetables was concentrated. Within the selected sub-districts, convenience sampling technique was used for the selection of respondents (Poole *et al.,* 2003; Siddique and Garnevska, in press; Teddlie and Yu, 2007). This technique builds a sample on the basis of finding convenient or available respondents in the studies districts (Ruane, 2005). The main consideration for that was the unavailability of the population of vegetable farmers. However, with convenience sampling there is an issue of non-response bias that can be addressed through several ways like pilot testing, pre-scheduled meetings, long field times, and visiting in the fields/ work place (Fogelman and Comber, 2007). A pilot study, scheduled meetings and visiting respondents at their work place helped reduced non-response bias for this study. The face to face interviews, based on a structured questionnaire, was administered during visits to vegetable farms or farmer homes in the three sub-districts of east Indonesia. The data was collected in a short interval of time, from September to October 2014, and a total of 135 respondents were interviewed. The data was incomplete for 9 respondents and were removed and a total of 126 smallholder vegetable farmers' data were included in the final analysis. It included both types of farmers i.e. supplying high value markets/supermarkets and farmers supplying traditional markets. The sampling technique, small sample size, limited time and resources are the limitations of this study; however, it still provides meaningful insight about the farmers' participation in modern supply chains in Indonesia and Manokwari region in particular. These limitations of the study also render its scope, lack of generalization and essentially make it area specific.

Data was analysed using the Statistical Package for Social Sciences (SPSS version 22, IBM, Armonk, NY, USA). Initially a cleaning process was performed to ensure its completeness and validity. This process included checking for logical inconsistencies, outliers and missing values. In order to avoid these data problems, the values of means and standard deviations of variables were produced. Based on these values, there was no missing values found, but some outliers were identified. The outliers were treated by replacing them with the mean values of each variable.

This study utilized binary logistic regression analysis to examine potential factors affecting farmers' decisions about market channel participation. A binary logistic regression is a type of regression models in which the dependent variable is a categorical dichotomy that takes only two values; zero and one (Wooldridge, 2013).

3.2 Model specification and variable description

The binary logistic regression model was used for the analysis since the probability of farmer responses were assumed as a binary choice due to the availability of only two marketing channels i.e. traditional and high value marketing channels. The dependent variable measured the choice of market channels (either modern supermarkets or traditional markets), while a set of independent variables were derived from farmer demographics, farm characteristics, marketing and institutional factors. These variables included in the analysis were in line with the literature and were also pre-tested before final data collection. Initially, the number of variables was more than what specified in the model. A pre-testing of questionnaire with all these variables was conducted with 8 respondents whose response was not included in the final analysis. A number of variables like gender, off-farm employment, total land, means of transportation, etc. were removed after pre-testing. All the respondents in pre-testing identified and responded to the following variables that were included in the final model showing that these variables play a decisive role in the choice selection between traditional and high value markets.

The empirical model for analysis in this research can be expressed as:

$$\begin{aligned} \text{Prob}(MC = 1 \mid \text{x}) = {} & \beta_0 + \beta_1 AGE + \beta_2 EDU + \beta_3 EXPRNCE + \beta_4 FMLY\_SZ + \beta_5 VEG\_AREA \\ & + \beta_6 IRR + \beta_7 LVSTOCK + \beta_8 DIST\_SM + \beta_9 TRNS\_COST + \beta_{10} AV\_PRICE \\ & + \beta_{11} EXTN + \beta_{12} CREDIT + \beta_{13} MKT\_INFO + \beta_{14} FARMER\_GR + \mu \end{aligned}$$

The farmers' demographic variables included age of the farmers, education level, farming experiences, and number of family members. Farm characteristic variables included vegetable farm size, irrigation system and livestock ownership. Marketing aspects included in the model were distance from vegetable farms to supermarkets, estimated transportation cost, and average price received by farmers. Institutional factors included farmers' attendance of farming extension service, access to credit, access to market information, and farmer group membership (Table 1).

