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Market Outlet Decision in the Value Chain of Vegetable Pea in Hilly Region of Kumaon, Uttarakhand, India

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ABSTRACT

Uttarakhand is emerging as a significant pea-producing state. In this paper, an attempt was made to determine the factors responsible for the market outlet decision made by the producer as an actor in value chain of vegetable pea in the hilly region. The study is based on the primary data collected using a multistage sampling technique from the pea producers of the study area. Three marketing outlet choices emerged from value chain mapping during the study that was via a wholesaler, via rural collector, and directly to the local market. A multinomial logit model was used to predict the relative probability of choosing an outlet among the three by the pea producer. Result of the model indicated that different factors played a significant role in the adoption of different outlet choices over other. The probability of choosing a rural collector increases by 1.4 and 3.3 percent, respectively, with the increase in per unit quantity supplied and per unit increase in distance from the market. In contrast, access to the market information imparts significant negative effects. The probability of choosing a local market trader as a market outlet increases by 1.07 percent with the increase in per unit of quantity supplied, while access to irrigation and market information poses a negative effect. The findings of this study could be used in designing technological and policy interventions by the different stakeholders.

Keywords: Value chain, mapping, multinomial logit, probability

Vegetables are annual or perennial horticultural crops with certain sections (roots, stalks, flowers, fruits, leaves, etc.) that can be consumed wholly or partially, cooked or raw. Pea is one of the members of the Leguminosae (Fabaceae) family that are commonly consumed as fresh and dried too. The global pea production was 20.70 million tonnes (mt) in 2017, as per FAO estimates. China ranks first, producing 12.6 mt followed by India (5.0 mt), the USA (0.2 mt), France, Egypt, and others. Out of total vegetable production in India, the share of pea production was 5.34 million tonnes (2.91%) from an area of around 0.53 million hectares (5.16%) during 2017-18, which was around 25% of global pea production. Out of total pea production in-country, the maximum share was produced in Uttar Pradesh (46.37%) followed by Madhya Pradesh, Punjab, Jharkhand, Himachal Pradesh and others. The state is well known for horticulture crop production. Horticulture crops account for about 43% of the total net sown area in the

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state. Out of total horticultural production of 0.989 million tonnes from an area of 0.100 million ha, pea production accounts for 0.093 million tonnes (9.40%) from an area of 0.013 (13%) million ha. With this, Uttarakhand holds a position among the top 10 pea-producing states in the country, and it is flourishing with a compound annual growth rate (CAGR) of 6.52%. Pea is among the primary vegetables grown in the state. Therefore, it is essential to consider the available marketing andvalue-adding facilities for the upcoming production, so pea is selected for the study. The major pea-growing areas of the state are Punda, Someshwar, Navgarh, Champavat, Padampuri, Udham Singh Nagar, and Haridwar. The existing value-chain analysis of pea in the hilly regions of the state where it is a crucial off-season vegetable crop and fetches premium price in the market so the present study was taken into account to analyze the actual conditions of the producers.

MATERIALS AND METHODS

The study was conducted in hilly regions of the state. Multistage sampling was adopted for the selection of the respondents. Out of the five districts of the hilly region of the Kumaon division Nainital and Almora were selected purposively in the basis of the maximum area under pea production. Two blocks from each selected district i.e., Ramgarh and Dhari from Nainital district and Lamgara and Tarikhet blocks from Almora were selected based on the presence of pea production. Further one village from each randomly selected block and 15 pea producers from each village were selected randomly, making the total sample size 60 producers. Primary data was collected from these respondents through a well-structured pre-tested survey schedule.

Econometric analysis using multinomial logit model was performed to achieve the underlying objective. Multinomial models are used in the case when individuals have a choice between the outcome among the set of mutually exclusive and collectively exhaustive choices. The model is based on the assumption of random utility maximization. The assumption while conducting the study was made is that the farmer's decision to choose among the outlet comprehends to different private costs and benefits, giving rise to different utility to them.

