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RESEARCH ARTICLE

PRODUCTION AND MARKETING ECONOMICS OF HONEY FROM *APIS CERANA* IN DANG DISTRICT OF NEPAL

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ABSTRACT

Beekeeping with *Apis cerana* is a vehicle to run livelihood of rural farmers in Nepal. Honey production is major source of cash income for them. This study was conducted in Dang, Nepal, with the aim to analyze production and marketing economics of honey form *A. cerana.* Total 55 beekeepers, two beekeeping groups, two collectors and five retailers were selected randomly for interview. The results showed that on average farmers holding 14.55 bee hive with productivity of honey 6.12 kg per hive. The benefit cost ratio was 3.71 and average annual net profit was NRs. 2,646.96 (USD 23.06) per hive. Human labour hours in colony management, number of beehives and number of honey harvest per year were significant factors affecting honey production. Ninety two percent of honey produce was actually marketed through three major marketing channels. Most of the producers directly sold honey to consumer and had higher farm gate price. Overall farm gate price, price spread, producer's share and marketing efficiency index of honey was NRs. 671.06/kg, NRs. 93.15/kg, 84.12 percent and 5.30 respectively. Absconding behavior of *A.cerana* was the top production problem and lack of wholesale marketing points was top most marketing problem perceived by farmers.

KEYWORDS

Beekeeping, Economics of production, Marketing, Production problem.

1. INTRODUCTION

Beekeeping and honey production with native bee species *Apis cerana* is a sustainable livelihood option for rural people of Hindukush Himalyan countries (Partap et al., 2017). It provides an opportunity to generate cash income among marginalized and landless people with low capital investment and management requirement (Verma, 1990; Neupane and Saebjoernsen, 2014). It contributes more than one third to almost two third share in average annual farm cash income of Nepalese farmers (Gurung, 2005; Joshi, 2008; Neupane and Saebjoernsen, 2014). According to a study, more than 50,000 Nepalese farmers are keeping *A. cerana* for honey production (Partap et al., 2017). Most of them keeping their bee colonies traditionally in log and wall hives (Joshi, 2008; Pudasaini, 2018). In Nepal *A. cerana* contribute 44 percent share toward national honey production and occupies 80 percent hives in total bee hives of the country (INCLUDE, 2014). *A. cerana* keepers sell honey to local markets and neighboring countries through informal channels (Linkenheil et al., 2015; Partap et al., 2012a).

Besides honey production, *A. cerana* has important role in pollination and plant diversity conservation (Ahmad et al., 2003). Pollination by *A. cerana* enhance quality and quantity of production in different agriculture crops (Pokhrel, 2009; Partap et al., 2012b). This bee species has been proved more efficient pollinator than exotic species (Partap et al., 2012b; Pudasaini and Thapa, 2014; Neupane and Saebjoernsen, 2014). But studies reported that *A. cerana* colonies are declining significantly in Nepal (Partap, 1999; Partap and Partap, 2002; Ahmad and Partap, 2008). This declination results poor agricultural production and low farm cash income among marginalized farmers, and eventually lead to threat in livelihood, food security and agricultural economies of the country. Thus, a best way for conserving *A. cerana* in Nepal is, to promote commercial beekeeping with *A. cerana* by analyzing production and marketing situation of its direct product. Hence, recognizing all the facts and benefits of *A. cerana*, this study was conducted to analyze production and marketing economics of honey form *A. cerana.*

2. MATERIALS AND METHODS

2.1 Study area

Dang district was selected for the study. It is situated in the mid-western inner Terai of Nepal and largest valley of Asia, located at altitude from 213 to 2058 meter above mean sea level (masl) (DADO, 2018). It is one of the top most honey producing district of Nepal and contribute about 14 percent share toward National honey production (INCLUDE, 2014). Major bee species keeping for honey production in the district are *A. cerana* in hilly area and *A. mellifera* in plain area (DADO, 2016). Hence the study was concentrated in hilly part of district. And conducted mainly in hilly part of Tulsipur sub-metropolitan and whole part of Banglachuli rural municipality, where more than 75 percent *A. cerana* keepers of the district are located (DADO, 2016).

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2.2 Selection of respondent and sample size

All *A. cerana* keepers keeping more than two beehives and completed at least one year of production cycle were taken in sampling population because this category of farmer have highest contribution in total honey production and marketing in this area. For interview, total 55 beekeepers, two beekeeping groups, two collectors and five retailers were selected from list provided by District Agriculture Development Office, Dang (DADO, 2016) and other authorized bodies. Simple random sampling technique was used for selection of respondents.