'Age' of the farmer represented the age of the vegetable farmer in years. It was claimed that younger farmers were expected to be more adventurous and more risk takers than older farmers. Thus it was expected to be negatively correlated with high value market participation. *Education* of the farmer that was measured in years of schooling was expected to have a positive effect on supermarket participation (Gong *et al.*, 2007). 'Farming experience' was predicted to have a positive influence on modern market participation (Ouma *et al.*, 2010; Shiimi *et al.,* 2012). 'Family size' was predicted to be negatively associated with high value market participation (Balint and Wobst, 2006; Hernandez *et al.*, 2007; Rao and Qaim, 2011). These studies argued that larger households tend to have more dependents and their production activities might be more subsistence oriented.

'Vegetable area' was hypothesised to have a positive influence on the marketing decision to sell at modern markets. Having larger cultivated areas could allow the household to have a surplus in production and be in position to sell (Balint and Wobst, 2006). 'Irrigation' was essential for commercial agriculture. Having irrigated area could increase farmers' possibility to participate in high value markets. This variable was set as a dummy variable taking the value of one if the farmer had irrigation system and zero otherwise. It was expected that irrigation has a positive effect on the dependent variable (Hernandez *et al.*, 2007; Neven *et al.*, 2009). 'Livestock ownership' was set as a dummy variable which took the value one if the household owned livestock, or zero otherwise. It was predicted to have a negative correlation with modern market participation (Hernandez *et al.*, 2007).

Table 1. Variable definition, unit of measurement and expected signs.

Variable code	Variable name	Measurement	Expected signs
Dependent variable			
MC	Market channel participation	1 supermarket, 0 traditional market	
Independent variables			
AGE	Age of farmer	Number of years	–
EDU	Education of farmer	Years of schooling	+
EXPRNCE	Farming experience	Number of years	+
FMLY_SZ	Family size	Numbers	–
VEG_AREA	Vegetable cultivated area	Hectares	+
IRR	Irrigation	1 if yes, 0 otherwise	+
LVSTOCK	Livestock ownership	1 if yes, 0 otherwise	–
DIST_SM	Distance to supermarket	Kilometers	–
TRNS_COST	Transportation cost	IDR[1]	–
AV_PRICE	Average price received by farmers	IDR	+
EXTN	Attendance of extension meetings	1 if yes, 0 otherwise	+
CREDIT	Access to credit	1 if yes, 0 otherwise	+
MKT_INFO	Access to market information	1 if yes, 0 otherwise	+
FARMER_GR	Membership of farmer groups	1 if yes, 0 otherwise	+

[1] IDR = Indonesian Rupiah. 1 US Dollar equaled to approximately 12,200 IDR = 1 US, calculated on the basis of the exchange rate on October 2014; http://tinyurl.com/pbxmqku.

'Distance to supermarkets' was expected to exert a negative effect on high value market participation since it related to transaction costs that farmers would pay (Hernandez *et al.*, 2007; Miyata *et al.*, 2009). Another variable relating to distance from farm to marketplace was 'transportation cost'. This variable was expected to have a negative effect on supermarket channel decision (Shiimi *et al.*, 2012). *'*Average price' of vegetables received by farmers was hypothesized to influence modern market channel positively (Alene *et al.*, 2008; Balint and Wobst, 2006).

'Attendance of extension meetings' was set as a dummy that took the value one and zero otherwise. The expected sign of this variable was positive (Jari and Fraser, 2009). 'Access to market information' was measured through the ability of the farmer to access market information and to comprehend it. This variable was allocated dummy values taking the value one if a farmer had access to market information and zero otherwise, and was expected to be positively associated with the dependent variable (Jari and Fraser, 2009; Ouma *et al.*, 2010; Panda and Sreekumar, 2012). 'Access to credit' provides financial capital that might encourage farmers to participate in vegetable market channels. This variable was set as a dummy variable, and hypothesized to have a positive effect on high value market channel (Shiimi *et al.*, 2012). 'Membership of farmer groups' can enable farmers to create economies of scale in production and to compete effectively in markets. This variable was set as a dummy variable, and hypothesised to influence supermarket participation positively (Alene *et al.*, 2008; Shiimi *et al.*, 2012).

