Research Article

Study of Production Economics and Production Problems of Honey in Bardiya District, Nepal

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Abstract | Beekeeping is very old practice in Nepal but modern beekeeping actually started from 1995. This study was carried in Bardiya, Nepal with the objective of analyzing production economics, resource use efficiency, technical efficiency and production problem of honey, produced from *Apis mellifera*. Total of fifty five households were randomly selected as the sample for the study. Farmers were rearing on an average 34.54 hives and average honey productivity was 34.6 Kg/hive. Average production cost was NRs. 7392.52 with the average net profit of NRs. 2987.05 (1 USD = 106 NRs), and B:C ratio was 1.67. Labor cost, migration cost and expenditure on sugar drug and comb foundation seems to have positive and significant relation with gross return. All of them appeared to be underutilized and needed to be increased by 39%, 74% and 34% respectively for the profit maximization. Main production problem found to be high cost and inadequate availability of modern equipment with the index score of 0.81. And, according to the farmers, main role institution that should play is providing training to the farmers. With proper and efficient use of input, beekeeping could be potential and viable commercial enterprise.

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Introduction

Bees and beekeeping is very old practice in Nepal and it has been known here since much longer than we can track. There is gradual change in the farming practices from the cultivation of traditional grain crops to high value crops. They are keen to increase the yield and enhance the quality of these crops in order to earn better economic returns. Of the various methods of increasing crop yields, management of crop pollination is one of the important means. Cross pollinated crops vastly depends upon pollinating insects for the pollination, among them bees are the major one (Pratap, 1999). Beekeeping itself is a profitable non-farm agricultural enterprise. It has been cultural and natural heritage for the rural people of Nepal. But still, its commercial farming practice is somewhat new. Some farmers and some area are involved in commercial beekeeping too but that margin is very low. According to GoN (1995), modern beekeeping was actually started in 1995, with the introduction of *Apis mellifera*. The European honeybee has been popular since that in the country due to its higher productivity and ease to handle as compared to other. There are nine species of honeybees in the world, and eight of them live in Asia making it treasure house of bees. Out of them, five are economically important and have been found in Nepal (Pau-

del, 2003). In Nepal, *Apis cerena, Apis laboriosa, Apis dorsata* and *Apis florea* are commonly found at wild state. With the increased market and demand of the honey as well beekeeping being one of the potential contender means in fighting against poverty, better understanding of its economical aspect, strength as well weakness needed to be understood properly. So, this study was carried in Bardiya, Nepal with the objective of analyzing production economics, resource use efficiency, technical efficiency and production problem of honey, produced from *Apis mellifera*.

Materials and Method

Study area

For the study Bardiya district was selected. Bardiya district lies in the western plain part of Nepal which falls in Bheri Zone.

Sample size and selection of the respondent

All the farmers rearing *Apis mellifera* from Bardiya district were the target population for this study. During the selection of the respondent only age of above 20 years and who have completed at least one year cycle of beekeeping were included in the sample, because they provide valuable and useful information from their own experience. Careful attention was paid to make the sample more inclusive as possible. Farmers less than 5 bee colonies were not included, because it was assumed that they were involved rather as hobby or just learning. Total of 55 households were selected as sampling respondents for this study.

Source of information

For the primary data, pre-tested systematic semi structured questionnaire was used for face to face interview and key informant interview. Secondary information was mainly collected through reviewing books, reports and different publications published by Ministry of Agriculture Development (MOAD), Central Bureau of Statistics (CBS), Nepalese Agriculture Research Council (NARC), District Agriculture Development Office, national/international journals. Other than those, published materials from different NGOs and INGOs, individual research and scholar research article concerning beekeeping.

Survey design and data collection

For the collection of primary data two sets of interview schedule were prepared, one set to collect the information from farmers another set to collect the information from key informants. Different variables were identified and interview schedules were prepared accordingly. The field survey was conducted in April, 2017. The respondents were interviewed using face to face method at their homes during day time. To avoid haphazard data, regular checking of the information along with their validation was carried after the fulfillment of interview schedule.

