INDONESIAN JOURNAL OF SOCIAL AND ENVIRONMENTAL ISSUES (IJSEI)
Journal Homepage: https://ojs.literacyinstitute.org/index.php/ijsei
ISSN: 2722-1369 (Online)
Research Article

Volume 2	Issue 1	April (2021)	DOI: 10.47540/ijsei.v2i1.200	Page: 78 – 85

Chiuri (*Aesandra butyracea*) and Beekeeping for Sustainable Livelihoods of Chepang Community in Raksirang-6, Makawanpur, Nepal

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ARTICLE INFO

Keywords: Beekeeping; Bee-Hive; Chepang; Chiuri; Honey.

Received : 18 March 2021
Revised : 06 April 2021
Accepted : 20 April 2021

ABSTRACT

Chiuri trees and beekeeping are the major sources of livelihood among the Chepang community. The study was performed to assess the role of Chiuri on livelihood improvement of the Chepang community through beekeeping and to analyze the efforts of CFUGs to conserve the Chiuri in Silinge Community Forest User Group, Raksirang-6, Makawanpur district, Nepal. Focus Group Discussion, Key Informant Survey, and Individual interview in households were carried out for the study from January to March 2019. With the increasing demand for organic honey made from the flower of Chiuri, the locals of the Chepang village in Makawanpur have started generating a good income from beekeeping. The majority (63%) of the respondents reported that the trends of the status of beekeeping were increasing in households. The selling of honey was the main source of income for the people of Silinge Community Forest User Groups (CFUGs). One-third of households made income in the range of NRs 200,000 (US$ 1,720.83) - NRs 300,000 (US$ 2,581.24). Physical capital and financial capital have significantly increased, whereas human, social and natural capitals were in increasing trends. The relationship between Chiuri and honey bees was very positive for both. The marketing system of Chiuri is not well developed in the study area. The Chepang community will get more prices after certifying their products as organic. Organic Certification of Nepal (OCN) should conduct studies about organic honey.

INTRODUCTION

Chiuri (*Aesandra butyracea*) is a deciduous tree; about 20 m high of family Sapotaceae (Manandhar, 2002). It is commonly known as butter tree. It is distributed in the sub-Himalayan region of Nepal, India, and Bhutan, and Bangladesh; at an altitude of 300m to 1500 m (Devkota et al., 2019). The butter called "Chiuri butter" or "Phulwara butter" is the main product of the tree, which is extracted from its seeds (Devkota et al., 2019). It contains 55% fat (Sakya, 2000). In Nepal, many ethnic people's income depends on the extraction of Chiuri butter and its sale (Devkota et al., 2019). From 2011 to 2016, about 20 tons/year of Chyuri butter was being exported from Nepal to the European market (Devkota et al., 2019). The companies such as Himalayan Bio-Trade Pvt. Ltd., Alternative Herbal Products (P) Ltd., Deuti Herbal Industry, etc. are producing herbal products from Chiuri butter (Rytkönen, 2016).

Chiuri is produced, collected, or harvested traditionally for home consumption, marketing, and socio-cultural uses in hilly areas of Nepal (Bista & Bhatta, 2014). Different parts of this plant are used for diverse purposes. Chiuri butter is used to treat pimples, burns, headaches, boils and as an emollient (Watanabe et al., 2013) for lighting and cooking lamp, hair oil, a raw material of soap (Devkota et al., 2019). Oil cake is used for fertilizer which also acts as an insecticide or wormicide (Shakya, 2000), and fish poison (Devkota et al., 2019). Fruits are used to make fruit jam (Sundariyal et al., 2004). Seed oil is used for cooking (Samant & Dhar, 1997) and lamp oil (Punetha, 2017). Chiuri nectar is important for bees to produce honey called Chiuri honey (Joshi, 2008; Bista & Bhatta, 2014). The

species is also planted on margins of agricultural lands for fodder and to restore degraded lands or wastelands (Tewari et al., 2015). Chiuri has antioxidant, analgesic, and anti-inflammatory potential supporting its traditional medicinal uses (Chhetri et al., 2020).

