Determinants of households' membership in agricultural cooperatives in Bhutan

Tashi Dendup[a], Satit Aditto[b,*]

[a]*College of Natural Resources, Royal University of Bhutan, Bhutan*
[b]*Faculty of Agriculture, Khon Kaen University, Thailand*

Abstract

The Royal Government of Bhutan has been promoting agricultural cooperatives (ACs) in the country; however, the number of people joining ACs is small. This study was conducted to identify the factors influencing households' decision to join ACs in Central Bhutan. A cross-sectional survey was conducted to collect data from 384 households (192 AC members and 192 non-AC members). Trained enumerators collected data in June and July 2018 using structured questionnaires. The binary logistic regression showed that households with older heads of household, being literate, having more family labour, more land under cultivation, owning farm machinery, being further away from a market, and having access to credit increased the likelihood of households joining ACs. Conversely, households earning off-farm income and locating far from the Renewable Natural Resources Centres decreased the likelihood of becoming member of ACs. Additionally, the gender of the head of a household and the number of cattle owned by a household showed no significant influence. As this paper is the first to empirically investigate the determinants of households' membership in ACs in Bhutan, the findings have some important policy implications. The government should continue to provide in-depth awareness to farmers on concepts and benefits of ACs in retaining existing members and recruiting new members.

Keywords: farmers' groups, participation, logistic regression

1 Introduction

Agricultural cooperatives (ACs) benefit smallholder farmers in numerous ways. For instance, ACs enhance farmers' access to extension services, including training, farm inputs, information, and machinery (Zeuli & Radel, 2005; Sonam & Martwanna, 2011). ACs also improve access to land (Chagwiza *et al.*, 2016), create an economy of scale, reduce transaction costs (Holloway *et al.*, 2000; Ortmann & King, 2007), gain market power, fetch higher prices for products (Roy & Thorat, 2008), improve access to credit, and promote saving behaviour among members (Sonam & Martwanna, 2011). ACs are also known for generating employment opportunities (Wanyama *et al.*, 2008), strengthening social capital (Abebaw & Haile, 2013; Tenzin & Natsuda, 2016), and promoting local culture (Dendup, 2018). If well-managed, ACs improve food security (Zeweld *et al.*, 2015), empower women (Prakash, 2003; Baviah, 2006), reduce poverty (Tenzin

et al., 2015), and increase the gross domestic product (Food and Agriculture Organization, 2011).

Embracing these potential benefits, the Royal Government of Bhutan (RGoB) has, in recent decades, reformed policies to promote ACs. The policy reforms included enactment of the Cooperative Act of Bhutan in 2001 and its amendement in 2009, establishment of the Department of Agriculture and Marketing Cooperatives (DAMC) in 2010, and endorsement of the Cooperatives Rules and Regulations of Bhutan in 2010 (Dendup, 2018). The RGoB has also supported ACs with technical, financial, material, and marketing assistance (Sonam & Martwanna, 2011). Although the agriculture sector employs more than half of Bhutan's population, only slightly over 2,000 farmers have registered with Bhutan's 55 ACs (DAMC, 2018). Therefore, the RGoB and its development partners must understand why only a few farmers have joined these cooperatives.

Previous studies in other countries explored factors affecting households' membership in ACs (Karlı *et al.*, 2006;

---

* Corresponding author – asatit@kku.ac.th

Bernard & Spielman, 2009; Francesconi & Heerink, 2010; Nugussie, 2010; Asante *et al*., 2011; Davis *et al*., 2012; Fischer & Qaim, 2012; Zheng *et al*., 2012; Adong *et al*., 2013; Etwire *et al*., 2013; Nugusse *et al*., 2013; Abate *et al*., 2014; Verhofstadt & Maertens, 2014; Benmehaia & Brabez, 2016; Chagwiza *et al*., 2016; Ma & Abdulai, 2016; Mojo *et al*., 2016; Mojo *et al*., 2017; Nahayo *et al*., 2017; Wossen *et al*., 2017; Hao *et al*., 2018). These studies reported household heads' characteristics, including age, gender, and education level, as significant determinants of households' membership in ACs. Household socio-economic profiles, including labour force, landholding, farm animals, off-farm income, and use of farm machinery, were also found as the significant determinants. Additionally, studies mentioned above showed that the distance to markets and extension offices and access to credit determined the households' membership in ACs.

