Resource use efficiency and marketing analysis of apple crop in Shimla district of Himachal Pradesh

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 Received: 28.10.2015/Accepted: 22.3.2016

ABSTRACT

Apple crop accounts for 50 per cent of the world's deciduous fruit tree production. This temperate crop has become a gainful cash crop for the people in northwestern Himalayas. It accounts for an economy of around Rs 3500 crores constituting 10 per cent of the gross domestic product of Himachal Pradesh. Apple is grown mainly in the districts of Shimla, Kinnaur, Kullu, Mandi, Chamba and some parts of Sirmour and Lahaul-Spiti. The analysis was based on data collected from 50 households of Shimla district of Himachal Pradesh in 2014 providing a deep insight into the resource use efficiency and marketing channels of apple. Various factors like use of labour, pesticides, FYM, fertilizers and area under apple cultivation were regressed through Cobb-Douglas production function and the results showed that all these factors directly affected apple yield. Input of labour and fertilizers was moderately affecting the apple yield. Increase in the pesticides input and area under apple cultivation by 1 per cent augmented the apple yield by 0.552 and 0.438 per cent respectively. Highest share of produce was traded through channel D (60%) followed by channel C (29%) which implies that channel D was more efficient in apple transactions to the consumers. Apple production is a profitable enterprise and is in its mature state in Himachal Pradesh as depicted by positive and increasing returns to scale respectively.

Keywords: Apple; multiple-regression; marketing efficiency; scale

INTRODUCTION

Apple is the most important temperate fruit crop of the northwestern Himalayan region in India. It accounts for 46 per cent of total area under fruit crops and 76 per cent of the total fruit production of Himachal Pradesh (Randev 2005). It is predominantly grown in Jammu and Kashmir, Himachal Pradesh, Uttarakhand and some hilly areas of Uttar Pradesh accounting to about 90 per cent of the total production. The apple production in India is 7-8 tonnes per hectare whereas globally in countries like Australia, New Zealand, USA and European countries it ranges from 60 to 70 tonnes per hectare (Anon 2006). The area under apple in Himachal Pradesh has increased from 3025 hectares in 1960-61 to 107686 hectares on 2013-14 (Anon 2014). The state gets around 8 to 10 tonnes of apple per hectare against 35 to 40 tonnes of fruit in the advanced countries. The transportation and marketing aspects are the main problems faced by the apple growers in Himachal Pradesh. A well organized network of apple markets easily accessible to all the widely scattered producers will help to overcome the difficulty that the apple sector faces because of the fixed locations of the farms (Kireeti 2013). There are other reasons as well for paying special attention to the marketing of apple produce. An efficient marketing system is essential for developing and also maximizing returns from apple production. In this regard Abdul and Afzal (2005) pointed out that an efficient market acts as bridge between the producer and consumer. Present marketing has an inherent tendency to give more benefits to these intermediaries at the cost of apple growers. In this view the study was undertaken to evaluate the resource use efficiency and marketing analysis of apple in Shimla district of Himachal Pradesh.

METHODOLOGY

The present study was undertaken during 2014 in the Shimla district of Himachal Pradesh being a major hub of apple crop in India and situated between 30º452 482 2 – 30º432 02 2 North latitude and 76º 592 222 2 – 78º 182 402 2 East longitude. The climate in Shimla district is predominantly cool during winters and moderately warm during summers. The average temperature during summer is 19 degree and 28 degree centigrade and in winter 1 degree and 10 degree centigrade. Monthly precipitation varies from 15 ml in November to 434 ml in August. It is typically around 45 ml per month during winter and spring and 175 ml in June. The average total precipitation is 1575 ml.

Multistage random sampling technique was used to select 50 respondents. Two apple cultivation blocks namely Theog and Kumarsain were selected where five villages were surveyed to acquire data and from each village five apple growers were selected. Analysis of data was done by using SPSS-2012 and XLSTAT-2012 through descriptive statistics such as multiple regression, marketing margin, marketing cost, price spread, marketing efficiency and producer's share in consumer's rupee.

