

Pro-Poor Value Chain Development for *Apis cerana* Honey

Potential Benefits to Smallholder *Apis cerana*
Beekeepers in the Hindu Kush Himalaya



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The International Centre for Integrated Mountain Development, ICIMOD, is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalayas – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and based in Kathmandu, Nepal. Globalisation and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream-downstream issues. We support regional transboundary programmes through partnership with regional partner institutions, facilitate the exchange of experience, and serve as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop an economically and environmentally sound mountain ecosystem to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now, and for the future.



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Acronyms and Abbreviations

ASHIKA	Ashika Manobik Unnayan Kendra
AKRSP	Aga Khan Rural Support Programme
BeCoB	Beekeepers Cooperative Bumthang
BSCIC	Bangladesh Small and Cottage Industries Corporation
BDT	Bangladeshi Taka
CHT	Chittagong Hill Tracts
CHTDF	Chittagong Hill Tracts Development Fund
ECO Development	Ethnic Community Development Organization
EU	European Union
FGD	Focus Group Discussion
HBRI	Honeybee Research Institute
HF	Hashoo Foundation
HKH	Hindu Kush Himalaya
ICIMOD	International Centre for Integrated Mountain Development
MoCHTA	Ministry of Chittagong Hill Tracts Affairs
Nu	Ngultrum
PAJURECO	Parbatiya Jumia Rehabilitation Environmental and Conservation Organization
PKR	Pakistani rupee
RNR-RC	Renewable Natural Resource Research and Development Centre
SRSP	Sarhad Rural Support Programme
UNDP-CHTDF	United Nations Development Programme - Chittagong Hill Tracts Development Facility
VCA	Value Chain Analysis
VCD	Value Chain Development

Executive Summary

Mountain communities of the Hindu Kush Himalaya (HKH) have a rich tradition of beekeeping and honey hunting with indigenous honeybee *Apis cerana*. Honey harvested from these bees is an important source of cash income for households in the mountain areas.

The region is rich in floral resources and offers great potential for the production of high quality *Apis cerana* (Asiatic honeybee) honey. Honey collected from a variety of plant sources in the mountain/hill areas is in great demand, and good quality *Apis cerana* honey fetches a much higher price than *Apis mellifera* (European honeybee) honey.

ICIMOD, in collaboration with its national partner organizations in the regional member countries including government and non-government organizations, has been working for the development of *Apis cerana* beekeeping to improve the livelihoods of mountain people. These interventions have helped people enhance their cash income in pilot areas. However, present constraints faced by beekeepers, and future scope for producing natural and pure honey for expanding markets within and outside HKH countries are yet to be understood.

Hence, ICIMOD coordinated a series of studies to gain a better understanding of the entire structure of honey value chain, especially *Apis cerana* honey, in all potential *Apis cerana* beekeeping districts of Chittagong Hill Tracts (CHT) of Bangladesh, southern Bhutan, and the Kalash valley of Chitral district in Pakistan. Primary data was collected by interviewing households engaged in *Apis cerana* beekeeping and honey traders in each country using pre-tested structured questionnaires and focus group discussions. This was supplemented with secondary data gathered from different published and unpublished sources.

This document presents the findings of the studies conducted on value chain analyses of *Apis cerana* honey in CHT, southern Bhutan, and the Kalash valley, Chitral.

Chapter 1 provides an introduction to the mountain beekeeping and its role in mountain livelihoods, value chain development approach, objectives and scope of the study. Chapter 2 describes the approach and methodology used for the studies. Chapters 3, 4 and 5 present the detailed findings of the studies carried out in each country. The country specific findings are summarised in the beginning and the conclusion and recommendations for each country are provided at the end of each country chapter.

Drawing on the value chain analysis conducted in three different sites/countries, Chapter 6 presents the conclusion and recommendations for the development of *Apis cerana* beekeeping and the honey sub-sector in the HKH countries.

Overall, the findings revealed that *Apis cerana* honey value chain in all study sites is quite simple/primitive. Honey production is quite low and most of it is sold directly to known consumers. Only a very small quantity of honey goes through local retailers or middlemen. Beekeepers perform most functions – production, processing and packaging and marketing – in the chain. In each country, the cost of production is low and the margin is high as *Apis cerana* honey fetches more than double the price of *Apis mellifera* honey. There is favourable demand for *Apis cerana* honey in each country.

Findings revealed a number of constraints in each node of the value chain. In most cases production practices are traditional, the number of colonies per beekeeper is small and production is low. Honey is packed in used plastic or glass bottles, sometimes without even removing the original label. Beekeepers are poor and do not have access to credit/loan to buy improved beehives and other tools and equipment and expand their enterprises. Further, their bee management, production, and processing capacities and skills are also poor. There is no branding or labelling of the product, though some traders who buy honey from beekeepers process and brand the honey before selling.

The study concluded that the availability of a diversity of bee flora in the study areas during different seasons of the year is likely to sustain a much larger honeybee population for enhanced production of honey. There are opportunities for harnessing the potential of producing mountain-specific high-value *Apis cerana* honey in the near future. However, lack of awareness on markets - market requirement regarding the quantity and quality, and price

offered for *Apis cerana* honey, limited business management skills, little or no knowledge on value-addition, weak linkages with markets and input suppliers, inadequate infrastructure (e.g., processing units) and lack of means to buy basic beekeeping inputs (veils, hive tools, etc.) are the inherent difficulties faced by smallholder *Apis cerana* beekeepers. Therefore it is necessary to make concerted efforts to support *Apis cerana* beekeepers to boost honey production through organizing beekeepers, strengthening forward and backward linkages and facilitating access to information, technology, financial support and market information, hygienic extraction, bottling and labelling. This will contribute in making the product attractive to customers, who are willing to pay a premium price for local honey, thereby ensuring a continuous flow of income to the beekeeping community.