However, household members in ACs were variously influenced by numerous factors in different countries (Davis *et al*., 2012). Bhutan is distinctive in its geography, politics, culture, and economy; thus, findings from other countries may not apply. Bhutan's smallholder farmers, the majority of whom lack access to resources and are scattered in small pockets of subsistence villages, can accrue several benefits from ACs.

Properly functioning ACs have historically come to the rescue of smallholder farmers across the world. Unfortunately, there is no study so far on factors influencing households' membership in ACs in Bhutan. This gap has motivated the authors to research this topic to help the RGoB and stakeholders make informed decisions related to ACs. This paper presents the determinants of households' membership in ACs in Bhutan.

2 Materials and methods

2.1 Data collection approach

Data for this study were collected from Zhemgang and Trongsa districts of Central Bhutan (Fig. 1) as these two districts were not only similar in terms of their socio-economical and agro-ecological conditions but also had many ACs with heterogenous characteristics. After submitting official letters to the DAMC and the selected district administrations, the trained enumerators collected data in June and July 2018, using pretested structured questionnaires. The findings were from 384 sample households (192 AC members and 192 non-AC members).
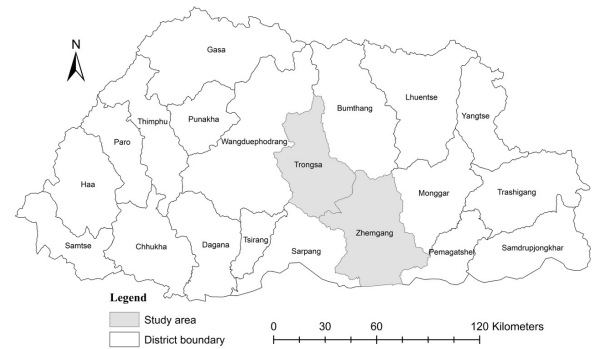

Fig. 1: *Map of Bhutan with the two study areas (shaded).*

The sample size was calculated using Cochran's formula:

$$n_0 = \frac{z^2 \times p \times (1 - p)}{e^2} \tag{1}$$

where: z^2 = 95 % confidence level (1.96); p = variability of the population (50 %); e = margin of error (5 %), and n_0 = smallest required sample size (384).

Cochran's formula was used because of its ability to compute the sample size from the unknown population. The DAMC (the only department overseeing ACs in Bhutan) had not updated either the list of members of ACs since their initial registration or the records of households involved in ACs during the time of the study. Twelve ACs were randomly selected for this study (six from each district). The online database of the DAMC (2018) was used to determine the number of ACs in Bhutan. The study employed a proportionate random sampling of 96 member households in each selected district. Lastly, a random selection was made of equal numbers of non-member households from the communities of the selected ACs.

Data gathered from 384 households were used to perform descriptive statistics, independent t-tests, Chi-square tests, and binary logistic regression in the Statistical Package for the Social Sciences. The statistical software RStudio was also used to compute the marginal effect.

2.2 Empirical model specification

Previous studies on the factors influencing membership in ACs were reviewed, and 11 explanatory variables (Table 1) were selected based on their relevance to Bhutan's socio-economic context. Household membership in ACs is a binary-choice problem. A value of 1 was assigned if a household had at least one registered member in any AC during the survey. Otherwise, 0 was assigned.

The use of discrete choice econometrics model was necessary as the dependent variable is dichotomous. The logit and probit models are two commonly used statistical tools for such studies. Accordingly, both logit and probit models were computed for this study. According to Antwi & Chagwiza (2019), the logit model is simpler computationally; for instance, it is easy to determine the probability of knowing the odds or the log odds. Thus, following other recent studies like Nahayo *et al.* (2017) and Kidane *et al.* (2018), only results of the logit model are presented in this paper, as shown in Equation 2:

$$\frac{Pro\ (Y_i = 1)}{Pro\ (Y_i = 0)} = \frac{P_i}{1 - P_i} = e^{(\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} \ldots \beta_k X_{ki})} \quad (2)$$

Where: P_i = probability of households' membership in ACs; $1 - P_i$ = households' non-membership in ACs, and e = exponential constant.

Computing log on two sides of equation (2), we get:

$$L = ln\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} \ldots \beta_k X_{ki} \quad (3)$$

Where: L = logit model, β_0 = intercept term; β_1 - β_k = coefficients of independent variables, and X_{1i} - X_{ki} = independent variables (Table 1).