Finally, bivariate correlation analysis was conducted to test the correlation between market channel participation and vegetable income to explain the effect of supermarket channels on farmer's income.

4. Results and discussion

4.1 Descriptive analysis

The majority of the respondents (about 70%) from the sample were over 35 years old and had completed at least elementary school. About 60% of the respondents had less than 10 years' experience in farming with an average of 13 years. The majority (over 85%) of the sample had four or less than four people in their family and relied on incomes from farming. There were no differences between the demographic characteristics of the farmers supplying different market channels except the result that one third of the farmers supplying traditional markets were less than 35 years old (Supplementary Table S1).

Over 80% of the respondents had farm size of less than 1 ha (over 60% had less than 0.5 ha) and did not have access to any kind of irrigation systems. Over 60% of the respondents grew water spinach as their main vegetable, followed by long yard beans and vegetable amaranth, at 45.2 and 44.7%, respectively. Respondents (over 50%) supplying high value markets had a farms size of over 1 ha (Supplementary Table S2).

About 40% of the sample had incomes over 6.500 IDR per kilogram of vegetable sold, transported their produce over 40 km on their own motorcycle. The majority of sampled farmers (77%) spent less than 500,000 IDR for transportation per year. Farmers who were supplying high value markets (75%) paid over 500,000 IDR for their transportation cost per year and 75% of them received over 6.500 IDR per kilogram of vegetable sold (Supplementary Table S3).

The majority of the interviewees did not have access to credit (over 90%), extension services (74%), or market information (90%). About 45% of them were members of cooperatives and other farmers' organisations. A significant share (about 80%) of the growers supplying the high value markets were members of cooperatives and as a result had better market information (Supplementary Table S4).

4.2 Factors affecting market channel participation: binary logistic regression analysis

Table 2 presents the results of the binary logistic regression estimating the factors that influence the marketing channel participation of smallholder farmers. The table showed the estimated coefficients (B), standard error (S.E.), significance value (sig.) and odds ratios of the explanatory variables in the model. According to Gujarati (2004), the coefficients (B values) estimate the change probability of the dependent variable for a unit change in the corresponding predictor, other predictors being equal. The sign of the coefficient values indicates the direction of influence of the explanatory variable. A positive sign, therefore, implies an increase in the likelihood of changing from selling through the traditional marketing channel to selling through the supermarket channel.

The results showed that the model was highly significant in estimating the factors influencing farmers' choice of vegetable marketing channels (*P*-value of 0.000).

Among the explanatory variables, age, education level, vegetable farm area and farmer group participation were statistically significant in determining supermarket channel participation. However, farming experience, family size, irrigation methods, livestock ownership, distance to supermarket, transportation cost, average price, attendance of extension meetings, access to credit, and access to market information were not statistically significant. Furthermore, the signs of the estimated coefficients of some independent variables were consistent with the *a priori* expectations whereas others were contrary to expectations.

The variable 'age of farmer' was found to significantly influence modern market participation. The beta coefficient of this variable was 0.059, with an associated *P*-value of 0.064. Unexpectedly, the effect of age on supermarket channel participation was positive. This positive relationship was contradictory to the

Table 2. Binary logistic regression results on market channel participation.[1,2]