The pea producer *i* was able to choose from the set of alternatives (*j* = 1,2 and 3) which will provide him a certain level of utility, U_{ij}, from each alternative. The model assumed that choice of producer among the outlets was based on the maximization of his utility. He can compare marginal benefits and costs based on the gained utility, i.e., if *i* producer chooses U_{i1}, it means that U_{i2} and U_{i3} provide him relatively more minor utility than U_{i1}. However, it is not possible to directly observe the utilities, but the choice made by the farmer reveals which marketing outlet provides the greater utility (Greene, 2012; Djalalou *et al.* 2015). Hence, the utility was decomposed into deterministic (V_{ij}) and random (ε_{ij}) part:

$$U_{ij} = V_{ij} + \varepsilon_{ij}$$

Since, it was not possible to observe ε_{ij} and predict exactly the choice of marketing outlet, the probability of any particular outlet choice was used in which a farmer selected a marketing outlet *j* = 1 if:

$$U_{ik} > U_i \forall\, j \neq k$$

where U_{ik} represents a random utility associated with the market channel *j* = *k*,

V_{ij} represents an index function denoting the decision-makers average utility associated with this alternative, and

ε_{ij} represents the random error.

Assuming that the error terms are identically and independently distributed with type *i* extreme value distribution, the probability that a household chooses alternative *j* can be explained by a multinomial logit model (Greene, 2000) as follow:

$$P_{ij} = \frac{\exp\left(\beta_j X_{ij}\right)}{\sum_{j=0}^{j} \exp\left(\beta_j X_{ij}\right)}$$

where X_{ij} is a vector of the household of the i^{th} respondent facing alternative *j*

β_j is a vector of regression parameter estimates associated with alternative *j*.

Following the above equation, in terms of the study, where,

i represents i^{th} producer, *i* = 1,2,3……60

j represents different marketing outlets identified in the research

P represents the probability of marketing of pea via outlet *j* to be chosen by producer *i*

β_j is a vector of regression parameter estimates associated with alternative *j*

X refers to independent variables used in the study

RESULTS AND DISCUSSION

The explanatory variables were selected to find out the determinants to estimate the factors responsible for choosing the outlet in the study area. Wholesalers appeared the most preferred outlet choice by the pea producers in the study area with 61.67 percent, followed by that of rural collectors and local market traders. Though the frequency to choose rural

Table 1: Description of dependent and independent variables used in the multinomial logit model

Variable	Measurement
Dependent variable	Categorical (unordered)
Market outlet choices	1. Wholesaler
	2. Rural collector
	3. Local market trader
Independent variables	
Yield	Continuous (quintals)
Land size allocated for pea	Continuous (hectares)
Family size	Continuous (numbers)
Quantity supplied to the market	Continuous (quintals)
Decision maker of the family	Dummy (0 female,1 male)
Distance from the nearest mandi	Continuous (km)
Access to credit	Dummy (1, if yes otherwise 0)
Sources of credit	Categorical
	1. if relatives,
	2. if banks,
	3. if traders and
	4. if multiple sources are adopted
Access to prior market information	Dummy (1 if yes, otherwise 0)
Access to irrigation	Dummy (1 if yes, 0 for rainfed)

Table 2: Multinomial logit result of the determinants of outlet choices by the pea producers

Explanatory variables	Outlet choices					
	Rural collector			Local market trader		
	Coefficients	P>	dy/dx	Coeff.	P>	dy/dx
Total land	**-1.91** (1.50)	0.231	**-0.23** (0.18)	**-0.22** (1.34)	0.901	**0.06** (0.11)
ln (Quantity supplied)	**2.20** (0.78)	0.031*	**0.15** (0.09)	**3.03** (0.97)	0.009*	**0.11** (0.06)
ln (Distance)	**3.34** (1.05)	0.006*	**0.35** (0.12)	**1.71** (0.83)	0.274	**-0.02** (0.09)
Irrigation	**-1.52** (0.91)	0.138	**-0.02** (0.10)	**-4.04** (1.59)	0.014*	**-0.23** (0.09)
Access to Information	**-4.20** (1.23)	0.004*	**-0.26** (0.14)	**-5.76** (1.53)	0.001*	**-0.37** (0.14)
Access to Credit	**1.08** (1.04)	0.354	**0.04** (0.10)	**2.00** (1.43)	0.188	**0.08** (0.07)
-cons	-17.36 (6.17)	0.018		-13.11	0.138	

Note: Values in the parentheses represent a robust standard error in case of coefficients and standard error in case of marginal effects (dy/dx); Log likelihood = -31.172229; LR chi^2 (12) = 48.33; Prob > chi^2 = 0.0000; Pseudo R^2 = 0.4367 *explanatory variables significant at 1% of confidence level.

collectors was more, the quantity disposed of via it was found less due to the amount they were handling. As rural collector was found to assemble the product from the producer's farm itself, a greater number of producers with less quantity had more access to it.