Additionally, the marginal effect was calculated to show the actual impact of each variable on the probability decision. The marginal effect captures changes in the predicted probabilities as the binary independent variable changes from 0 to 1 when all other variables equal their means. Similarly, it shows how much the response variable changes with a unit change in one continuous independent variable, maintaining other independent variables constant.

3 Results

3.1 Characteristics of non-member and member households of ACs

Table 2 shows the aggregate statistics of the characteristics of members and non-member households. Except for the household heads' gender and the number of cattle owned, other profiles differed significantly.

Table 1: *Description of independent variables and their expected signs.*

Variable	Type	Description	Expected sign
Dependent			
Membership	Dummy	1 if the household has a registered member	
		0 if the household has no registered member	
Independent			
Age	Scale	Age of head of household in years	+/-
Gender	Dummy	1 if the head of household is male	+
		0 if the head of household is female	
Literacy	Dummy	1 if the head of household can read and write	+
		0 if the head of household cannot read and write	
Family labour	Scale	Number of household members between 18 and 60 years	+/-
Land cultivated	Scale	Area cultivated in hectare	+/-
Cattle	Scale	Number of cattle	+/-
Off-farm income	Dummy	1 if the household earns off-farm income	-
		0 if the household does not earn off-farm income	
Farm machinery	Dummy	1 if the household uses farm machinery	+
		0 if the household does not use any machinery	
Distance to market	Dummy	1 if the nearest market is more than 5 km away	+/-
		0 if the market is less than or exactly 5 km away	
Distance to RNR* centre	Dummy	1 if RNR is more than 5 km away	-
		0 if RNR is less than or exactly 5 km away	
Access to credit	Dummy	1 if the household has access to credit	+
		0 if the household has no access to credit	

*Renewable Natural Resources Centres

Table 2: *Characteristics of non-member and member households of agricultural cooperatives.*

		Membership			
Item	*Unit*	*Non-members (n=192)*	*Members (n=192)*	*Overall (n=384)*	*Test of difference**
Age	years	48.02	51.54	49.78	-2.538*
Gender					0.286
Male	%	36.46	33.85	35.16	
Literacy					19.286**
Literate	%	36.98	59.38	48.18	
Family labour	persons	1.96	2.61	2.29	-5.537**
Land cultivated	hectare	0.75	1.04	0.89	-4.914**
Cattle	number	5.25	5.34	5.30	-0.206
Off-farm income					7.353**
Yes	%	39.58	26.56	33.07	
Farm machinery					32.723**
Yes	%	33.33	62.50	47.92	
Distance to market					7.396**
Greater than 5 km	%	54.17	67.71	60.94	
Distance to RNR centre[†]					11.689**
Greater than 5 km	%	67.19	50.00	58.59	
Access to credit					15.048**
Yes	%	39.06	58.85	48.96	

*Test of differences between non-member and member households for variables included based on
chi-square and independent t-test; [†] Renewable Natural Resources Centres.
* and ** significant at 5 % and 1 %, respectively.

The average age of heads of the household was about 50 years, indicating that people of economically active age lead households in the study area. The results showed that member households had significantly older heads on average than non-member households. Gender composition was almost equal among member and non-member households. The heads of member households were significantly more literate than heads of non-member households. Households in the study area were smallholders with average cultivated land of 0.89 hectares. However, member households cultivated significantly higher acarage of land than non-member households. The proportion of member households engaged in off-farm activities was significantly less than the non-member households. The results also showed that more member households owned farm machinery than non-member households. A significant percent of member households were located over five kilometres away from the nearest market. A significantly higher percent of non-member households compared to the member households were situated five or more kilometres away from Renewable Natural Resources (RNR) centre. The proportion of member households with access to credit was significantly more than the non-member households.

3.2 Determinants of households' membership in ACs

Table 3 shows the binary logistic regression model results on the determinants of households' membership in ACs. Before generating the model, the multicollinearity issue was checked by tolerance and variance inflation factors. The largest variance inflation factor values were less than 10 (Myers, 1990). Tolerance values were all greater than the threshold of 0.2 (Menard, 1995). Thus, both tolerance and variance inflation factors were within the acceptable thresholds. The model Chi-square was significant (χ^2 (11) = 158.811, $p < 0.001$), and the model correctly classified 75.5 % of the observations. As desired, the Hosmer-Lemeshow test was not significant (χ^2 (8) = 6.947, p = 0.542). Nagelkerke R^2 was 0.452, indicating that the independent variables explained 45.2 % of households' membership in ACs. Collectively, these statistics (Table 3) confirmed the effectiveness of the model.