Variables	B	S.E.	Sig.	Exp(B)
AGE	0.059	0.032	0.064***	1.061
EDU	0.239	0.116	0.039**	1.270
EXPRNCE	0.014	0.035	0.684	1.014
FMLY_SZ	-0.288	0.230	0.211	0.750
VEG_AREA	2.429	1.227	0.048**	11.351
IRR	-0.152	0.937	0.871	0.859
LVSTOCK	0.344	0.701	0.624	1.410
DIST_SM	0.036	0.036	0.308	1.037
TRNS_COST	0.000	0.000	0.273	1.000
AV_PRICE	0.000	0.000	0.183	1.000
EXTN_SERV	-0.279	0.729	0.702	0.756
CREDIT	1.556	1.134	0.170	4.741
MKT_INFO	0.097	1.131	0.931	1.102
FARMER_GR	2.289	0.748	0.002*	9.865
Constant	-10.417	2.771	0.000	0.000
Number of observations	126			
Log likelihood	82.209			
Chi square (14)	46.079			
Sig. chi square	0.000			
Nagelkerke R^2	0.480			
% correct predictions	84.1			

[1] B = coefficients; S.E. = standard error; sig. = significance value; Exp(B) = odds ratio.

[2] * Significant at the 1% level; ** Significant at the 5% level; *** Significant at the 10% level.

studies done by Hernandez *et al.* (2007) and Alene *et al.* (2008). These studies reported that due to the reluctance of older farmers in adopting new technologies, younger farmers were more likely to participate in supermarket channels. The odds ratio of 1.061 supported that when farmers were more mature, the possibility of participation in supermarket channels was higher than in traditional market channels. This may correlate with how long farmers are involved in marketing relationships. Older farmers may have repeat contracts gained through long-term marketing relationships, which can enhance trust between farmers and their main buyers including supermarkets.

The level of education of sampled farmers had a positive effect on high value market participation. The beta coefficient of this variable was 0.239, with a significance *P*-value of 0.039. This explained that better education for smallholder farmers may result in households shifting from selling through traditional market channels to selling through supermarket channels. This result was in line with the previous studies conducted by Neven *et al.* (2009), Rao and Qaim (2011), and Ismael *et al.* (2013) which concluded that farmers who supply high value markets have a higher education level than traditional market suppliers. The result, however, did not coincide with the findings of Hernandez *et al.* (2007) who reported no significant effect on supermarket channel participation was made by the education background of the farmers in Guatemala. Although most vegetable farmers in the Manokwari region were categorised with a low level education as presented in the descriptive analysis, the odds ratio value (Exp(B)=1.270), however, showed that vegetable farmers were likely to choose supermarket channels with an increased level of education. More educated farmers were expected to have a better understanding not only of the production process, but also of marketing and business aspects, such as supply requirements and price negotiations.

Another variable that significantly affected supermarket channel participation was vegetable farm area (hectares). The outcome showed that the coefficient of this variable (2.429) had a significance *P*-value of 0.048. The positive sign on its coefficient indicated that an increase of farm size may result in a higher probability for smallholder farmers to participate in modern market channels. This positive relationship was consistent with the *a priori* expectations, which also confirmed the results of various studies done in other countries by researchers such as Balint and Wobst (2006), Neven *et al.* (2009), Schipmann and Qaim (2011) and Wang *et al.* (2011). Furthermore, despite the fact that the average vegetable farm size in the Manokwari region was relatively small, the larger odds ratio of 11.351 indicated that when there was a unit (hectare) increase of land area under vegetables, the probability of participation in supermarket channels would increase about 11.2 times greater than in traditional market channels.

The results also showed that membership of cooperatives or farmer groups had a significant influence on vegetable marketing channel choice. The coefficient value of this variable was 2.289, with the significance level (*P*-value) of 0.002. The positive relationship between farmer group membership and market channel participation was consistent with the *a priori* expectations, and supported previous studies (Blandon *et al.*, 2009; Jari and Fraser, 2009; Panda and Sreekumar, 2012). The larger value of the odds ratio (9.865) provided evidence that when farmers participated in cooperatives/farmer groups as members, there was a higher possibility of participating in high value market channels. The plausible explanation to this was that through the farmer groups, individual farmers had access to technical assistance, market information and training that enabled them to meet production thresholds for market participation and increase marketed supply.