Key informants were interviewed in the same manner. Information obtained from the interview was cross checked during the focus group discussion.

Data analysis

Both the primary information collected from survey and secondary information collected from various means were coded, tabulated and analyzed by using Microsoft Excel and Statistical Package for Social Sciences (SPSS).

Summarization and presentation of data

Simple statistical tools like mean and frequency were utilized to summarize the data about comparative economics of production, marketing, socio-economic situation etc.

Cost of production of honey

The items included for calculation were labor cost, feeding and comb foundation cost and migration cost.

Benefit Cost Ratio (B:C Ratio): Benefit cost ratio is a simple and quick method to evaluate the economic performance of any enterprise. It measures the amount of revenue per unit of cost involved. It was determined as the ratio of total return to total cost. Thus, the benefit cost analysis was carried out by using formula;

B:C Ratio = Gross return (NRs./hive) /Total cost (NRs./hive)

Profit analysis: Net profit per hive apiary products were calculated as following;

Net Profit = Gross return – Total cost

Factors of production: In order to estimate the factors affecting honey production multivariate regression model was applied. Production (Kg/hive) was accounted as the dependent variable while cost incurred on feeding and comb foundation, labors and migra-

tion cost considered as the explanatory variables. For the estimation of impact of different inputs and their efficiency on honey production non-linear production function i.e. Cobb-Douglas function was used. Because of its convenience on comparison of partial elasticity coefficient it is commonly used in agriculture research (Prajneshu, 2008). For the examination of productivity and efficiency of resource a production function was established, which is as follows;

$$Y = aX_1^{b1} X_2^{b2} X_3^{b3} e^m$$

Where;
Y: Gross return (NRs./hive); X_1: Human Labor Cost (NRs./hive); X_2: Cost of sugar drug and comb foundation (NRs./hive); X_3: Migration cost (NRs./hive); e: Base of natural logarithm; m: Random disturbance term; a: Constant term; $^{b1, b2, b3}$: Coefficients of respective variables. The non-linear production function was linearized using ordinary least square (OLS) technique, and turned into as follows;

$$lnY = lna + b_1 lnX_1 + b_2 lnX_2 + b_3 lnX_3 + m$$

Where;
Ln: Natural logarithm; m: Error term.

Return to scale of honey production was estimated by following formula;

$$Return\ to\ scale\ (RTS) = \Sigma bi$$

Where;
Bi: Coefficient of i^{th} explanatory variables.

Indexing: Major problem in honey production along with role of institution in the development of honey production as perceived by entrepreneurs were ranked by forced ranking technique.

$$I = \Sigma\ Si\ fi / N$$

Where, I: Index Score; Si: Scale value of i^{th} level; Fi: Frequency of i^{th} level; N: Total number of observation.

Results and Discussion

Description of the study area

Bardiya district lies in the western plain part of Nepal which falls in Bheri Zone. The district covers an area of 2,025 km^2 among the total area 71.4% of area falls under lower tropics, 22.6% area is covered by upper tropics and 2.7% area is by subtropics (Lilleso et al., 2005). The altitude of the district is 300 m to 2000 m from the mean sea level. Total population of the Bardiya district was 426,576 in 2011 (CBS, 2011). Kailali district is in the west, Banke district in east, Surkhet and Salyan on north and Uttar Pradesh region of India in the south of the district. Majority of the area of this district falls under the fertile plains, covered mainly with agricultural land and forest. Bardiya National park covers 968 Km^2 covers the most of the northern half of the district.