Table 3 shows that 2 of the 11 explanatory variables included in the model, gender of head of household and

Table 3: *Determinants of households' membership in agricultural cooperatives.*

Variables	Coefficients	Marginal effects
Age	0.021*	0.005
Gender	-0.196	-0.049
Literacy	1.424**	0.341
Family labour	0.552**	0.138
Land cultivated	0.320**	0.080
Cattle owned	-0.025	-0.006
Farm machinery	1.574**	0.374
Off-farm income	-0.767**	-0.189
Distance to market	1.134**	0.276
Distance to RNR	-1.222**	-0.294
Access to credit	0.871**	0.214
Constant	-4.347**	-1.086
Model χ^2	158.811**	
Hosmer-Lemeshow test (χ^2):	6.947	
Percentage correctly predicted:	0.755	
Nagelkerke R^2:	0.452	
-2 Log-likelihood:	373.526	

* and ** significant at 5 % and 1 %, respectively.

number of cattle owned were not significant determinants of households' membership in ACs both at 5 % and 1 % significance level. However, the coefficients of education, family labour, land cultivated, farm machinery, off-farm income, distance to market, distance to RNR, and credit access were significant at 1 %. The coefficient of the age of the heads of households was significant at 5 %.

4 Discussion

Nine out of eleven factors included in this study significantly influenced households' membership in ACs in Central Bhutan. For instance, the age of the head of the household significantly increased households' membership in ACs. Increasing the age of the head of household by one year increased the likelihood of households' membership in ACs by 0.5 %. This result agreed with Adong *et al.* (2013), who reported that older people were 0.9 % times more likely to participate in collective action than younger people. In Bhutan, people perceive farming as an unpromising and challenging career. Young people aspire to be government officers or look for white-collar jobs, and their parents support such aspirations. As a result, young people migrate to urban areas searching for better employment opportunities (Dendup, 2018). In agreement, Chagwiza *et al.* (2016) and

Fischer & Qaim (2012) reported that young people preferred off-farm employment opportunities. Mojo *et al.* (2017) and Nahayo *et al.* (2017) also agreed that older people were more likely to join ACs than younger ones.

Literacy of the head of the household significantly increased households' membership in ACs. As shown in Table 3, the participation rate in ACs increased by 34.1 % when the household head was literate. In the study area, heads of households usually participate in awareness programs, training, and public meetings. Literate household heads could better understand training and meetings than their counterparts; making them more aware of the opportunities associated with ACs, including access to machinery, farm inputs, and improved varieties of cattle the RGoB distributes primarily through ACs. Previous studies also supported this finding (Karlı *et al.*, 2006; Bernard & Spielman, 2009; Adong *et al.*, 2013; Nugusse *et al.*, 2013; Chagwiza *et al.*, 2016; Wossen *et al.*, 2017; Hao *et al.*, 2018).

The availability of family labour had a significant influence on households' membership in ACs. Increasing family labour by one person increased the households' likelihood of membership in ACs by 13.8 %. Larger families cultivated more land and reared more livestock, requiring more supports in marketing, pricing, and inputs (Asante *et al.*, 2011); thus, they were more likely to participate in ACs to access resources. Additionally, labour shortage challenges farmers in rural Bhutan; thus, households with more family labour could spare surplus family labour to attend the cooperative activities. The current finding is well supported by other recent studies (e.g., Verhofstadt & Maertens, 2014; Chagwiza *et al.*, 2016; Mojo *et al.*, 2017; Kidane *et al.*, 2018).

The acreage of land cultivated had a significant influence on households' membership in ACs. Cultivating an additional hectare of land increased the likelihood of membership in ACs by 8 %. In Bhutan, large-scale farmers who lived in remote mountainous terrains having poor road conditions joined ACs to reduce the transaction costs of their products. Additionally, cardamom, bananas, vegetables, and fodder were cultivated in the lands belonging to the members of the ACs. Several other studies also supported that the large-scale farmers join ACs to avail production and market supports (Asante *et al.*, 2011; Fischer & Qaim, 2012; Zheng *et al.*, 2012; Nugusse *et al.*, 2013; Ma & Abdulai, 2016; Shumeta & D'Haese, 2016; Mojo *et al.*, 2017; Wossen *et al.*, 2017; Hao *et al.*, 2018).