The model for the multiple regressions was specified by Rumayor-Rodriguez (1995) thus Cobb-Douglas production function as given below was used for resource use efficiency:

$$Y = b_o X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5}$$

where Y= Yield of fruit (kg), X_1= Labour (man days), X_2= Pesticides (Rs/acre), X_3= FYM (Rs/acre), X_4= Fertilizers (Rs/acre), X_5= Area under apple cultivation (acres)

$$\text{Log}Y = \text{Log}b_0 + b_1\text{Log}X_1 + b_2\text{Log}X_2 + b_3\text{Log}X_3 + b_4\text{Log}X_4 + b_5\text{Log}X_5$$

Marketing margin (MM)= Selling price (SP) – Purchase price (PP)

In case of marketing channels the marketing efficiency is concerned with the movement of goods from producer to consumer at the lowest possible cost consistent with the provision of services desired by the consumers. The marketing efficiency of various channels in the study area has been computed by using Acharya's method (Acharya and Agarwal 2011) as under:

$$ME = \frac{CP}{MC + MM} - 1$$

where ME= Marketing efficiency, CP= Consumer's price, MC= Total marketing costs, MM= Total marketing margins

Producer's share in consumer's rupee is the price received by the farmer expressed as a percentage of retail price (ie the price paid by the consumer) (Acharya and Agarwal 2011). If P_r is the retail price the producer's share in consumer's rupee (P_s) may be expressed as follow:

$$P_s = \frac{P_f}{P_r} \times 100$$

where P_s= Producer's share in consumer's rupee, P_r= Retail price or price paid by consumer, P_f= Farmer's price

This study was restricted to only farmers who dealt in local apple in the state. The study was based on the data collected for one year only (2014-15) which may not necessarily hold true for other periods as well.

RESULTS and DISCUSSION

Multicollinearity

Multicolinearity explains the linear relationship among the explanatory variables of a regression model. Multicollinearity statistics of data as expressed in tolerance and variance inflation factor showed in Table 1 reveal that the values of tolerance for all the variables viz labour (X1, man days), pesticides (X2, Rs/acre), FYM (X3, Rs/acre), fertilizers (X4, Rs/acre) and area under apple cultivation (X5, acres) lied in the range of 0.326 to 0.837 which seems closer to 1 and implies that there was no collinearity among the explanatory variables. On the other hand the values of variance inflation factor ranged from 1.195 to 3.072 which was less than 10 and indicated that there was no multicollinearity among all the explanatory variables (Gujarati et al 2012).

Multiple regression analysis

Multiple regression analysis of data was done through Cobb-Douglas/power production function which was the best fitted model with highest R^2 (93.4%)

Table 1. Multicollinearity statistics (Gujarati et al 2012)

Statistics	X1	X2	X3	X4	X5
Tolerance	0.340	0.386	0.786	0.837	0.326
VIF	2.940	2.592	1.273	1.195	3.072

and adjusted R^2 (92.0%) among all the production functions. The data in Table 2 reveal that all the variables were found statistically significant. However variables X2 (pesticide), X3 (FYM) and X5 (area under apple cultivation) were found highly significant at 5 per cent level of significance and indicated direct effect on apple crop yield in the state whereas variables X1 (labour) and X4 (fertilizers) were affecting the apple yield at 10 per cent level of significance. The one per cent increase in the pesticides increased the apple yield by 0.552 per cent one per cent increase in area under apple increased the yield by 0.438 per cent as shown in following Cobb-Douglas function.

The summation of the powers all of the input variables provides directly with a ready estimate of the returns to scale as also the degree of homogeneity

$$Y(\text{yield}) = -2.608 X1(\text{Labour})^{0.219} X2\ (\text{Peasticides})^{0.552} X3(\text{FYM})^{0.316} X4\ (\text{Fertilizers})^{0.316} X4\ (\text{Area under apple cultivation})^{0.438}$$

Table 2. Multiple regression analysis

Source	Value	Standard error	T	R^2 (%)	Adjusted R^2 (%)	Return to scale ("b_i)
Intercept	-2.608	0.520	-5.017	93.4	92.0	1.61
Labour (man days)	0.219	0.120	1.825*			
Pesticides (Rs/acre)	0.552	0.123	4.489**			
FYM (Rs/acre)	0.316	0.115	2.749**			
Fertilizers (Rs/acre)	0.156	0.088	1.772*			
Area under apple cultivation (acres)	0.438	0.093	4.702**			

of the production function. In the present study return to scale value was 1.61 which means increasing return to scale in this enterprise (Table 2).