Chiuri has a very important religious and cultural value in Nepalese ethnic communities. Especially in the Chepang community, people give Chiuri plants as a dowry to their daughters, which indicates its significance in their livelihood (Sakya, 2000). Chepang (an indigenous ethnic group of mid-Southern Chitwan, Nepal) use different parts of Chiuri for different purposes, eg. Seeds for medicine, insecticides, cooking oil, the fish poison, cosmetics, cultural and religious events; leaves for fodder; stem for firewood; branch for medicine (wounds), fruits for consuming as food; and nectar for honey (Rijal, 2011). The efficient cultivation, utilization, and conservation of Chiuri tree may enhance the socio-economic condition of people who depend on it (Devkota et al., 2019). Chepang people highly depend on forest resources to fulfill their daily needs, livelihood support, and socio-cultural identity (Joshi et al., 2015; Aryal et al., 2018). Farming alone cannot provide enough food for them, hence they follow other traditional means of living like; hunting, collecting wild foods, fishing, etc. (Regmi et al., 2006; Piya et al., 2011a). The Chepang tribe is considered the poorest of Nepal's poor (Beine et al., 2012).

Nepali people are using different parts of Chiuritree for economic development and livelihood sectors through micro-enterprises like soap production, domestic ghee, wine or juice production, beekeeping, and oilcake used as an insecticide. With the increasing demand for organic honey made from Chiuri, the Chepang village locals in Makawanpur have started processing honey and generating a good income from beekeeping. However, there were no research studies carried out, how beekeeping through Chiuri tree uplifts the livelihood of the Chepang community in the study site. Thus, this study aims to assess the role of Chiuri on livelihood improvement of the Chepang Community through beekeeping and to analyze the efforts of CFUGs for the conservation of Chiuri, assess the livelihood improvement, and document the beekeeping practices by the Chepang community.

MATERIALS AND METHODS

The study was conducted in Makawanpur district (latitudes 27°10' and 27°40' N and longitude 84°41' and 85°31' E) of Bagmati province, Nepal from January to March 2019. It extends from the inner terai lowland to mid-hills at an altitude range of 170m-2,584m. It covers an area of 2,430 km2. The climate of the district ranges from tropical to temperate (Joshi et al., 2015). The study was mainly focused on Silinge Community Forest User Group, Raksirang Rural Municipality-6. The community forest has a total area of 4.3044 Km^2 which is managed by the Chepang community. The majority of people are engaged in the beekeeping business where bees solely depend upon Chiuri for the nectar.

The study was focused on the understanding of the various stakeholders, functions, participation, roles, and services that they provide methods and approaches to understand opinions of multiple interest groups and stakeholders. Several governmental and non-governmental officials were consulted. The questionnaire survey was carried out by one person per Chepang households who are involved in the beekeeping business. Focus group discussion was carried out with the beneficiaries (Target group) to collect information regarding Chiuri cultivation, its uses and potential relationship with Beekeeping (Market analysis), Besides it, Key informants' interview was carried out among Chepang communities, CFUGs members, local collectors and local bodies (Wada, Raksirang Rural Municipality, etc.), and Division Forest Office (DFO). Secondary data were retrieved from online tools like Google Scholar and ResearchGate (Gautam et al. 2020, Miya et al., 2020; Timilsina et al., 2020), from literature, various thesis reports, desk research, etc.