Owning farm machinery also significantly affected the rate of households' membership in ACs. Families possessing farm machinery were 37.4 % more likely to join ACs. In this study, farm machinery referred to tools and equipment such as power tillers, mills, and harvesters. In recent years,

Bhutanese farmers have expanded their production due to improved market access through ACs; however, the shortage of farm labour remains an obstacle. The farmers had increasingly embraced farm machinery to address the labour shortage and increase output. However, small-scale farmers who could not afford farm machinery privately were deterred from increasing the production. The RGoB and its development partners have continued to support ACs and their members with farm machinery. Additionally, households with farm machinery cultivated more land and reared more animals, requiring more support from collective actions such as ACs. In line with the current finding, several studies agreed that families owning farm machinery were more likely to participate in ACs than their counterparts (Karlı *et al.*, 2006; Nugussie, 2010; Asante *et al.*, 2011; Fischer & Qaim, 2012; Nugusse *et al.*, 2013; Ma & Abdulai, 2016; Mojo *et al.*, 2016; Wossen *et al.*, 2017).

In addition to revenue generated from farming, households also depended on the income from non-farm activities, including government jobs, shops, and construction works. The earning from off-farm activities by households had negative and significant influence on their membership in ACs. The results showed that households earning off-farm income had 18.9 % lower rates of membership in ACs than their counterparts. Some non-member households in the study area had family members working as shopkeepers, civil servants, and private employees. These households had limited time and low motivation to participate in ACs. This was because they faced higher opportunity costs than those families pursuing farming as a primary activity for their livelihoods. Farming is often a secondary activity to many of the families earning off-farm revenues. Abate *et al.* (2014) and Asante *et al.* (2011) also validated that households earning non-farm income were less likely to participate in ACs.

The distance of households from the nearest market also influenced rates of participation in ACs. The families located more than five kilometres from the nearest market were 27.6 % more likely to join ACs. Farmers who resided far from the market experienced higher transaction costs for marketing inputs and outputs. Therefore, households in remote areas have joined ACs to reduce transaction costs. The spillover effect of the market also engaged nearby families in off-farm activities, including running their shops and working on construction sites. Also, families near marketplaces required less support from ACs than more remote households, as they had good market access. Supporting the current finding, Nugussie (2010), Zheng *et al.* (2012), Adong *et al.* (2013), and Benmehaia & Brabez, (2016) also found a positive influence of distance from the market on households' membership in ACs.

Distance from the RNR centre had negative and significant influence on households' membership in ACs. Households located more than five kilometres away were 24.9 % less likely to participate in ACs than those residing nearby. The RNR, among others, disseminates information on the benefits of ACs. Also, the government routes most rural projects through the RNR (Sonam & Martwanna, 2011). Therefore, households near RNR were more likely to join ACs compared to households located far away from the RNR due to better awareness of the benefits of ACs. In agreement with this finding, Francesconi & Heerink (2010) reported that farmers located far away from the extension office were 19 % less likely to join cooperatives. Adong *et al.* (2013), Nugusse *et al.* (2013), Ma & Abdulai (2016), and Mojo *et al.* (2017) also asserted that as the distance to an extension centre increased, membership in cooperatives decreases.

Households required financial capital to adopt new technologies and to invest in cooperative activities. Thus, access to credit by households significantly determined their membership in ACs. Families accessing credit had a 21.4 % higher participation rate in ACs. Traditional banks usually do not provide loans to low-income and marginalised farmers due to lack of collateral and high default risk (Asante *et al.*, 2011). However, members received group loans from commercial banks to buy improved cattle breeds and start other agribusinesses, as other members in ACs assured the repayment. ACs also provided low-interest loans to their members from the mutual funds generated through their regular saving schemes. Thus, it is plausible to assume that poor households joined ACs to avail credit facilities and raise the financial capital required for farming and adopting technologies. Similar results were also reported in other studies (Nugussie, 2010; Fischer & Qaim, 2012; Wossen *et al.*, 2017).