Household characteristics

The household characteristics of beekeeping farmers can have little to very high impact on their decision making, approach, practice leading up to success or failure of their enterprise. Collected data of general household characteristics of beekeeping farmers was analyzed and the major descriptive household characteristics include total population, family size, main occupation, income sources and land holding. Total population of 55 sampled households was 294. In which, 51.48% were female and 48.52% were male. The average family size for the sampled household was 5.34, which was higher compared to district average of 5.13 in 2011 (CBS, 2011). The economically active population in the sampled study (referring to the population belonging to the age group of 15-59) was more than $2/3^{rd}$ of the population (68.31%). The occupational pattern showed that very few beekeeping households (17.31%) were involved in non-agricultural profession and majority of them (82.69%) were involved solely in agriculture. Very few of the sampled entrepreneurs were found to be illiterate. Among them, 94.73% of them found to be literate. On an average, the sampled households were found to be engaged in commercial beekeeping for 5 years with maximum of 10 years.

Returns from beekeeping

The average hive number per household for the study area was 34.54 hives with production of honey equivalent to 34.6 Kg/hive. In the research area, Gross return of beekeeping was estimated to be about NRs. 7392.52, which was derived by multiplying the total amount of honey production per hive and per unit farm gate price of honey (Michael, 2008), while total cost of beekeeping per hive was estimated to be about NRs. 4405.47. And, the net profit of beekeeping in

the research area found to be NRs. 2987.05 per hive. The average B:C ratio of beekeeping in the research area was 1.67. Such high benefit cost ratio advocates very strongly on the profitable potential of beekeeping in the area. Detail of production economics has been expressed in Table 1.

Table 1: *Economic statement of beekeeping in the study area.*

Measuring criteria	Average value
Average number of hives per farm	34.54
Productivity-main product equivalent (Kg/hive)	34.6
Gross return(Rs./hive)	7392.52
Total cost (Rs./hive)	4405.47
Net profit (Rs./hive)	2987.05
Benefit cost ratio	1.67

Table 2: *Estimated values of coefficients and related statistics of cobb-douglas production function of beekeeping.*

Factors	Coefficient	Std. Error	t-value	Sig. level
Constant	3.019	0.777	3.87	0.000
Human labor cost (NRs./hive)	0.351	0.114	3.17	0.003
Expenditure on sugar drug and comb foundation (NRs./hive)	0.313	0.306	3.09	0.004
migration cost (NRs./hive)	0.149	0.045	3.72	0.001
F-value	46.44			0.001
R square	0.74			
Adjusted R-square	0.72			
Return to scale	0.813			

Resource use efficiency on beekeeping

As like all the other production process in the world, honey production also requires combination of different inputs in its production process. The detail of efficiency of resources and other related statistics of production function of beekeeping are presented in Table 2. Three independent variables i.e. human labor cost, expenditure on sugar drug and comb foundation and migration cost were considered to show their effects on production of honeybee. All of those three variables to be significant at 1% level. Result showed that, if we increase labor cost by 100% that will enhance gross return by 35%. Likewise, with 100% increase of expenditure on sugar drug and comb and migration cost, that will result in increase of gross return by 31% and 15% respectively. The coefficient of multiple determination (R^2) is a number which indicates the proportion of the variation occurred in dependent variable due to independent variable(s) (Gujarati, 1995). The coefficient of multiple determination R^2 of the given model was 0.74, which indicates that about 74% of variations in gross return have been occurred due the explanatory variables of the model.

The F value for overall significance of the estimated regression was 46.44 indicating that factor variance is 46.44 times more than error variance. And significance level of the model was 1% suggesting importance of independent variables of model in output. The return to scale of honey production can be estimated by summing all the production coefficients (Dhakal et al., 2015). The return to scale of honey production of the study area was0.813which indicates that income can be increased by 81.3% with 100% increase in all the specified inputs of the production model.

Technical efficiency of inputs used in beekeeping

The estimated value of MVP and MFC of all inputs of honey production is presented in Table 3. The ratio of MVP to MFC appeared to be positive and greater than one indicating underutilization of resources. That means income from honey production can be enhanced with increasing the level of those resource inputs. All the inputs i.e. human labor, expenditure on sugar drug and comb foundation & specially, migration cost were underutilized on beekeeping in study area. Here, Human labor was underutilized, it was needed to be increased by 39% and similarly, expenditure on sugar drug and comb foundation& migration cost were required to be increased by 34% & 74% re spectively.

