

Smallholder Vegetable Farmers and Marketing Choices: Implications for Inclusiveness of Farmers to Markets

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Authors' contributions

This work was carried out in collaboration between all authors. Authors DR and WB designed the study and managed the literature searches. Author DR performed the statistical analysis, wrote the protocol and the first draft of the manuscript. Authors DR, WB and EOG managed interpretation of the analysis. All authors read and approved the final manuscript.

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ABSTRACT

This study has evaluated the factors that influence the smallholder farmers selection of marketing channels to sell vegetables. The marketing channels include cooperative, regulated and conventional market. The primary data were collected from a random sampling of 100 vegetable growing smallholder farmers from Karnataka, India. Personal interview was conducted with the help of semi-structured interview in the field survey. Ten variables describing the socio economic, product and market factors were considered for the analysis. Data revealed that farmers were selling their produce in one or more than one marketing channels. The multivariate probit was used to analyze the co-relation in the choice or selection of the marketing channels. Empirical findings reveal that the factors such as extension activities, subsidiary occupation, lower vegetable area, higher quality checks, and nearest distance influence the farmers selection of the cooperative market, while the distance influence the selection of the regulated market and lesser quality checks influence the selection of the conventional market.

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1. INTRODUCTION

Indian agriculture is dominated by small and marginal farmers [1]. Smallholder farmers are those farmers with landholding of less than 2 ha of land [2,3]. These farmers own about 33 percent of the total cultivated area [1]. Even though the contribution of agriculture to GDP has been declined substantially since 1950, the decrease in a number of persons dependent on agriculture is minimal [1]. Hence a study in the context of smallholder farmers is paramount.

Further, there is diversification from subsistence farming to growing of fruits and vegetables over the years. Studies show, that among crops grown, fruits and vegetables are allocated a larger proportion of the cultivated land due to the comparative advantage of quick returns especially in the case of vegetables [4,5]. Nationally, about 15.3 percent of the farm households grow vegetables; among them, 16 percent are small-scale farmers (less than 2 ha) contributing about 61 percent of the aggregate vegetable production [2,6]. Vegetable marketing is a complex process due to perishable nature of the produce. Vegetables have to be marketed as and when they are harvested as most of farmers lack cold storage facility. Vegetables are characterized as bulky with seasonal production [7]. Studies indicate the need for strengthening the Indian agriculture and this can be achieved not only by increasing the farm production, but also addressing trade, processing, marketing, and distribution by linking farmers to markets [8]. The decision to sell in any channel is in consideration many other factors than merely higher returns. For instance, selection of the marketing channel depends on information related to product attributes, prices and cost [9,10].

Understanding the factors affecting the market choice (i.e. farmers decision to sell in different marketing channels) is important and can be used to guide farmers, farm investment decision, and market channel development. Further, this also directs in formulating the strategic plans, policies for farmers inclusiveness to the marketing, and development of market abilities. In this study we evaluated the factors that influence the farmers marketing choices to sell vegetables in co-existing marketing channels and

the correlation between those marketing channels.

Co-existence of different marketing channels appears to support producers by providing convenient access to a range of price, quality and service combinations. Marketing of vegetables is not a mere selling of the produce; it also includes the value added activities associated with post-harvest quality maintenance, according to the market channel requirement and unit prices for the produce. Market prices vary due to difference in quality and location. Markets are chosen not only with price consideration but also due to services offered and proximity to these markets. When choosing the buyer, farmers consider factors such as farmers household characteristics, location-specific attributes such as distance to markets and a number of buyers, their own preference and buyers attributes [11,12].