Marketing channels

In the marketing of apple various market intermediaries like local traders, primary wholesalers, secondary wholesalers and retailers were engaged (Fig 1). In the channel C and D local trader has been found to perform the functions like picking, assembling grading, packing and transportation for the disposal of apple after purchasing the standing crop. In the channel B, C and D primary wholesalers took the title of produce from either producer (in channel B) or local trader (in channel C and D). Secondary wholesaler was found in channel D and took the title of produce from primary wholesaler and purchased the produce in bulk by different methods of sales such as direct selling, auction, bidding etc. Retailers took the title from secondary wholesaler and sold to consumer in small quantities.

Price spread

In the marketing of agricultural commodities, the difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of farm produce is known as price spread or gross marketing margin. It includes marketing cost (the cost involved in moving the product from the point of production to point of consumption ie the cost of performing the various marketing functions and of the various agencies and marketing margin (profits of the various market functionaries are involved in moving the produce from point of production to ultimate consumer). The analysis revealed the net price on per quintal basis received by the growers to be Rs 3890, 4370, 5000 and 5000 in channel A, B, C and D respectively (Table 3). Consumer's price or retailer's selling price varied from Rs 4850 to 10197. Total marketing cost varied from Rs 960 to 2548 and marketing margin from Rs 0.00 to 2499 in different channels (Table 4). Price spread was examined Rs 960 in channel A to Rs 5047 in channel D. Producer's