Table 3: *Estimates of measures of technical efficiency of inputs used in beekeeping.*

Inputs	Geometric mean	Coefficient	MVP	MFC	MVP/ MFC	Efficiency	Percent adjustment required
Human labor cost (Rs./hive)	1618.86	0.351	1.621	1.00	1.621	Under utilized	38.798
Expenditure on sugar drug and comb foundation(Rs./hive)	1474.25	0.313	1.535	1.00	1.535	Under utilized	34.235
Migration cost (Rs./hive)	329.71	0.149	3.741	1.00	3.741	Under utilized	73.678

Problems in honey production

Information about major problems were identified from focus group discussion and key informant interview. Then, those problems were asked to respondents to rank from their point of view. Identified five major problems were disease, high cost and inadequate availability of modern equipment, lack of source honey processors, use of poison on source and shortage of skilled human power found to be major problems. Among all of them, High cost and inadequate availability of modern equipment and accessories appeared to be most important problem, with the index score of 0.81, from farmers' point of view. Detail about index score and rank for other problems are shown in Table 4.

Table 4: *Production problems of honey production as perceived by farmers.*

Top ranked problems	Index score	Rank
Disease and pest	0.52	IV
High cost and limited availability of modern equipment and accessories	0.81	I
Lack of honey processors	0.40	V
Use of poison/pesticides in the source	0.58	III
Shortage of skilled human power	0.67	II

Table 5: *Role of institution in the development of honey production.*

Top ranked roles	Index score	Rank
Increasing awareness	0.61	III
Training with latest technology	0.72	I
Pasture development	0.67	II
Product diversification of honey	0.45	V
Breed improvement	0.57	IV

Role of institution in the development of honey production

Information about major roles institution can play in development of honey production were identified from focus group discussion and key informant interview. Then, those roles were asked to respondents to rank from their point of view. Identified five major roles were increasing awareness, training with latest technology, pasture development, product diversification of honey and breed improvement. Among all of them, training with latest technology found to be the most important role, with the index score of 0.72, that institution can play from farmers' point of view. Detail about index score and rank for other roles are shown in Table 5.

Average honey production of the area was 34.6 Kg/hive which is slightly less compared to 40.71 Kg/hive as found by Vaziritabar and Esmaeilzade (2016). And, that clearly shows need of improvement in production technique and feeding material etc. The undiscounted benefit ratio of honey production of that area was 1.67. Devkota (2006) reported it to be 2.41 & Devkota et al. (2016) reported it to be 1.81, in comparison to them, of result of our research is little low, and suggest more efficient input use and need for increasing the productivity in over all, but it is still very profitable. Average cost found to be NRs. 4405.47, which is almost double in comparison to what reported by Devkota (2006) but in fairness total revenue, NRs. 7392.52, is also about one and half times more compared to what he reported. Average profit of that area was NRs. 2987.05, similar was reported by Micheal (2008). Here, labor used in honey production found to have positive and significant relation with yield but Ahmad et al. (2016) reported it to be negative and insignificant. Here, feeding material and others used in honey production found to have positive and significant relation with yield, which is supported by Devkota et al. (2016). And Migration cost seems to have positive and significant effect on yield, which is supported by Paudel (2003). Returns to scale of that area was 0.813, this estimation is supported by Dhakal et al. (2015), who estimated returns to scale to be 0.857 also in the case of maize-pumpkin production. Here, Human labor was underutilized, it was needed to be increased by 39%, which is supported by Dhakal et al. (2015) reported to its opposite. The major production problem of that area was high cost and inadequate availability of modern equipment and accessories, which is supported by Abebe et al. (2016), and it shows the need of better and cheaply availability of equipment and accessory. The main role that any local institution should play to improved honey production is training of farmers with latest technology according to farmers, which is also supported by Paudel (2003). That shows farmers interest in adapting latest technology and at the same time weakness of local bodies in teaching farmers about modern and improved techniques.