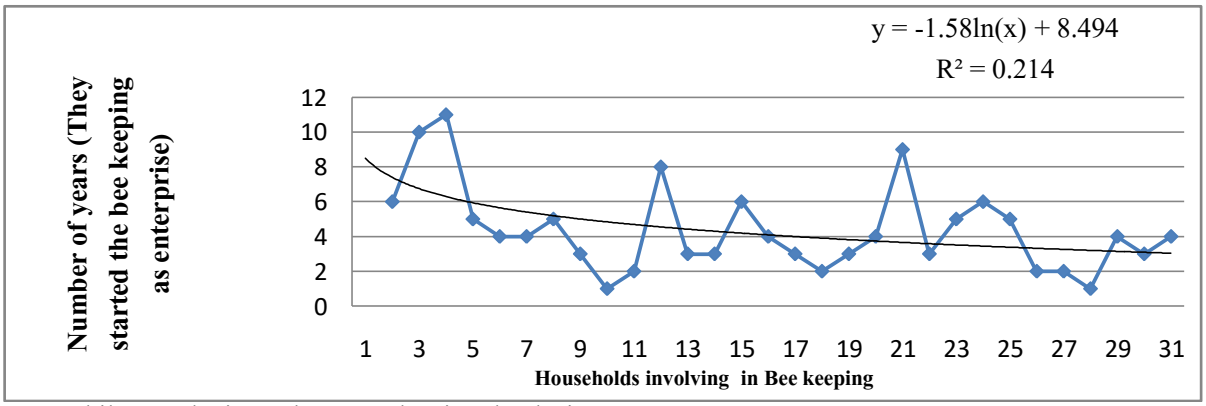
The data were processed and analyzed using computer software packages such as MS Excel and SPSS. The perception of respondents was measured in strongly agree to strongly disagree (1-5) on the Likert scale (Babbie, 1995 cited in Gentle, 2000). Also, the information was expressed in asset pentagon through radar form in MS excel and the area of the shaded portion represents the livelihood contribution from beekeeping.

RESULTS AND DISCUSSION

Households involved in Bee Keeping

The trend of people involving in beekeeping is not similar. Some people have started up beekeeping enterprises for the past 30 years, and some have just started by seeing the success made by other beekeeping farmers. Without a basic knowledge of beekeeping history, honey bees, biology, and distribution, it is difficult to successfully practice beekeeping (Gupta et al., 2014). It is difficult to manage hives without this information. There was no linearity in the number of years they were involved. The perceptions of the local people towards beekeeping have significantly increased, and trends of beekeepers have been increased. However, People have randomly used bee-hive in their home as a profession or for consumption purposes only.

Figure 1: Household involving in Bee Keeping



While analyzing the people involved in beekeeping, the nature of the graphs is received as a logarithm which got the higher R2 value compared to linear, exponential, and polynomial equations (Figure 1). The history of commercial beekeeping as an enterprise in the study area showed the logarithm model at the household level. Bee-hive has been linked with the livelihoods of the people. Most of the Chepang depend on forest resources, agriculture, livestock, farm, and non-farm jobs and remittance to sustain their livelihood (Piya et al., 2011b). Also, they depend on wild edible plants during the shortage of food (Aryal et al., 2009). 26% had 1 to 50 hives, 42% of beekeepers had 51 to 100 hives, 22% had 101 to 150 hives, and 6% had 151 to 200 hives whereas 4% people had more than 200 hives (Table 1). From that information, we can conclude that the majority of the people have hives with an average of 40 hives. In Nepal, there are about 5,700 registered beekeepers with 55,000 hives while 280,000 hives are owned by non-commercial beekeepers (FNBK, 2015).

Table 1. Number of Bee-hives and Percentage of Household

Number of Bee-hives	Number of Household (in %)
1-50	26
51-100	42
101-150	22
151-200	6
>200	4

Trends on the status of Beekeeping in households

The majority (63%) of the respondents reported that the trends on the status of beekeeping are increased in households. Similarly, 10% reported that they reduced the hive numbers and 27% of respondents replied that they neither increased nor decreased the number of hives in households (Table 2). Beekeeping has been practiced for rural development for many decades (Gupta et al., 2014). CIED (2019) has reported that the number of bee-hives increased from 140,000 in 2009 to 280,000 in 2018 in Nepal.

Table 2. Trends on status of Beekeeping in Households

Trends on status of Bee keeping	Respondents (%)
Increasing	63
Stable	27
Decreasing	10

Capitals

1. Natural Capital

a. Income and Land Owned: The natural capital of the people is in increasing order. After increasing financial capital, some people (16%) were able to buy their land in their own money from beekeeping. Due to the income of the beekeeping, 16% of the respondents reported that they were able to buy self-owned land. The majority of the respondents (84%) revealed that they did not buy the lands; however, they spent their income on household suppliers, child education, and health (Table 3). Only a small population of Chepang has sufficient food throughout the year although agriculture forms the major livelihood. This is due to less productive land where they are residing in the country (Piya et al., 2011a). They also cultivate on "Khoriya land" to sustain their food security (Sharma, 2011). But the Khoriya cultivation is decreasing in the present days (Mukul and Byg, 2020).