2.3 Source and method of data collection

Primary data collected by using pre-tested systematic semi structured questionnaire through face to face interview, focus group discussion and key informants survey. Secondary information was taken by reviewing different publications of concerning organizations, published research article, news, internet browsing etc. Field survey conducted on October and November, 2018. During field survey face to face interview of all respondents and key informants was taken at their residence, shop or office. Information obtained were regularly checked and validated to increase effectiveness. One focus group discussion of farmers was conduct to collect group information and validation of information obtained in face to face interview.

2.4 Data analysis

Collected data were entered and analysed by using Microsoft Excel 2013, Statistical Package for Social Sciences (SPSS 20.0 V).

2.5 Summarization and presentation of data

2.5.1 Cost of honey production

To determine cost of production all variable and fixed cost were considered at current price.

Total cost of production = Total variable cost + Total fixed cost (Devkota, 2006)

2.5.2 Return and margin analysis

Gross return from honey and wax (NRs/hive) = Total produced (kg/hive) × Farm gate price (NRs/kg) (Michael, 2008)

Gross Margin (NRs/hive) = Gross return -Total variable cost (Adedeji and Joseph, 2016)

2.5.3 Benefit cost analysis

Undiscounted benefit cost ratio = Gross return ÷ Total cost (Shrestha, 2017)

2.5.4 Profit analysis

Net profit (NRs/hive) = Total sales revenue – Total cost (Shrestha et al., 2018)

Total sales revenue = Quantity sold (kg/hive) × Price (NRs/kg)

2.5.5 Factors affecting honey production

Multiple linear regression model was applied to estimate the effect of different factors on honey production. Honey production (in kg) was taken as dependent variable while human labour hours, number of honey harvest per year and number of bee colony are taken as explanatory variables. The model was fitted using ordinary least square technique with Logarithmic function.

Mathematical expression of model is;
$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + m$
Where,
Ln = Natural logarithm,
Y = Honey yield (kg)
X_1 = Human Labour hours
X_2 = Number of bee colony
X_3 = Number of honey harvest per year
a = Constant
m = Error term and
b_1, b_2 and b_3 are the Coefficients of respective variables

2.5.6 Marketing channel

Different marketing channel of honey from *A. cerana* were identified through information provided by respondents.

2.5.7 Marketed surplus

Marketed surplus = Total quantity of honey produce – (Quantity of honey used for family consumption + Quantity of honey loss if any)

2.5.8 Price spread

Price spread = $P_c - P_F$ (Acharya and Agrawal, 1999)

Where,
P_c = Price paid by consumer
P_F = Farm gate price

2.5.9 Producer's share

$P_S = (P_F \div P_c) \times 100$ % (Singh and Meena, 2014)
Where, P_S = Producer's share
P_c = Price paid by consumer
P_F = Farm gate price

2.5.10 Marketing cost

Marketing cost of traders = Cost of honey transportation + cost of container

2.5.11 Marketing margin

Margin of each marketers in different marketing channel of honey was calculated as;
$A_m = P_R - (P_P + C_m)$ (Singh and Meena, 2014)
And, $P_m = [P_R - (P_P + C_m)] \div P_R \times 100\%$
Where, A_m= Absolute margin of marketers
P_R = Sale price
C_m = Marketing cost per kg
P_m = Percentage margin of marketers
P_P = Purchase price

2.5.12 Marketing efficiency

MME = [RP ÷ (MC + MM)] - 1
Where, MME = Acharya's modified marketing efficiency
RP = Price paid by the consumer
MC = Total marketing costs
MM = Net marketing margin

2.5.13 Indexing

Top most Problems of honey production and marketing were ranked using force ranking techniques, based on the perceived attitude of respondent toward these problems. List of major problems for ranking was prepared by discussing with key informants. The index value of ranking was calculated as;

$I = \sum S_i f_i / N$
Where, I= Index value; Si = Scale value of i^{th} level; Fi= Frequency of i^{th} level; N = Total number of respondents.

3. Results and Discussion

3.1 Demographic and beekeeping characteristics of farmers

Demographic and beekeeping characteristics of farmers affect overall social and economic status of beekeeping community. The result of these characteristics analysis act as basis to formulate different extension programs for targeted groups. Total population in household of sampled beekeepers was 409. In which percentage of male and female were 49.88 percent and 50.12 percent respectively. More than half (56.97%) of total population was economically active population (Ages 15-59). Average family size of beekeepers was 7.44. Most of the beekeepers (94.55%) were involved in agriculture as major occupation. Education status of respondents showed more than half (53%) of beekeepers were found to complete only basic level and more than one third (38%) were not went for any formal education. It is due to the rural background. All sampled beekeepers used traditional beehives for honey production. But it was found that some of the beekeepers trying to keep 1-2 colony in framed hive

as an experiment to modernize. More than half (53%) beekeepers had not taken even basic training for beekeeping. Almost two third (60%) keepers had not received any type of subsidy for beekeeping either from government or non-government sector.