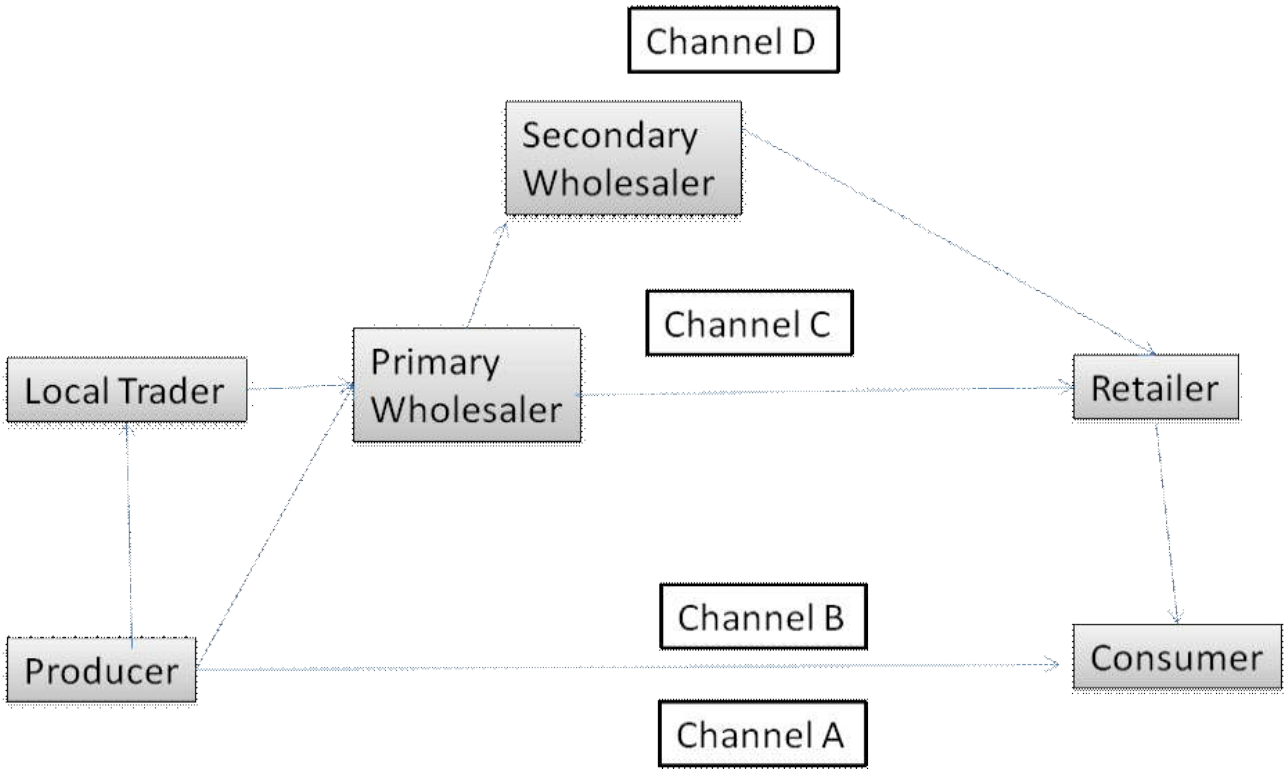

Fig 1. Different marketing channels of apple

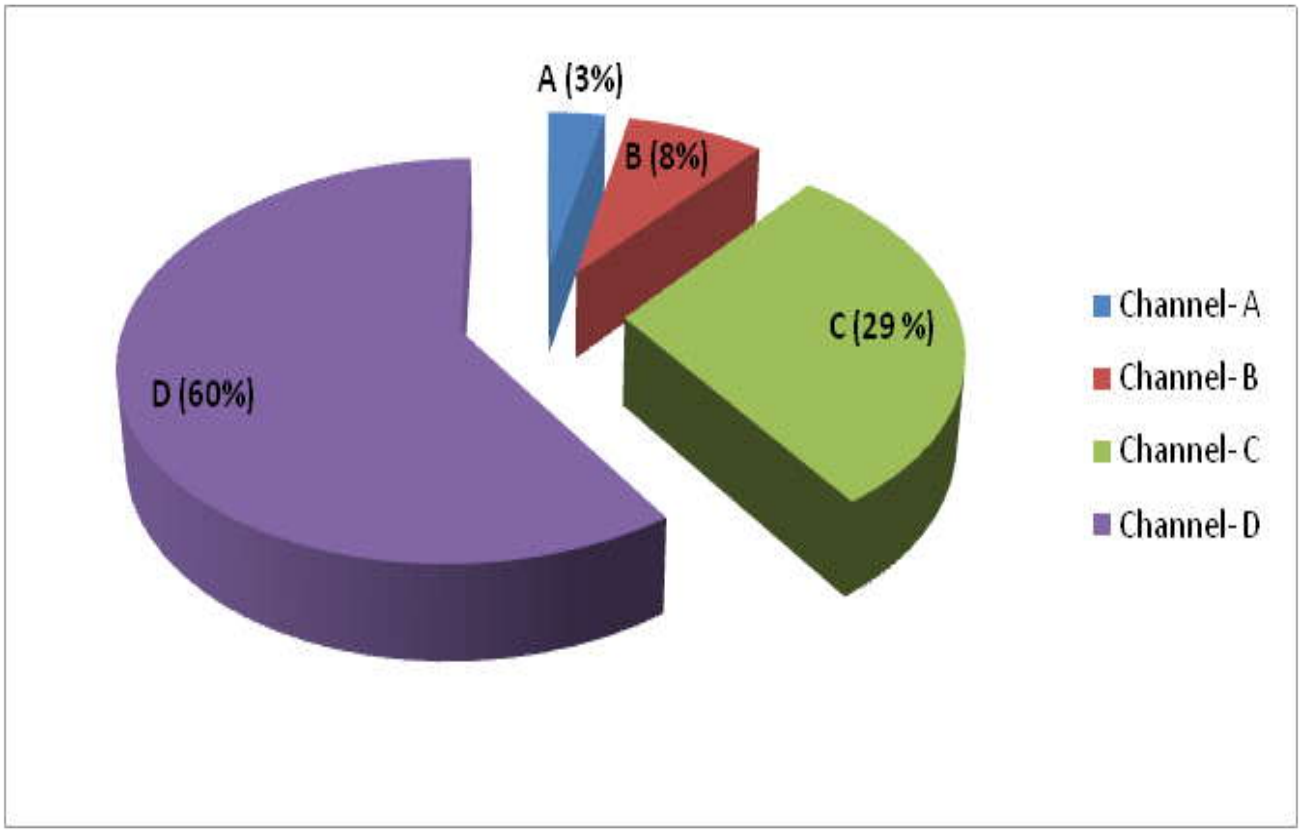

Fig 2. Percentage share in total quantity of apple marketed

Table 3. Marketing costs and margins of different functionaries in the different marketing channels of apple in Shimla district of Himachal Pradesh (in Rs/q)