1.1 Description of Vegetable Marketing Channels under Study

1.1.1 Co-operative

Cooperative have been successful in overcoming the constraints of fresh fruits and vegetable sector in India. It has bridged the gap between producers and consumers by building efficient supply chains in forward and backward linkages [13]. The functioning of the co-operative is as follows. Prerequisite for an individual grower to transact in co-operative is that they have to become a member of the farmers' association in co-operative by paying nominal membership fees. Then, through extension activities, growers have been trained to grade their produce. For the consistent quality and quantity requirement of the market, the specific indent required is informed to the secretary of farmers association who will inform to farmers in advance. The farmers provide the indent of supply i.e. quantity of produce they can provide to the secretary of farmers association. Most of the times, the packaging materials and transportation facilities are arranged from the farmer's field with predetermined charges to farmers association. Also at farmers' association there will be check for the quality of the produce, then the boxes are weighed and labeled as A and B grade produce. The receipt is given to the farmer. Then produce collected from all the farmers is transported to

the main market. The traders/buyers also have to be registered member of the co-operative to bid and buy the produce. The retail and wholesale buyers participate in the auction and bid through the electronic button system. Market facilitates the transaction between producers and buyers through a transparent electronic auction system, thus buying and selling takes place at the press of a button in electronic auction hall. The payments are then made to farmers association in the form of demand draft and then the secretary of the farmers association provides account payee cheques to the farmers. Regardless of the seller, quality determination, payment, weight measurements are transparent.

1.1.2 Regulated market

Markets in agricultural products are regulated under the APMC Act enacted by state governments. These regulated markets function under the market committees as per the regulations in the APMC Act. In India, marketing of Agriculture commodities has been regulated with the aim of creating fair and open competition. This has resulted in fair and open access to farmers to sell their produce directly to the registered traders (traders who have got approval from the government who acts as a middleman between the buyers and the sellers) and involve in output markets effectively. These APMC were established to minimize the number of middlemen so that farmers are not exploited and are assured to get existing prices for their produce. Daily updates of price information of all commodities in the websites and via SMS for the registered growers.

Features of the regulated vegetable market under study include governmental control over the marketplace with a large number of transactions. Produce can be homogenous or heterogeneous in quantity, size, and other attributes. Produce is sold through an open auction system by the registered trader via face to face contact between buyer and seller. There will be price quotations, where the highest bidder gets the produce. The returns are paid in cash on the spot. Weights and measures are standardized and monitored.

1.1.3 Conventional market

Small producers in rural areas sell their produce to small shops or kiosks. It is also observed that these are the conventional traders who normally visit the field during the growing season and fix

the price for the crop and either they harvest or farmers harvest and sell to the trader after maturity of the crop. This depends on the agreement and the agreement is usually a word of mouth. No formal contract will be signed between the parties. This market is characterized highly by the easy accessibility to sell, nearby to the farm place and easy access to credits by pledging their produce. Most of the transactions and agreement are informal. Conventional marketing is still predominant way of marketing where the markets are poorly developed.

Having explored smallholder farmers marketing situation in preceding section, following section of the paper describe the material and methods, results and discussion with conclusions.

2. MATERIALS AND METHODS

2.1 Conceptual Framework

The conceptual model explains farmers' marketing behavior. It is assumed that selection of more than one channel by a farmer maximizes the returns conditioned on other factors [14]. Fig. 1 provides a basis for understanding and determining smallholder farmers decision-making process to sell their produce. During marketing of agricultural products, choice of marketing channel affects many other decisions [15] as different channels are characterized by diverse institutional attributes. The choice of marketing channels depend on a) Farmer and farm characteristics b) Socio-economic characteristics [16] as smallholder farmers deal with broadened market choices depending on prices, sales services, degrees of relationship, trust and different enforcement mechanisms of the trader, and c) Market attributes which include transportation facility, market infrastructure, extension services, government regulations, quality management, market or buyer characteristics [17] service of the marketing channel [18].