The gender of household head was expected to have significant results (Nugussie, 2010; Bernard & Spielman, 2009; Davis *et al.*, 2012). However, the gender of the head of the household did not significantly influence the households' membership in ACs in this study. The non-significant result could be potentially due to minimum gender inequality issues in Bhutan. Nonetheless, non-significant results were reported in other studies too (Abate *et al.*, 2014; Verhofstadt & Maertens, 2014; Wossen *et al.*, 2017). The number of cattle owned by the family also did not significantly affect the households' membership in ACs, which could be due to the predominant practice of integrated farming in Bhutan. Likewise, other recent studies reported non-significant effect of the number of cattle owned by households on their membership in ACs (Fischer & Qaim, 2012; Mojo *et al.*, 2016).

T. Dendup & S. Aditto / J. Agr. Rural Develop. Trop. Subtrop. 122 – 2 (2021) 173–181

179

5   Conclusions and recommendations

The current study findings have important implications for retaining and recruiting members in ACs. As literate and older farmers (experienced ones) positively influenced households' membership in ACs, we suggest continuing in-depth awareness to farmers on concepts and benefits of ACs. In practice, the government could also design training and educational programs accessible to illiterate and inexperienced farmers by broadcasting on national television and radio. The households having more labour, more land, and better access to machinery joined ACs. This finding implies that the government should provide ACs with technical backstopping and assistance in the operation and repairing of machinery suitable to Bhutan's mountainous terrain. It is because households' access to farm machinery could address the labour shortage for agricultural activities. Farmers tended to join ACs to better access the market, indicating the importance of marketing and market access; thus, authorities concerned should also focus on improving the marketing systems. Accordingly, stakeholders should help ACs by sharing market information, processing, grading, packaging, and establishing contract farming. There is also a need for establishing and strengthening a cooperative chain to coordinate and streamline stakeholders. The cooperative chain would coordinate the efforts of inputs suppliers, farmers, credit providers, extension agents, marketing agencies, and policymakers. Addressing these recommendations and other similar efforts will help retain existing members and encourage non-members to join ACs.

As this study's scope was limited to identifying factors determining households to join ACs in Bhutan, it could not capture the socio-economic impacts of ACs on the members of ACs. Therefore, we believe that research on the impacts of ACs on their members and the broader community is a promising area for studies in future. It would also be interesting to know if the type of cooperatives in terms of activities, sizes, and capacities influenced farmers' decision to join ACs.

Conflict of interest

The authors declare that they have no conflict of interest.

References

Abate, G. T., Francesconi, G. N., & Getnet, K. (2014). Impact of agricultural cooperatives on smallholders' technical efficiency: Empirical evidence from Ethiopia. *Annals of Public and Cooperative Economics*, 85 (2), 257–286. https://doi.org/10.1111/apce.12035.

Abebaw, D., & Haile, M. G. (2013). The impact of cooperatives on agricultural technology adoption: Empirical evidence from Ethiopia. *Food Policy*, 38, 82–91. https://doi.org/10.1016/j.foodpol.2012.10.003.

Adong, A., Mwaura, F., & Okoboi, G. (2013). What factors determine membership to farmer groups in Uganda? Evidence from the Uganda census of agriculture 2008/9. *Journal of Sustainable Development*, 6 (4), 37–55. 10.22004/ag.econ.148950.

Antwi, M., & Chagwiza, C. (2019). Factors influencing savings among land reform beneficiaries in South Africa. *International Journal of Social Economics*, 46 (4), 474–484. https://doi.org/10.1108/IJSE-06-2018-0309.

Asante, B. O., Afarindash, V., & Sarpong, D. B. (2011). Determinants of small scale farmers decision to join farmer based organizations in Ghana. *African Journal of Agricultural Research*, 6(10), 2273–2279. http://197.255.68.203/handle/123456789/2572.

Baviah, M. (2006). Microfinance for women empowerment and gender equality: Experiences of some Asian countries and lessons for Ethiopia. Paper presented at the Biannual Conference of the Association of Ethiopian Microfinance Institutions (AEMFI) hosted by Dedebit Credit and Saving Institutions (DECSI), Mekelle, Ethiopia.

Benmehaia, M. A., & Brabez, F. (2016). The propensity to cooperate among peasant farmers in Algeria: An analysis from bivariate approach. *International Journal of Food and Agricultural Economics*, 4(4), 79–92. https://doi.org/10.22004/ag.econ.251820.