Parameter	A	B	C	D
Marketing costs incurred by producer				
Net price received by farmer	3890	4370	5000	5000
Marketing cost	960	1530		
Farmer's selling price	3890	4370	5000	5000
Marketing costs incurred by local trader				
Gross price paid by local trader			5000	5000
Marketing cost			1550	1550
Local trader's margin			1000	1000
Local trader selling price/primary wholesaler purchase price		5900	7550	7550
Marketing cost incurred by primary wholesalers				
Gross price paid by primary wholesaler		5900	7550	7550
Marketing cost		480	480	480
Primary wholesaler margin		654	654	654
Primary wholesaler selling price/secondary wholesaler's purchase price		7500	8650	8870
Marketing costs incurred by secondary wholesaler				
Gross price paid by secondary wholesaler				8870
Marketing cost				232
Secondary wholesaler's margin				408
Secondary wholesaler's selling price				9510
Marketing costs incurred by retailer				
Gross price paid by retailer		7500	8650	9510
Marketing cost		262	262	262
Retailer's margin		425	425	425
Retailer's selling price		8187	9337	10197
Consumer's purchase price	4850	8187	9337	10197

Table 4. Marketing efficiency and producer's share in consumer's rupee

Parameter	Marketing channel			
	A	B	C	D
Total marketing cost (Rs/q)	960.00	1792.00	2316.00	2548.00
Consumer's price (Rs/q)	4850.00	8187.00	9187.00	10047.00
Total net marketing margin(Rs/q)	0.00	1371.00	1871.00	2499.00
Marketing efficiency (%)	5.05	2.59	2.19	1.99
Price spread (Rs/q)	960.00	3163.00	4187.00	5047.00
Producer's share in consumer's rupee (%)	80.21	53.38	54.42	49.77

share in consumer's rupee was examined in different marketing channels which varied from 80.21 to 49.77 per cent in channel A to channel D implying that channel A was more efficient.

Marketing efficiency is the effectiveness or competence with which a market structure performs its designated function (Jasdanwalla 1966). Simply it is an indicator of overall performance of the marketing channels. The results indicated highest efficiency in channel A (5.05%) followed by channels B (2.59%), C (2.19%) and D (1.99%). Though channel A was found efficient but the volume transacted was very less (3%) and high quality produce was traded through this channel.

Data presented in Fig 2 detail about percentage share of marketing channels in total quantity of apple transacted. Highest share of produce was traded through channel D (60%) followed by channel C (29%) which implies that channel D was more efficient in apple transactions to the consumers. Remaining channels A and B were found to be inefficient as far as trading of apple was concerned. Thus very small

share of produce was traded through A and B marketing channels.

CONCLUSION

Increasing trends in returns to scale of apple steers the planner to plan production strategies for long run so as to safeguard the interests of farmers involved in production process. Cobb-Douglus production function determined that at 5 per cent level of significance pesticides, FYM and area under apple cultivation enormously affected apple crop yield while input of labour and fertilizers was moderately affecting the apple yield at 10 per cent level of significance. Increase in the pesticides input and area under apple cultivation by one per cent augmentated the apple yield by 0.552 and 0.438 per cent respectively.

The present marketing structure shows that 89 per cent of the quantity was transacted from the channel C and channel D.These channels involved high total marketing costs and marketing margins. Marketing is a wider concept and deserves careful attention towards pre- and post-harvest technologies and operations. Apple production is a profitable enterprise in Himachal Pradesh and is in its mature state as depicted by positive and increasing returns to scale.

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