2.2 Empirical Model

The empirical specification of market choices can be modelled either through multinomial or multivariate regression analysis. But in multinomial regression analysis, we encounter the problem due to the assumptions of IIA (independent irrelevant alternatives) i.e. error terms of the equations are mutually exclusive [19,20]. Thus multinomial regression is

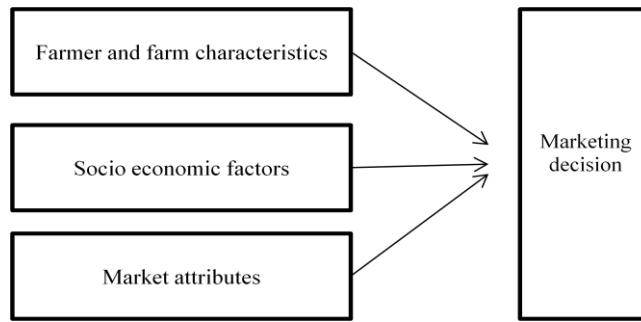


Fig. 1. Conceptual model of smallholder farmers' decision making process

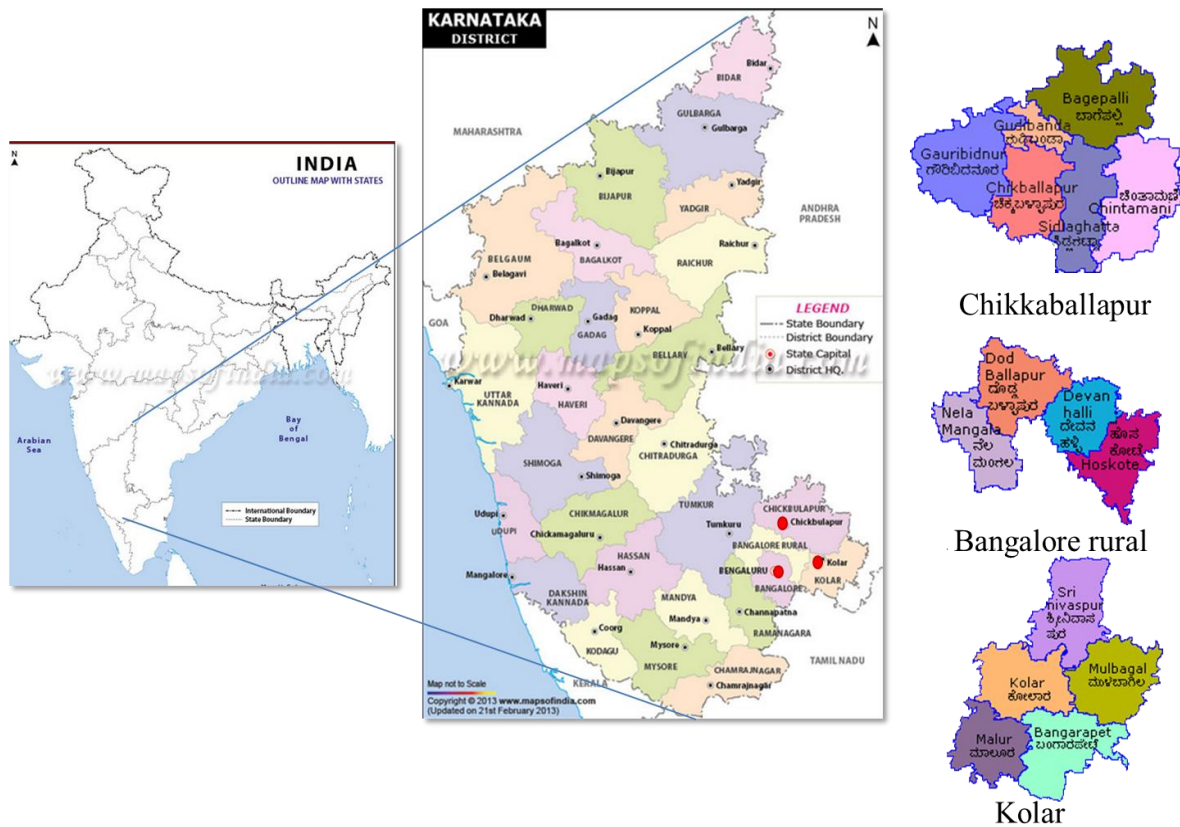


Fig. 2. State and districts of the selected study area

applicable while choosing only one alternative choice from a set of mutually exclusive alternative choices. The market choices by smallholder farmers are not mutually exclusive as farmers are opting for one or more than one market channel choice (Table 1), thus the random errors may be correlated. Hence we opt for multivariate model which allows for correlation choices.