Conclusions

All those analysis and result concludes that beekeeping and honey production is a potential enterprise. Although it has potential for high profitability and productivity, it has not gained its optimum due to un-

derutilization of its inputs. Other than that, frequently occurring pest like ants, honey badger, diseases, small bee hives, poor management etc.also could be the other hurdles. Higher level of gross return and net profit can be ensured by increasing the implementation of inputs in recommended manner. The analysis of resource use efficiency on beekeeping shows that all the explanatory inputs of beekeeping considered in the study area were underutilized. So, to harness maximum possible return farmers needed to be encouraged for further increasing the use on inputs to reach the optimum level. Thus, if proper and efficient use of input could be ensured, beekeeping could be very potential and viable commercial enterprise.

References

Abebe, A., Yilma Tadesse, Y., Equar, Y., Faji, M. and Alebachew, H. 2016. Analysis of honey production systems in three agro-ecologies of Benishangul-Gumuz, Western Ethiopia. J. Agric. Extension Rural Dev. 8(3): 29-38. https://doi.org/10.5897/JAERD2014.0705

Ahmad, O.S., Alabi, O.O. and Daniel, P.O. 2016. Resource-use efficiency of honey production in Kachia Local Government Area, Kaduna-State. Nigeria J. Agric. Stud. 4 (1): 117-126.

CBS. 2011. National Population and Housing Census 2011. National Planning Commission Secretariat. Central Bureau of Statistics. Kathmandu, Nepal. 6.

Devkota, K.H. 2006. Benefit-Cost analysis of apiculture enterprise: A case study of Jutpani VDC, Chitwan, Nepal. J. Inst. Agric. Anim. Sci. 27:119-125.

Devkota, K., Dhakal, S.C. and Thapa, R.B. 2016. Economics of beekeeping as pollination management practices adopted by farmers in Chitwan District of Nepal. Agric. Food Security. 5:6. https://doi.org/10.1186/s40066-016-0053-9

Dhakal, S.C., Regmi, P.P., Thapa, R.B., Sah, S.K. and Khatri, D.B. 2015. Productivity and profitability of maize-pumpkin mix cropping in Chitwan, Nepal. J. Maize Res. Dev. 1(1):112-122. https://doi.org/10.3126/jmrd.v1i1.14249

GON. 1995. Annual Report, 1994-95. Ministry of Agriculture and Cooperatives. Department of Agriculture. Kathmandu, Nepal.

Gujarati, D.N. 2007. Basic Econometrics. Tata McGraw-Hill Ltd, New Delhi, India.

Lilleso, J.B., Shrestha, T.B., Dhakal, L.P., Nayaju, R.P. and Shrestha, R. 2005. The map of potential vegetation of Nepal. : A Forestry? Agro-ecological? Biodiversity Classification System. University of Copenhagen.

Micheal, O.F. 2008. Costs and Return in Modern Beekeeping for Honey Production in Nigeria. Pak. J. Soc. Sci. 5(4): 310-315.

Paudel, L.P. 2003. Economics of honey production and marketing: A case of Chitwan, Nepal. IAAS, Rampur Campus. Chitwan, Nepal.

Pokhrel, S. 2009. Comparative benefits of beekeeping enterprise in Chitwan, Nepal. J. Agric. Environ. 10.

Prajneshu. 2008. Fitting of Cob-Douglas production function. Agric. Econom. Res. Review. 21: 289-292

Pratap, U. 1999. Pollination management of mountain crops through beekeeping: trainers resource book. ICIMOD. Kathmandu, Nepal.

Vaziritabar, S. and Esmaeilzade, S.M. 2016. Profitability and socio-economic analysis of beekeeping and honey production in Karaj state, Iran. J. Entomol. Zool. Stud. 4(4): 1341-1350.