Farming experience had a non-significant effect on market channel participation. So farmers who had longer farming experience did not necessarily have a higher possibility of selling through supermarket channels. This result did not support the previous studies such as Gong *et al.* (2007), Ouma *et al.* (2010) and Shiimi *et al.* (2012) who concluded that experience of farming was a strong explanatory variable in determining farmers' participation in high value markets. Moreover, this study also found that the effect of family size on market channel participation was statistically not significant. This confirmed the findings of Gong *et al.* (2007), Hernandez *et al.* (2007) and Neven *et al.* (2009) that the number of family members had no relationship with what market channel farmers participated in.

The variable 'Irrigation methods applied' demonstrated a negative and statistically non-significant effect on marketing channel participation. This finding did not support the previous results reported by Hernandez *et al.* (2007) and Neven *et al.* (2009). As most sampled farmers run their vegetable farms on a small scale, it would therefore be costly for them to apply advanced irrigation systems. The effect of livestock ownership on modern market participation was found positive, but not significant. The explanation to this may be associated with the fact that most farmers included in the sample run their livestock farms in a relatively small scale, for the purpose of household consumption. Therefore, whether smallholder farmers had livestock or not, it would not affect their participation in modern market channels.

All marketing aspects included in the logistic regression model demonstrated non-significant effects. Distance to supermarkets had a positive, but not significant influence on market channel participation. This explained that the location of vegetable farms was not an important factor determining supermarket participation, despite some respondents expressing the location (in terms of distance to big cities) of farms as a problem limiting supermarket channel participation. The result was contradictory to the study of Miyata *et al.* (2009) emphasising that the distance variable was a strong explanatory variable, affecting farmers' decisions to participate in high value markets. Similarly, transportation costs had a positive but not significant effect on marketing channel participation. This finding did not confirm the result of the study done by Shiimi *et al.* (2012) who concluded that transportation costs had a negative influence on market channel decision to sell to supermarkets. This was probably because the studied districts have relatively good roads and adequate public transport that facilitated farmers to have contact with marketplaces in the city of Manokwari including supermarkets. Average prices of vegetables received by farmers had a positive, but not significant, influence on modern market channel participation. This relationship did not coincide with the previous studies conducted by Balint and Wobst (2006) and Alene *et al.* (2008). These studies concluded that the relative prices that farmers received for the agricultural produce they sold could motivate them to increase their participation in supermarket channels.

Institutional factors included in the model demonstrated non-significant effects on market channel participation, except the variable 'membership of farmer groups'. The results showed that the attendance of extension meetings had a negative and non-significant effect on high value market channel participation. This variable was found to be inconsistent with the study by Alene *et al.* (2008), who found that extension services played an important role in encouraging smallholder farmers to participate in the supermarket channels.

Access to credit had a similar effect on market channel participation, which was positive and non-significant. The plausible reason to this relationship was that most smallholder farmers did not have access to financial institutions such as banks. Some respondents borrowed some amount of money from other farmers or family, but not for investing in farming. This result was also similar to the studies of Rao and Qaim (2011) and Ismail *et al.* (2013). These studies found that access to credits had a non-significant effect on supermarket channel participation.

The variable access to market information had a positive and non-significant effect on modern market channel participation. This finding was contradictory to the studies of Jari and Fraser (2009), and Panda and Sreekumar (2012), who found that access to market information, increased the possibility of smallholder farmers participating in high value markets. The plausible reason for this was probably because there was no viable market information service in the research area. In some cases, farmers had to find information regarding prices and new marketplaces by asking the local traders or going physically to local assembly markets. In the Manokwari region, food price information was often published by the local government through the radio and newspapers, and only for major items such as rice, sugar, and some vegetables such as cabbages and chilies.