Multivariate probit model provides such prediction rule [21]. The model accounts for simultaneous choices of different marketing channels [9] and potential correlations among

choice decisions [22]. The multivariate probit model for the farmers choice is given by:

$$Y_{im}^* = \beta_m X_{im} + \varepsilon_{im} \quad (1)$$

In equation (1) Y_{im}^* is a variable reflecting choice of a marketing channel by the i^{th} farmer with m denoting the market choice ($m=1,2,3$) i.e. co-operative, conventional and regulated. It is assumed that a farmer sells the produce ($Y=1$) if $Y_{im}^* > 0$ and does not sell the produce ($Y=0$) if $Y_{im}^* < 0$. β_m reflects the set of parameters that reflect the impact of changes in the vector of

explanatory variables X_{im} on the farmer's decision to choose a particular channel. ϵ_{im} denotes random errors of the equations that have a multivariate normal distribution. The multivariate probit model estimates the parameters β_m and the variance and covariance matrix of the multivariate normal distribution of the error terms [19,22].

2.3 Data Collection

Data used was collected by means of face-to-face interviews in regional language using a semi-structured schedule from a sample of 100 vegetable growing smallholder farmers from three districts (Chikkaballapur, Bangalore rural and Kolar districts) of Karnataka, India. Random sampling of smallholder vegetable growers was used in the survey to collect the data.

3. RESULTS AND DISCUSSION

3.1 Variable Description and Descriptive Analysis

The proportion distribution of farmers selling in different marketing channels is tabulated in Table 1. The selling pattern of smallholder farmers from the Table 1 shows that majority of farmers mediate in more than one marketing channel. About 42% of farmers were selling through regulated market 19% through co-operative and only 5% through conventional market. Farmers selling pattern in different marketing combination, for instance, both in cooperative and regulated constitute 23% as listed in Table 1. Table 1 shows that significant percentage of farmers were selling the produce through regulated marketing channel.

Table 1. Three co-existing markets and smallholder farmers selling pattern

Co-operative	(Percentage and proportion)		
	Regulated market	Conventional market	
		Yes	No
Yes	Yes	3	23
	No	7	19
No	Yes	10	42
	No	5	NA

The descriptive statistics of the data and description of the variables are reported in Table 2. The three choices available for the marketing include Cooperative (Y1), Regulated (Y2) and Conventional (Y3) and they were expressed by two dummy variables. Y1=1 if farmer is selling

through cooperative, otherwise zero. Y2=1 if farmer is selling through regulated market, otherwise zero. Y3=1 if farmer is selling through conventional market otherwise zero.

From the conceptual model it is hypothesized that the decision of choosing a marketing channel choice depends on farm and farmer characteristics, socio-economic characteristics and market attributes which includes: family size (HHsize), farm size (FarmSize), area under vegetables (VegArea), education (Edu), number of extension activities involved (Extn), the person has own means of transport to transporting the produce (OwnTrans), has livestock as a subsidiary occupation (Subsidiary), total number of quality checks done for the produce before selling (NrQualCheck), distance to the nearest market (NearD), distance to the main market (MainD), satisfaction of the persons towards their current marketing behavior (MarktSatis).