Table 3. Respondents' land Status

Land status	Respondents (%)
Parental land	84%
Self owned land	16%
No land	0%

b. Status of Chiuri in Private lands: Every household has Chiuri plant ranging from single to 80 in numbers. The major feeding source of the honey bee is Chiuri. There is a very good relation between Chiuri and Bee farming. Bee helps to pollinate the Chiuri and takes the materials for honey production. Chiuri honey has high antioxidant activity and high mineral content (Bhattarai et al., 2019). Local people have been planting the Chiuri tree for the past many years. The result revealed that most people have already started the Chiuri plantation in a professional way that is directly or indirectly related to honey production and sustainable livelihoods of the Chepang community in the study area. Further training on beekeeping and natural feed management is very essential for sustainable honey production.

Table 4. Status of Chiuri on Private lands

Number of households	Chiuri planted on private land
1	8
2	2
3	3
4	3
5	2
6	15
7	1
8	2
9	5
10	20
11	8
12	2
13	40
14	3
15	15
16	2
17	5
18	15
19	8
20	5
21	55
22	25
23	50
24	52
25	80
26	20
27	40
28	5

2. Financial Capital: Beekeeping has the potential to generate extra revenue which helps for sustainable development (Gupta et al., 2014; Devkota, 2020). Financial capital plays a vital role for members of Silinge CFUG. The Majority of respondents (30%) were able to earn between NRs 300,000 (US$ 2,581.24) to 400,000 (US$ 3441.66) per annum, which is very high from the average income of the people. Higher income indicates positive livelihood outcomes (Piya et al., 2012). People are increasing their incomes by adding more hives and Chiuri plants. 3% of the people were receiving the highest income, equal to at least NRs. 500,000 (US$ 4302.07) per year, which was very high compared to the national average income of Nepal. The local people's capacities are needed to

be addressed, which ultimately enhanced the financial capital to add prosperity and dignity to the local peoples' life. While talking about financial capital, soft loan to the people are essential for enterprise development. Beekeeping cooperative is another option to generate employment as well as financial support in the community. The selling of honey was the main source of income for the people of Silinge CFUGs. The majority of the people (1/3rd of households) earned the money in the range of NRs 200,000 (US$ 1,720.83) - NRs 300,000 (US$ 2,581.24) (Table 5). The demand for honey in the local market of Nepal is estimated at 300-350 tons annually (Devkota, 2020). It is also highly demanded in international markets (Devkota, 2020).

Table 5. Income of people in the study area by selling honey

Income (NRs)	Respondents (%)
<100000	23
100000-200000	20
200000-300000	30
300000-400000	14
400000-500000	3
>500000	10

3. Social Capital: Only 17% percent of respondents were in the executive committee member in CFUG while the majority (63%) of the respondents was not in any executive position in any organization (Table 6**)**. Therefore, the social capital of the people was very low compared to other livelihood capital. They have a low literacy rate which may be a barrier for administrative representation (Piya et al., 2012)**.** However, CFUG helped to uplift them for socio-economic aspects. Community-based institutions help to empower and increase the bargaining capacity of the people (Bista and Webb, 2006). While discussing the frequency of the attended meetings, 20% of the respondents participated frequently, 27% in often, 23% in rarely, and 17% in never. Therefore, executive committee members did not attend the program regularly (Table 7).

Table 6. Respondents involved as Executive committee members

Name of executive committee	Respondents involved (%)
CFUGs	17
Frequetly participation	20
Not involved in any executive committee	63

Table 7. Meeting Attended in CFUG

Meeting Attended in CFUGs	Respondents (%)
Always attended the meetings	13
Frequently	20
Often	27
Rarely	23
Never	17

4. Physical Capital: The relation between financial capital and physical capital is very close to each other. After increasing financial capital, people started to build up new houses. Some of the people have just started the RCC buildings in their community. The major source of income was from selling honey to the cooperatives. While discussing the physical capital, people are constructing a new house or improving their existing house.

a. Nature of the house: The majority of the respondents reported that they had a stone with zinc made house. 30% of the respondents revealed that they had a house with a Zinc roof. Only 13 % of the respondents had a thatched house and will change near future after increasing their income. A few (3%) of the people reported that they had their RCC building (Table 8). However, the income of the people has come from beekeeping enterprises. The majority (80%) of the people's income was from selling the honey, especially from Chiuri Honey.