Overall, the binary logistic regression has provided information regarding key variables that significantly influenced smallholder farmers' decisions about vegetable market channel participation. Of the farmers' demographics, only education was the most important factor affecting their decision to sell to supermarket

channels. Farm size, representing farm characteristics, also became an important predictor explaining modern market channel participation. All marketing-related variables included in the logistic regression model showed non-significant effects on market channel participation. Most importantly, participation in farmers' groups was a strong predictor determining their participation in the supermarket channels. This also indicated that acting collectively can enable smallholder farmers to reach the high value markets.

4.3 Impact of market participation on vegetable income

The bivariate correlation analysis was conducted under the null hypothesis, stating that there was no correlation between supermarket channel participation and vegetable income, and the alternative hypothesis stating that there was a correlation between these two variables. The result of the correlation analysis regarding the relationship between market channel participation and income was presented in Table 3.

The Pearson correlation coefficient (r) was 0.258, with a related significance level of 0.004. Based on these outcomes it can be concluded that the association between supermarket channel participation and income generated from vegetable farms was positive and statistically significant. In addition, this relationship was categorised between small and moderate correlation (Cohen, 1988, as cited in Corder and Foreman, 2014). This finding implied that differences in vegetable marketing practices contributed to essential differences in profitability between traditional market suppliers and supermarket channel suppliers. This study identified difference in income received from different market channel that ranged from 20-40% depending on type of vegetable cultivated. Furthermore, this finding was also in line with results from previous studies revealing that participation in the modern market channels was associated with relatively higher household income (Miyata *et al.*, 2009; Neven and Reardon, 2006; Rao and Qaim, 2011). For the context of the Manokwari region, where the supermarket channels have been growing, the result suggested that this marketing channel mode can be beneficial for smallholder farmers in relation to providing alternative marketplaces and economic potential.

5. Conclusions and recommendations

The development of modern food markets, including supermarkets, has been taking place in Indonesia for more than two decades. The presence of supermarkets, with new procurement practices, has affected all actors in the supply chains including smallholder farmers. Participation in supermarket channels can bring opportunities for smallholder farmers in gaining economic advantages. However, smallholder farmers are also facing constraints regarding higher standard requirements that might potentially limit participation possibilities.

The results of this study indicated that age and education level were the only significant farmer demographic factor for high value market participation. Better educated smallholder farmers between 35-55 years old have better ability to analyse market situations and participate in high value market channel. Farm size was another important factor to enable smallholder farmers to participate in supermarket channel. Farmers with farm size of over 1 ha have better opportunities in dealing with supermarket requirements. However, the majority of vegetable farmers in Manokwari region owned relatively small areas under vegetables, which also became a main challenge in dealing with supermarkets requirements and standards. This study also

Table 3. Correlation between market channel and vegetable income.[1]

		Vegetable income
Market channel	Pearson correlation	0.258**
	Sig. (2-tailed)	0.004
	n	126

[1] ** Correlation is significant at the 0.01 level (2-tailed).

reported that in some cases, modern food markets source from smallholder farmers, even when the access to larger farms is available.

Farmers' participation in organisations/groups was another critical factor that helped smallholder farmers to access high value market channels as well as to increase production. Furthermore, the results revealed that the smallholder vegetable farmers that were selling through supermarket channels received higher incomes, compared to those who marketed through the traditional market channels.

Smallholder farmers' participation in modern market channels in Eastern Indonesia is challenging, due to the fact that the majority of agricultural products, including fresh fruits and vegetables, supplied to supermarkets are mostly delivered from outside the Manokwari region. Another challenge that smallholder farmers are facing is dealing with the quality and continuity of products supplied to supermarkets or food stores. Because smallholder farmers are characterized by small farm size and low productivity, it is usually difficult to meet the basic requirements regarding quality and consistent supply. Hence, instead of participating in modern food retail and wholesale markets, smallholder farmers prefer to sell products through the traditional market channels that are considerably free of binding contracts. In addition, interventions of the supporting institutions, such as the government, NGOs, cooperatives and associations, regarding agricultural development are more likely to engage with technical aspects, whereas aspects relating to value addition and marketing receive very little attention.