Farm size (Farmsize) has featured prominently in the literature of the marketing choice decisions [23,24]. Farm size is used as a proxy for wealth of farmers [24,25]. The literature revealed that in Indian context wealth has an effect on the farmers choice of place as wealthier farmers can take advantage of low transportation cost facility or wider social network helps in better market access and market facilities [26]. Further vegetable farm size (VegArea) is important as production of vegetables and investment decisions and marketing decisions depend on it irrespective of the farm size. It is found that the average landholding is 1.72 ha. This result reveals that individual farmer's landholdings is fragmented with less than 2 ha of land area. The allocation of this constrained land resource for the growing of vegetables (VegArea) shows that on an average 0.79 ha of the total available land area is allocated to growing vegetables. Thus, the quantity of total production in the available area decreases the bargaining position of farmers and also increases the assembly cost of produce and search cost of buyers. Farmer characteristics such as education (Edu) could be important because it ensures information flow through different means and enables in rational marketing decisions. Education is an indicator of managerial decisions and marketing practices [27]. The education level of the farmer is measured in terms of a total number of years of education and is likely to influence the farmers' decision. Illiterate farmers were given the value 0, the person with primary education was given a value 1, while the higher secondary was given

the value 2, and a person who had studied for 12 years was given value 3 while upto degree and above were given 4 and 5 respectively. Descriptive statistics reveals that on an average farmers have completed the higher secondary school and thus ensures literacy of most of the farmers leading to better marketing practices. A number of extension activities (Extn) attended by the farmer have impact on marketing decisions. On an average, the smallholder farmer has attended only 2 extension activities.

The presence of own transport affects the market participation and market choices [28,29]. Farmers using either two-wheeler or four-wheeler vehicle for transporting produce is identified as availability of own transport (OwnTrans) and it takes the dummy variable value 1. It is assumed that the farmers who were selling small quantities of produce in the nearby market would use their own transport to avoid transport hiring costs. About 86 percent of the farmers were using their own vehicle to transport a part of their produce or whole of the produce to one or more marketing channels. Further, if a household is involved in subsidiary occupation, such as livestock rearing suggests positive attitudes towards cooperative marketing. It is assumed that farmers with livestock as a subsidiary occupation are already beneficiaries (as farmers are selling milk through dairy cooperatives) and knows the pros and cons of the cooperative behavior. About 73 percent of farmers' were involved in the subsidiary occupation. Technical activities in the farm are inferred from the number of quality checks (NrQualCheck) done before selling the produce that influences the marketing decision. The relative activity among the producers during post-

harvest stratification of the produce had impact on the economic outcome of the producer. The analysis highlighted the influence of quality check on the market channel selection decision. Seven maximum quality segregating checks were found to be done before marketing the produce by the producer. Further, they were distinguished as grade A and B in the producer organization before it reaches the final consumer. Here we consider only the total number of physical quality checks done by the producer during post-harvest stage. Most farmers were doing at least 3 quality checks of which segregating according to size and color are the prominent ones. From the field survey, it is evident that major barrier for the producers to sell in the cooperative channel is the high-quality requirement. The adoption of quality standards may be constrained by limited availability of labor as it is a labor intensive technique. The household family size (HHsize) economically implies cheap availability of labor, thus expected to have a positive relation between the number of increased household members and better bargaining position [30] with higher quality produce in market channel of their choice. Distance is determined as one of the important variables in determining the marketing channel choice. To understand the influence of market distance on marketing channel choice farmers geographical distribution was analyzed. On an average, farmers are situated within a radius of 9.44 km from the nearest market (accordingly for most farmers, it is either farmers' organization or conventional market) and 21.32 km from the main market. The result from econometric analysis presented in Table 2 further explains the influence of these variables on marketing channel choice.

Table 2. Description of the dependent and independent variables used in the model

Variables	Description	Mean	SD
Y_1	1 if Selling in cooperative	0.46	-
Y_2	1 if Selling in regulated market	0.72	-
Y_3	1 if Selling in conventional market	0.19	-
HHsize	Total number of household family members	5.77	2.83
FarmSize	Farm Size (ha)	1.72	0.08
VegArea	Area under vegetables (ha)	0.79	2.00
Edu	Education of the producer	2.78	1.45
Extn	Number of extension activities involved	2.14	2.98
OwnTrans	1 if owning own transport	0.86	-
Subsidiary	1 if involved in dairy	0.73	-
NrQualCheck	Number of quality checks done	3.05	1.30
NearD	Distance to nearest market (Km)	9.44	7.62
MainD	Distance to main market (Km)	21.32	16.26
MarktSatis	1 if satisfied with the current marketing approach	0.87	-

3.2 Empirical Analysis

Empirical results from multivariate probit model estimation on factors influencing selection of marketing channel are summarized in Table 3. The likelihood ratio test of independency of marketing channel decision $\rho_{ki} = 0$ reject the null hypothesis of the error term correlation indicating the goodness of fit thus justifying the use of multivariate probit model.