The result obtained from the multinomial logit model described the factors (Table 1) responsible for the choice of different outlets, by taking producers disposing of their produce via wholesaler as the base category as it attained the maximum frequency, on the basis of which interpretations are made. The hypothesis that the coefficients of all the independent variables used in the model were zero is rejected at 0.01 percent level of significance using the likelihood ratio chi-square test (LR chi^2 test), interpreted that the coefficient of not all the independent variables used in the model were zero. The value 0.4367 of McFadden's R^2 (Pseudo R^2) test indicated the model as a good fit.

The findings of the model in table 2 present the coefficients and the marginal effects of the independent variables on the outlet choice among the alternatives. Values of marginal effects measure the expected change in the dependent variable for a unit change in the corresponding independent variable, other independent variables being equal. The sign of the coefficient shows the direction of influence of the variable on the logit. A positive value indicates an increase in the likelihood that a producer will change to the alternative outlet from the baseline category (Greene, 2012). Results presented in table 2, indicate that significant independent variables vary with the variation in the outlet. Quantity supplied, distance from the nearest mandi, and access to information were found to significantly determine the selection of rural collector as the outlet choice. In contrast, quantity supplied, access to irrigation, and access to market information was found to determine the selection of local market trader as the outlet choice, compared to the base category.

CONCLUDING REMARKS AND POLICY RECOMMENDATIONS

1. Determinants for the rural collector as an outlet

Quantity supplied, distance from the nearest, and access to market information appeared to have a significant impact on producers' decision to choose rural collectors as an outlet. Quantity supplied and distances from the mandi pose a positive impact on the choice, while access to irrigation poses a negative impact. The marginal effect of quantity supplied indicated that the probability of choosing rural collectors over wholesalers as an outlet by the producers of the study area will increase by 1.4 percent with an increase in quantity supplied by him in the market by one quintal. Similarly, regarding distance from the market, the probability of choosing rural collectors over wholesalers as the outlet will increase by 3.3 percent with the increase in distance by one km. But, regarding access to irrigation, as it poses a significant negative impact on the outlet choice, its marginal effect indicated that the probability of choosing rural collector as an outlet could decrease by 25.85 percent over choosing a wholesaler as an outlet as a producer get access to information.

2. Determinants for the local market trader as outlet

Quantity supplied, access to irrigation, and access to market information appeared to have a significant impact on producers' decisions for choosing local market traders as outlet. Quantity supplied poses a positive impact on the choice, while access to irrigation and access to market information pose a negative impact. The marginal effect of quantity supplied indicated that the probability of choosing rural collectors over wholesalers as an outlet by the producers of the study area can increase by 1.07 percent with an increase in quantity supplied by him in the market by one quintal. While, regarding distance from the access to irrigation and information, choosing a local market trader over a wholesaler as an outlet can decrease by 22.6 and 36.52 percent, respectively, with the increase as producers get access to irrigation and information.

As a result of, the econometric analysis suggested improving and increasing the access to market information with pea producers. This could possibly be achieved only if trust and strong trade agreements among the traders and producers get established, which in turn increase the chances of producers to choose wholesalers as outlet. This could improve the arrivals of the market, increasing the status of

the market as a whole. Distance from the market appeared in the econometric result as an important factor, and transportation cost accounted for the maximum share of the marketing cost incurred by the actor; small outlets as social or private investments need to get focused. As it is showing a positive impact while supplying the product to rural collectors in order to avoid high transportation costs, the probability that farmers would prefer small outlets nearby to dispose of their produce directly to consumers will be more, which could improve their share in consumer rupee also.

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