Based on the results of this study several recommendations are drawn for the farmers, farmers groups, policy makers and other institutional players. Policies that encourage smallholder farmers to build their capacity through sharing knowledge and information are essential to be reinforced. Having higher level of technical skills can help smallholder farmers to produce better quality vegetables and increase productivity that can enable them to sell to high value markets. Another recommendation relates to encouraging and strengthening collective action through farmer groups/cooperatives. The presence of cooperatives and farmer organisations not only helps smallholder farmers in sharing knowledge and information but also strengthens their market position with supermarkets. The final recommendation for the local and regional government is to initiate an integrated systems approach, in order to address the institutional issues such as lack of market information, standards and grades, credit access, and extension services. Moreover, infrastructure developments, such as roads, transportation, market outlets, and vegetable based industries, should also be improved in order to provide a positive environment for the small scale vegetable farms in the Manokwari region of Indonesia.

Further investigation in other regions of Indonesia, larger sample size, larger number of farmers supplying high value markets would provide more comprehensive and comparative information about the market channel participation.

Supplementary material

Supplementary material can be found online at https://doi.org/10.22434/IFAMR2017.0011.

Table S1. Demographic characteristics of the respondents.
Table S2. Farm characteristics.
Table S3. Marketing characteristics.
Table S4. Institutional characteristics.

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Towards high value markets: a case study of smallholder vegetable farmers in Indonesia

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Table S1. Demographic characteristics of the respondents.

Description	Traditional market (%)	Supermarket channel (%)
Age		
<35 year old	36.0	11.5
35-55 year old	40.0	61.5
>55 year old	24.0	27.0
Total	100.0	100.0
Education level		
Not school attended	29.0	15.4
Completed elementary school	51.0	50.0
Completed high school	20.0	34.6
Total	100.0	100.0
Farming experience		
<10 years	63.0	53.8
10-25 years	14.0	19.2
>25 years	23.0	27.0
Total	100.0	100.0
Family size		
1-4 people	86.0	76.9
>4 people	14.0	23.1
Total	100.0	100.0

Table S2. Farm characteristics.

Description	Traditional market (%)	Supermarket channel (%)
Vegetable cultivated area		
<0.5 hectares	67.0	38.5
0.5-1.0 hectares	19.0	23.0
>1.0 hectares	14.0	38.5
Total	100.0	100.0
Irrigation		
No	87.0	80.8
Yes	13.0	19.2
Total	100.0	100.0
Livestock ownership		
No	47.0	50.0
Yes	53.0	50.0
Total	100.0	100.0

Table S3. Marketing characteristics.

Description	Traditional market (%)	Supermarket channel (%)
Distance to supermarket		
<25 km	19.0	30.8
25-40 km	34.0	34.6
>40 km	47.0	34.6
Total	100.0	100.0
Transportation costs		
<IDR 500,000	83.0	42.3
IDR 500,000-1,000,000	7.0	26.9
>IDR 1,000,000	10.0	30.8
Total	100.0	100.0
Average price		
<IDR 6,500	65.0	26.9
≥IDR 6,500	35.0	73.1
Total	100.0	100.0

Table S4. Institutional characteristics.

Description	Traditional market (%)	Supermarket channel (%)
Attendance of extension meetings		
No	77.0	61.5
Yes	23.0	38.5
Total	100.0	100.0
Access to credits		
No	96.0	88.5
Yes	4.0	11.5
Total	100.0	100.0
Access to market information		
No	91.0	88.5
Yes	9.0	11.5
Total	100.0	100.0
Membership of farmer groups		
No	63.0	19.2
Yes	37.0	80.8
Total	100.0	100.0