3.2 Economics honey production

3.2.1 Productivity, cost and return analysis

In study area, average bee hive holding per household was 14.55 hives with average annual honey production of 6.12 kg/hive. Productivity was slightly less compared to 10.3 kg/hive in Bangladesh and 8 kg/hive in Pakistan as reported by some researchers, it shows need to work on productivity enhancement (Partap et al., 2017). Total cost of beekeeping was estimated to be NRs. 1,113.33 per hive (114.80 NRs. = 1 USD), INCLUDE estimated it to be NRs. 1,700 (INCLUDE, 2014). Labour cost was only major variable cost, because all farmers adopted traditional type of beekeeping and do not use inputs such as sugar and honey feeding, drug and chemicals and migration of bee colonies. Gross return in research area was estimated to be NRs. 4,132.08 per hive and gross margin was estimated to be NRs. 3,044.75 per hive. The gross return found was almost four times more than what reported, such a high gross return is due to rise in price and demand of honey rather than production (Pokhrel, 2009). Details of cost and return are shown in Table 2.

3.2.2 Benefit - cost ratio and profit analysis

Average undiscounted benefit cost ratio from beekeeping in the research area was 3.71, which was little bit more compared to 2.86 as found (Islam et al., 2016). Such higher B: C ratio reveals an excellent economic viability and profitability of beekeeping and honey production in the study area. The profit analysis of beekeeping showed average annual net profit of NRs. 2,646.96 (USD 23.06) per hive, which was somewhat low compared to USD 33.8 as reported in Bhutan. Production economics is summarized in Table 1 (Partap et al., 2017).

Table 1: Economic statement of beekeeping in study area

Measuring criteria	Average value
Average number of beehives per household	14.55
Productivity- main product equivalent (kg/hive)	6.12
Gross return (NRs/hive)	4132.08
Gross margin (NRs/hive)	3044.75
Total cost (NRs/hive)	1113.33
Net profit (NRs/hive)	2646.96
B/C ratio	3.71

Source: Field survey, 2018

Table 2: Cost and returns in beekeeping

Cost and return per hive	**Value (NRs)**
Variable cost of production (human labour cost)	1087.33
Fixed cost of production (Depreciation)	26.00
Total cost of production	1113.33
Gross return from honey	4109.38
Gross return from wax	22.70
Total gross return	4132.08

Source: Field survey, 2018.

3.2.3 Factors affecting honey production

The results of multiple regression analysis showed that explanatory variable namely human labour hours in colony management, number of honey harvest per year and number of bee colony had positive and significant effect on honey production (dependent variable) at 1% level of significance. In case of relation between honey production and Number of bee colony result was similar to the finding but it was contradictory to the result of same persons in case of human labour hour and honey production, as they reported insignificant effect of human labour hours on honey production (Sapkota, 2006; Paudel, 2003). Model summary showed that the regression coefficients were 0.246, 0.740 and 0.334 for human labour hours, number of bee colony and number of honey harvest per year respectively. Indicating spend of one-hour additional human labour in colony management can yield additional 0.246 kg of honey, additional one bee colony can add 0.740 kg of honey and one times more honey harvest can enhance honey production by 0.334 kg remaining other thing constant. The value of coefficient of multiple determination (R^2) of regression model was 0.854, which means 85.4 percent variation in dependent variable have been occurred due to explanatory variables. F-value of given model was 99.481showing factor variance was 99.5 times more than error variance which was significance at 1% level indicates the importance of independent variables in variation of model output (Table 3).

Table 3: Estimated value of coefficients and related statistics regression analysis.

Factors	**Coefficients**	**Std. Error**	**t- value**	**Sig. level**
Constant	0.736	.395	1.862	0.068
Human labour hours	0.246**	0.091	2.706	0.009
Number of bee colony	0.740**	0.071	10.381	0.000
Number of honey harvest per year	0.334**	0.116	2.868	0.006
F - Value	99.481**			0.000
R square	0.854			
Adjusted R square	0.845			

Note: ** indicates the significance at 1% level of significance
Source: Field survey, 2018.

3.3 Economics of honey marketing

3.3.1 Marketed surplus and marketing channel of honey

The total marketed surplus of honey in study area was 91.35 percent. It was low compared to 96 percent as found and suggest high level of honey self- consumption in the study area (Partap et al., 2017). The total marketed honey of research area was found to be traded through three major marketing channels. Which are;

Channel-I: Producer - Consumer
Channel-II: Producer - Collectors - Consumers
Channel-III: Producers - Retailers – Consumers

Among those prevailing marketing channels, channel - I was most common and marketed highest volume (87.73%) of total honey traded (Table 4). The result is in line with the finding of (Pokhrel, 2009; Partap et al., 2017). In channel-I producers sold honey to consumer based on personal contact.