The significant value of Wald chi-square statistic at 1% level allows us to accept the overall significance of the variables included in the model. Estimated results shows that for cooperative seven variables were found to be statistically significant while for regulated and conventional market two variables are found to be statistically significant.

Results show that increase in area under vegetable production (VegArea) decreases the probability of the decision of selling in cooperative. These results are inconsistent with

the other studies [31]. It indicates that smallholder farmers with lesser vegetable area are more likely to sell in cooperatives implying that cooperatives are farmer friendly and preferred marketing channels for land constraint vegetable farmers. The positive and significant coefficient for farmers accessed extension services (Extn) reflects that other things remaining constant, the probability of a farmer to sell in cooperative increases with the number of extension activities attended. These farmers are more likely to obtain information regarding marketing strategies from attending extension activities. The coefficient for farmers who has own transport facilities (OwnTrans) was found to be positive and significant which shows that the probability of farmers to sell in cooperative increases among farmers owning means of transport. Further, farmers who has subsidiary occupation as livestock (Subsidiary) has more probability of selling their produce in cooperative. The result reveals that benefits from dairy cooperative influence farmer's choice of selling produce through the vegetable cooperative.

Table 3. Determinants of smallholder farmers marketing choices: Multivariate probit results

Variable	Co-operative (Y1)		Regulated (Y2)		Conventional (Y3)	
	Param	t-value	Param	t-value	Param	t-value
Total Number of family members (<i>HHSize</i>)	0.143 (0.091)	1.56	0.022 (0.075)	0.29	-0.03 (0.086)	-0.35
Farm Size (<i>FarmSize</i>)	0.253 (0.196)	1.29	-0.222 (0.142)	-1.57	0.056 (0.19)	0.30
Area under vegetables (<i>VegArea</i>)	-1.291** (0.386)	-3.35	0.529 (0.34)	1.56	-0.26 (0.354)	-0.74
Education (<i>Edu</i>)	0.194 (0.141)	1.38	-0.117 (0.105)	-1.12	0.121 (0.129)	0.94
Number of extension activities involved (<i>Extn</i>)	0.175** (0.087)	2.00	-0.032 (0.042)	-0.76	0.063 (0.063)	1.00
Own Transport (<i>OwnTrans</i>)	1.533** (0.757)	2.03	-0.161 (0.435)	-0.37	0.196 (0.496)	0.40
Livestock (<i>Subsidiary</i>)	0.944* (0.506)	1.86	-0.231 (0.337)	-0.69	0.381 (0.429)	0.89
Total number of quality checks (<i>NrQualChecks</i>)	0.560** (0.175)	3.21	-0.066 (0.132)	-0.50	-0.646* (0.197)	-3.27
Distance to nearest market (<i>NearD</i>)	-0.174** (0.047)	-3.69	0.073* (0.029)	2.48	-0.031 (0.032)	-0.98
Distance to main market (<i>MainD</i>)	0.042** (0.019)	2.24	-0.037** (0.012)	-3.00	-0.001 (0.016)	-0.06
Satisfied with current marketing approach (<i>MarktSatis</i>)	0.182 (0.5)	0.36	-0.072 (0.606)	-0.12	-0.974* (0.514)	-1.89
Constant	-4.523** (1.407)	-3.22	1.667 (1.025)	1.63	1.292 (0.967)	1.34

***, **, * Significant at 1%, 5% and 10% level respectively

Table 4. Correlation coefficients between the marketing channel selection decisions