Table 8. House of the respondent

Nature of House	Respondents (%)
Rcc	3
Stone with zinc	37
Stone house	30
Thatched house	13
Others	17

b. Transportation: Due to the income by selling honey, people also bought the means of transportation like a tractor, Bike, Bolero Jeep, and others as needs. In the study area, the respondent reported that 20% of the people have their motorbike, 10% had a tractor and 3% had Bolero Jeep. They bought their means of transportation after increasing the financial capital. Therefore, there was a very close correlation between financial and physical capitals. People of the study area have started converting financial capital to physical capital which was a very good indicator of sustainable community development.

c. Sources of water: The respondents reported that 50% of them are using the group tap water system while only 10% of the respondents are using their tap as a source of water. The majority (40%) of the people have to impose drinking water from the well (Table 9). Due to the income from honey, respondents are utilizing their financial resources for fulfilling the demands of water facilities in their houses. Chepang is mostly dependent on local natural resources, hence even small changes in rainfall patterns or dry up of water resources have a severe impact on their livelihood (Piya et al., 2012).

Table 9. Sources of water

Sources of water	Respondents (%)
Personal	10
Group	50
Well/Kuwa	40

5. Human Capital: Human capital is one of the very important capitals among all five livelihood assets. Since the people of Raksirang depended upon beekeeping for earning and livelihoods, they are deprived of getting training related to bee-keeping and honey bee processing technology. The respondents reported that about half (40%) had already received training in beekeeping, and 33% had not got an opportunity to get training on beekeeping (Table 10). Such training help to increase bargaining power and improve competitiveness in the NTFP market like; honey (Piya et al., 2011c).

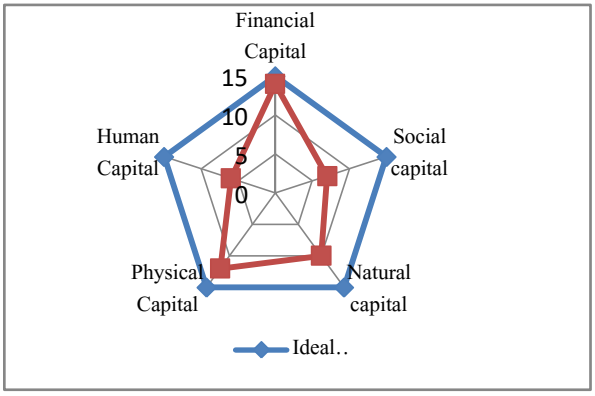
Table 10: Status of capacity building trainings

Status of capacity building trainings	Respondents (%)
Received beekeeping training	40%
Other training	27%
No training	33%

Overall Livelihoods

While discussing the livelihood capitals of the local people of Raksirang, there was not similar to the ideal condition. The 15 band marks have been fixed in ideal condition. Out of 15 marks, financial capital was received as high (14 marks). However, social, human, and physical capital was received as lower as compared to financial and natural capital. One of the reasons why local people marked as high (10 marks) for natural capital was: peoples' willingness to plant the Chiuri plant for livelihoods, which was the main feeding source of honey bees. The marking of physical capital falls on second after financial capital (Figure 2). In a nutshell, financial capital stands in the first position followed by physical capital, natural capital, social capital, and human capital respectively. Social and physical capital is needed to be improved for the sustainable livelihood of Chepang (Khanal et al., 2019). The main reason behind human capital as the last stand is due to very limited capacity development training initiated by local government or concerned authorities.

Figure 2. Overall livelihood status of the community



CONCLUSION

To conclude, the majority (63%) of the respondents reported that the trends on the status of beekeeping are increasing in household levels. The selling of honey was the main source of income for the people of Silinge CFUGs. The majority of the people (1/3 of households) earned the money in the range of NRs 200,000 (US$ 1,720.83) - NRs 300,000 (US$ 2,581.24). Physical capital and financial capital have significantly increased, whereas human, social and natural capitals are in increasing trends. People have planted the Chiuri seedling, and recently, they

have 18 mature trees per household (on average), this played a positive role in honey production.

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