3.3.2 Farm gate price, price spread and producer's share

In study area average farm gate price of honey was found to be NRs. 671.06/kg (Table 4). Which was varied according to the marketing channel of honey and fetched highest when producer directly sold honey to the consumers (Joshi, 2008; INCLUDE, 2014; Partap et al., 2017). Price spread of honey in research area was NRs. 93.15/kg and producer's share in consumer rupee was 84.12 percent (Table 5).

Price spread was highest when honey sold through retailers while producer's share was highest when it sold through collectors. Sapkota found producer's share to be 93 percent compared to this, producer's share in the research area is low that shows a need to improve marketing system (Sapkota, 2006).

3.3.3 Marketing margin and efficiency of honey marketing

Average marketing cost of honey in the research area was estimated to be NRs. 29.74/kg in case of retailers and NRs. 20/kg in case of collectors. Similarly, marketing margin was found to be 11.79 percent for retailers and 11.43 percent for collectors on their selling price. Marketing margin of retailer found in study area was in line with the finding of some researchers, however marketing margin of collector was almost half as compared to their result (Partap et al., 2017).

Overall marketing efficiency index of honey marketing channels having different intermediaries was found to be 5.30. Which is highest (5.71) for channel-II and shows that marketing of honey is more efficient when it is marketed through collectors rather than retailers. Contradictory to the result Oyuga reported it to be more efficient when honey marketed through retailers (Oyuga, 2008). Detail of marketing margin and efficiency are shown in Table 6.

Table 4: Marketing channel and Farm gate price of honey in study area

Marketing channels	Quantity sold (kg)	Percentage	Farm gate price per kg (NRs.)
Channel I	3910.00	87.73%	695.92
Channel II	266.00	5.97%	490.98
Channel III	281.00	6.30%	495.55
Overall	4457.00	100.00%	671.06

Source: Field survey, 2018.

Table 5: Price spread and producer's share in honey marketing

Marketing channels	Retail price per kg (NRs.)	Farm gate price per kg (NRs.)	Price spread per kg	Producer's share per kg
Channel II	576.96	490.98	85.98	85.10%
Channel III	595.49	495.55	99.94	83.22%
Overall	586.48	493.33	93.15	84.12%

Source: Field survey, 2018.

Table 6: Marketing cost, margin and efficiency of honey marketing

Marketing channels	Price paid by consumer per kg (NRs.)	Percentage margin	Absolute margin (NRs.)	Marketing cost per kg (NRs.)	Marketing efficiency index
Channel II	576.96	11.43%	65.98	20.00	5.71
Channel III	595.49	11.79%	70.20	29.74	4.96
Overall	586.48	11.62%	68.15	25.00	5.30

Source: Field survey, 2018.

3.3.4 Problems of honey production

Result of the study showed that among five major problems absconding behaviour of *A. cerana* was most important problem in beekeeping and honey production with highest index (0.84) (Pudasaini, 2018). Due to absconding behaviour most of the beekeepers in the study area not able to keep their bee colonies in modern framed hive and perform better management practices for commercialization.

The second most important problem was infestation of pest which include insect pest and other wild pests such as wasps, wax butterfly, ants, birds etc. Major production problems with respective rank are presented in Table 7.

3.3.5 Problems of honey marketing

Honey marketers in the study area marketed very less quantity of honey so that they had no more significant marketing problems. But the honey producers perceived various problems in honey marketing. The result showed that top most problem in honey marketing realised by beekeeper was lack of whole sale marketing point to sale their honey in bulk. The problem showed highest index of 0.85 (Table 8.).

Table 7: Production problems in honey production ranked by beekeepers in the study area

Major production problems	Index	Ranking
Absconding behaviour	0.84	I
Low production and productivity	0.46	IV
Pest infestation	0.77	II
Pesticide use in the nectar source	0.42	V
Lack of training and support	0.51	III

Source: Field survey, 2018.

Table 8: Marketing problems in honey marketing perceived by producers in the study area

Major marketing problems	Index	Ranking
Lower price	0.78	II
Lack of whole sale marketing points	0.85	I
Lack of market information	0.29	V
Price differentiation	0.68	III
Poor market access	0.41	IV

Source: Field survey, 2018.

4. Conclusion

Based on the results of this study it is concluded that honey production from *A. cerana* is highly profitable and potential in Dang district, thus, more resources can be diverted to improve condition and commercialization of beekeeping with *A. cerana.* The marketing system of honey is still preliminary and need to put efforts for establishment of well develop competitive market. In order to increase share of marketers in honey marketing, marketers need to reduce their cost and margin and offer higher price to producers. Government organizations, non-government organizations and farmers themselves required to focus on proper management of production problems. Adherence of government sector is needed to generate probable solutions such as establishment of collection centres, price fixation of honey etc. for marketing problems.

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