Pair	Correlation	Standard error	t – value	P [z] >Z
Conventional/Cooperative	-0.385*	0.207	-1.860	0.063
Regulated/Cooperative	-0.369**	0.151	-2.440	0.015
Regulated/Conventional	-0.653***	0.149	-4.380	0.000

***, **, * Significant at 1% ,5% and 10% level respectively

The coefficient for the total number of quality checks (NrQualChecks) is found to be positively significant for cooperative and negatively significant for the conventional farmers. The significant positive coefficient for cooperative clearly indicates that an increase in number of quality checks increases the probability of a farmer selling in cooperative. The negative coefficient of the conventional market indicates that an increase in the number of quality checks decreases the probability of selling in conventional market.

Figures in parenthesis are robust standard errors

Likelihood ratio test $\rho_{21} = \rho_{21} = \rho_{21} = 0$, $\chi^2_{(3)} = 22.74$, p-value= 0.0000

Cooperative marketing requires the highest quality graded produce. The variable distance to nearest market (NearD) is significant for both cooperative and regulated markets. The negative coefficient indicates that longer distances to the nearest market decreases the probability of the farmer selling in cooperative. Whereas the positive coefficient for regulated market indicates that as the distance to nearest market increases the probability of selling in regulated market increases. It is observed that farmers sell produce to cooperatives due to its nearest proximity to the farm field. As the distance increases farmers preference to sell in cooperative decreases while that of the regulated market increases. Further results reveal that distance (MainD) has a negative effect on farmers' choice of marketing channel. Farmers mostly prefer channels that are near to the marketing field. Similar kind of results were found in the study conducted on cocoa farmers choice of market channels where increased transportation distance discouraged farmer's choice of marketing channel [32]. The negative coefficient for satisfied with current marketing approach (MarktSatis) for conventional market suggests that as the farmers satisfaction with marketing increases it is less likely to sell in conventional market.

Correlation coefficients between the equations for marketing decision of cooperative, regulated

and conventional market are given in Table 4. Correlation coefficients between cooperative, regulated, conventional are negative and significant at 1% significant level. Indicating that selling in the conventional market is negatively correlated with selling in the cooperative market. The decision to sell in the regulated market has a negative correlation with selling in the cooperative market.

4. CONCLUSION

Marketing decision is important for smallholder farmers since agriculture is the main source of livelihood. It is evident from the study that farmers try to maximize their utility by choosing multiple marketing channels which have different characteristics. In this study we have conducted the empirical analysis of the factors (farm and farmer characteristic, socioeconomic and marketing attributes) that influence the farmers' selection of multiple marketing channels and the relation among marketing channels using multivariate probit technique. Number of extension activities attend by the farmer was positive and significantly affects the farmers' selection of cooperatives. The inclusion of farmers to high value marketing channels such as cooperative market can be done through involving farmers in extension activities. The positive coefficient for the number of quality checks done for the produce and negative coefficient for the farm holdings to cooperative market indicates that cooperative markets are a boon for farmers with lesser farm holdings but requires high-quality checks for the produce. Variable livestock rearing had positive and significant influence on the choice of cooperative market. The policies directed towards livestock rearing will have positive influence on the cooperative market. Physical distance to the markets was identified as the major determinant factor that affects the marketing channel choice. Results for both cooperative and regulated market showed that, as the distance to the market from the farm increases farmers choice to sell in that marketing channel decreases. Therefore, it is required to improve the market infrastructure within the farmers reach to

overcome this barrier so that the distance between the farm and market is reduced. It encourages farmers to sell their produce either in cooperative or regulated market and increase their income and improve livelihood. The positive significant coefficient for number of quality checks to the cooperative market and negative coefficient for the conventional market signifies that, farmers doing higher number of quality checks preferred the cooperative market while farmers doing lower numbers of quality checks selected the conventional market. Looking at the different characteristics of marketing channel and drawbacks of each marketing channel it can be concluded that, there is a need for the development of markets which can accommodate both quality and quantity requirements within the proximity of the farmer.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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