Bernard, T., & Spielman, D. J. (2009). Reaching the rural poor through rural producer organizations? A study of agricultural marketing cooperatives in Ethiopia. *Food Policy*, 34(1), 60–69. https://doi.org/10.1016/j.foodpol.2008.08.001.

Chagwiza, C., Muradian, R., & Ruben, R. (2016). Cooperative membership and dairy performance among smallholders in Ethiopia. *Food Policy*, 59, 165–173. https://doi.org/10.1016/j.foodpol.2016.01.008.

DAMC. (2018). Summary of Co-operatives. Available at: http://www.agrimarket.gov.bt/public/farmer/summary/type/1. Last accessed 10.10.2018.

Davis, K., Nkonya, E., Kato, E., Mekonnen, D. A., Odendo, M., Miiro, R., & Nkuba, J. (2012). Impact of farmer field schools on agricultural productivity and poverty in East Africa. *World Development*, 40(2), 402–413. https://doi.org/10.1016/j.worlddev.2011.05.019.

Dendup, T. (2018). Agricultural transformation in Bhutan: From peasants to entrepreneurial farmers. *Asian Journal of Agricultural Extension, Economics and Sociology*, 23(3), 1–8. https://doi.org/10.9734/AJAEES/2018/40289.

Etwire, P. M., Dogbe, W., Wiredu, A. N., Martey, E., Etwire, E., Owusu, R. K., & Wahaga, E. (2013). Factors influencing farmer's participation in agricultural projects: The case of the agricultural value chain mentorship project in the Northern region of Ghana. *Journal of Economics and Sustainable Development*, 4(10), 36–43.

Fischer, E., & Qaim, M. (2012). Linking smallholders to markets: Determinants and impacts of farmer collective action in Kenya. *World Development*, 40(6), 1255–1268. https://doi.org/10.1016/j.worlddev.2011.11.018.

Food and Agriculture Organization. (2011). Agricultural cooperatives are key to reducing hunger and poverty. Available at: http://www.fao.org/news/story/en/item/93816/icode/. Last accessed 12.3.2019.

Francesconi, G. N., & Heerink, N. (2010). Ethiopian agricultural cooperatives in an era of global commodity exchange: Does organizational form matter?. *Journal of African Economies*, 20(1), 153–177. https://doi.org/10.1093/jae/ejq036.

Hao, J., Bijman, J., Gardebroek, C., Heerink, N., Heijman, W., & Huo, X. (2018). Cooperative membership and farmers' choice of marketing channels–Evidence from apple farmers in Shaanxi and Shandong Provinces, China. *Food Policy*, 74, 53–64. https://doi.org/10.1016/j.foodpol.2017.11.004.

Holloway, G., Nicholson, C., Delgado, C., Staal, S., & Ehui, S. (2000). Agroindustrialization through institutional innovation: Transaction costs, cooperatives and milk-market development in the East-African highlands. *Agricultural Economics*, 23(3), 279–288. https://doi.org/10.1111/j.1574-0862.2000.tb00279.x.

Karlı, B., Bilgiç, A., & Çelik, Y. (2006). Factors affecting farmers' decision to enter agricultural cooperatives using random utility model in the South Eastern Anatolian region of Turkey. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 107(2), 115–127.

Kidane, H., Lemma, T., & Tesfay, G. (2018). Determinants of smallholder farmers participation in seed producing co-operatives in Southern Zone of Tigray, Ethiopia. *Journal of Agricultural Extension and Rural Development*, 10(4), 75–83. 10.5897/JAERD2017.0868.

Ma, W., & Abdulai, A. (2016). Does cooperative membership improve household welfare? Evidence from apple farmers in China. *Food Policy*, 58, 94–102. https://doi.org/10.1016/j.foodpol.2015.12.002.

Menard, S. (1995). Applied logistic regression analysis. Sage university paper series on quantitative application in the social sciences. Thousand Oaks, CA: Sage.

Mojo, D., Fischer, C., & Degefa, T. (2016). Collective action and aspirations: The impact of cooperatives on Ethiopian coffee farmers aspirations. *Annals of Public and Cooperative Economics*, 87(2), 217–238. https://doi.org/10.1111/apce.12103.

Mojo, D., Fischer, C., & Degefa, T. (2017). The determinants and economic impacts of membership in coffee farmer cooperatives: Recent evidence from rural Ethiopia. *Journal of Rural Studies*, 50, 84–94. https://doi.org/10.1016/j.jrurstud.2016.12.010.

Myers, R. (1990). Classical and modern regression with applications (2nd edition). Boston, MA: Duxbury.

Nahayo, A., Omondi, M. O., Zhang, X., Li, L., Pan, G., & Joseph, S. (2017). Factors influencing farmers' participation in crop intensification program in Rwanda. *Journal of Integrative Agriculture*, 16(6), 1406–1416. https://doi.org/10.1016/S2095-3119(16)61555-1.

Nugusse, W. Z., Huylenbroeck, G. V., & Buysse, J. (2013). Determinants of rural people to join cooperatives in Northern Ethiopia. *International Journal of Social Economics*, 40(12), 1094–1107. https://doi.org/10.1108/IJSE-07-2012-0138.

Nugussie, W. Z. (2010). Why some rural people become members of agricultural cooperatives while others do not. *Journal of Development and Agricultural Economics*, 2(4), 138–144.

Ortmann, G. F., & King, R. P. (2007). Agricultural cooperatives II: Can they facilitate access of small-scale farmers in South Africa to input and product markets? *Agrekon*, 46(2), 219-244. https://doi.org/10.1080/03031853.2007.9523769.

Prakash, D. (2003). Rural women, food security and agricultural cooperatives. Presented at 4th Asian-African International Conference on Women in Agricultural Cooperatives in Asia and Africa by ICA, AARRO, JA-Zenchu and IDACA. Tokyo, Japan, August 24-29, 1999.

Roy, D., & Thorat, A. (2008). Success in high value horti-cultural export markets for the small farmers: The case of Mahagrapes in India. *World Development*, 36(10), 1874–1890. https://doi.org/10.1016/j.worlddev.2007.09.009.

Shumeta, Z., & D'Haese, M. (2016). Do coffee cooperatives benefit farmers? An exploration of heterogeneous impact of coffee cooperative membership in Southwest Ethiopia. *International Food and Agribusiness Management Review*, 19(4), 37–52. https://doi.org/10.22434/IFAMR2015.0110.

Sonam, T., & Martwanna, N. (2011). Smallholder dairy farmers' group development in Bhutan: Strengthening rural communities through group mobilization. *Khon Kaen Agriculture Journal*, 39(4), 413–428.

Tenzin, G., & Natsuda, K. (2016). Social capital, household income, and community development in Bhutan: A case study of a dairy cooperative. *Development in Practice*, 26(4), 467–480. https://doi.org/10.1080/09614524.2016.1161731.

Tenzin, G., Otsuka, K., & Natsuda, K. (2015). Can social capital reduce poverty? A study of rural households in Eastern Bhutan. *Asian Economic Journal*, 29(3), 243–264. https://doi.org/10.1111/asej.12057.

Verhofstadt, E., & Maertens, M. (2014). Can agricultural cooperatives reduce poverty? Heterogeneous impact of cooperative membership on farmers' welfare in Rwanda. *Applied Economic Perspectives and Policy*, 37(1), 86–106.https://doi.org/10.1093/aepp/ppu021

Wanyama, F., Develtere, P., & Pollet, I. (2008). Encounter-ing the evidence: Co-operatives and poverty reduction in Africa. *Journal of Co-operative Studies*, 41(3), 16–27.

Wossen, T., Abdoulaye, T., Alene, A., Haile, M. G., Feleke, S., Olanrewaju, A., & Manyong, V. (2017). Impacts of extension access and cooperative membership on technol-ogy adoption and household welfare. *Journal of Rural Studies*, 54, 223–233. https://doi.org/10.1016/j.jrurstud.2017.06.022.

Zeuli, K., & Radel, J. (2005). Cooperatives as a com-munity development strategy: Linking theory and prac-tice. *Journal of Regional Analysis and Policy*, 35(1), 43–54. 10.22004/ag.econ.132302.

Zeweld, W., Huylenbroeck, G. V., & Buysse, J. (2015). Household food security through cooperative societies in Northern Ethiopia. *International Journal of Develop-ment Issues*, 14(1), 60–72. https://doi.org/10.1108/IJDI-02-2014-0014.

Zheng, S., Wang, Z., & Awokuse, T. O. (2012). Determin-ants of producers' participation in agricultural coopera-tives: Evidence from Northern China. *Applied Economic Perspectives and Policy*, 34(1), 167–186. https://doi.org/10.1093/aepp/ppr044.