1. Introduction

1.1 Importance of Beekeeping to Mountain Livelihoods

ICIMOD, through its various programmes and implementation partners, is working to support poor and vulnerable mountain communities in the Hindu Kush Himalaya in mitigating and adapting to climate change. Interventions are implemented within the mountain perspective framework (Jodha, 1992) with the aim to contribute to people's livelihoods by managing natural resources sustainably and ensuring the flow of ecosystem services and inclusive policy.

The Rural Livelihoods and Climate Change Adaptation in the Himalayas (Himalica) Initiative supported by the European Union focuses on strengthening the resilience of mountain people in vulnerable areas through the delivery of innovations, options, and practices in mountain niche products and services and products for facilitating effective adaptation of mountain livelihoods for improving livelihood opportunities and encourage natural resource management practices at the local level.

Beekeeping with indigenous honeybee *Apis cerana* has been identified as a useful income generating option in mountain areas across the HKH region. Bees help in improving the income, food security and livelihoods of mountain people, particularly the socio-economically marginalized and geo-physically isolated groups, through providing honey, pollination services and creation of off-farm employment opportunities in hive carpentry, honey trading, renting and hiring of bee colonies for pollination, bee colony development, and other bee-based micro-enterprises. It offers a particularly useful opportunity for poor and landless farmers to earn income as it requires minimal start-up investment, can be carried out in a small space close to the house, and generally yields profits within the first year of operation (ICIMOD, 2017; Verma, 1990). Bees provide by-products rich in nutrition and health benefits such as honey, pollen, royal jelly, which, when marketed well, can further increase household income. In addition, beekeeping also enhances the yield and quality of agricultural crops and helps maintain biodiversity, and helps ensure human food security through pollination services. Beekeeping brings harmony by developing social relationships between different sections of society – rich and poor – through their products and services. For example, beekeepers are generally poor people; they produce honey rich in nutrition and health benefits, sell it and make an earning, and those who buy it enjoy its nutrition and health benefits. Similarly, by providing pollination services, beekeeping creates a mutually beneficial social relationship between the beekeepers who provide bees for pollination and get paid, and the rich orchard owners who pay for the pollination service and receive higher yield and quality of fruits and seeds (ICIMOD, 2017).

1.2 Honey Production in the HKH

Honey is the best known of all bee products both from a quantitative and an economic point of view. The world's total honey production is about 1.7 million metric tonnes per year (Partap et al., 2012; FAOSTAT, 2013), of which a major chunk is produced in developing countries. Poor farmers and landless people, who constitute the majority of beekeepers in the world, generate substantial cash earnings from the sale of honey. Being the main product of most apiaries and given its high value as nutritious food and medicine, honey has been gaining enormous attention from various sectors including bee scientists, honey traders and honey consumers.

It has been estimated that the Hindu Kush Himalaya produces over 80,000 tonnes of honey annually from over six million colonies and nests of indigenous (*Apis cerana*, *Apis dorsata*, *Apis florea* and *Apis laboriosa*) and introduced (*Apis mellifera*) honeybees. The Himalayan region of China alone has 160,000 *Apis cerana* farmers and 9,000 *Apis mellifera* beekeepers producing 60,000 tonnes of honey annually. Similarly, Nepal has over 50,000 *Apis cerana* beekeepers and around 5,000 *Apis mellifera* beekeepers producing 1,500 tonnes of honey annually. Similar numbers of beekeepers are found in other countries of the HKH. However, most bee farmers of the HKH belong to the poorer sections of society. They keep only a few colonies of bees and/or collect small quantities of honey from the wild nests of bees, which forms an important source of cash income for them (ICIMOD, 2012).

1.3 Market and Scope for HKH Honey

Globally, there is a growing demand for honey, especially in the European and American market. Germany, USA and UK are the top importers of honey; the import is worth more than 1 billion US dollars per year. China is the lead honey exporter producing 436,000 tonnes of honey (World Trade Daily, 2012). Among the HKH countries, China and India export honey to USA, while Pakistan exports to Gulf countries. There is great prospect for other HKH countries for penetrating the foreign market for exporting honey. But the current production of honey in the HKH countries is quite low and can hardly even meet the local demand. Given the availability and diversity of bee floral resources in the region, honey production can be increased significantly by supporting beekeepers in increasing the number of their colonies and applying improved beekeeping management technologies. There is demand for honey produced in the countries of the HKH; for example, in 2015, Slovenia, a country of the European Union, expressed keen interest to import honey from Bangladesh (BSS, 2015). As the doors of the foreign market are opening for honey produced in the HKH, countries in the HKH can take the opportunity to increase the production and quality of honey.

1.4 Value Chain Development Approach

Value chain analysis and development has been identified as a significant tool for reducing poverty and increasing opportunities for poor communities to participate in social and economic development and for providing benefits for pro-poor growth (M4P, 2008; SDC, 2008; Hoermann et al., 2010; Choudhary et al., 2014; Joshi et al., 2016; Microlinks, 2017). For poor agricultural producers, gaining market access is difficult because they lack knowledge of market requirements or the skills to meet such requirements. Furthermore, poor information flow and other obstacles in value chains prevent them from entering new markets or reduce the benefits they obtained from entry. Initiatives that foster value chain development, often with a focus on reducing poverty among smallholder farmers, are designed to overcome some of these obstacles. Thus, a pro-poor value chain development can help improve sustainable livelihoods of poor beekeepers of hilly and mountainous areas of the HKH and build their resilience by connecting them with markets.

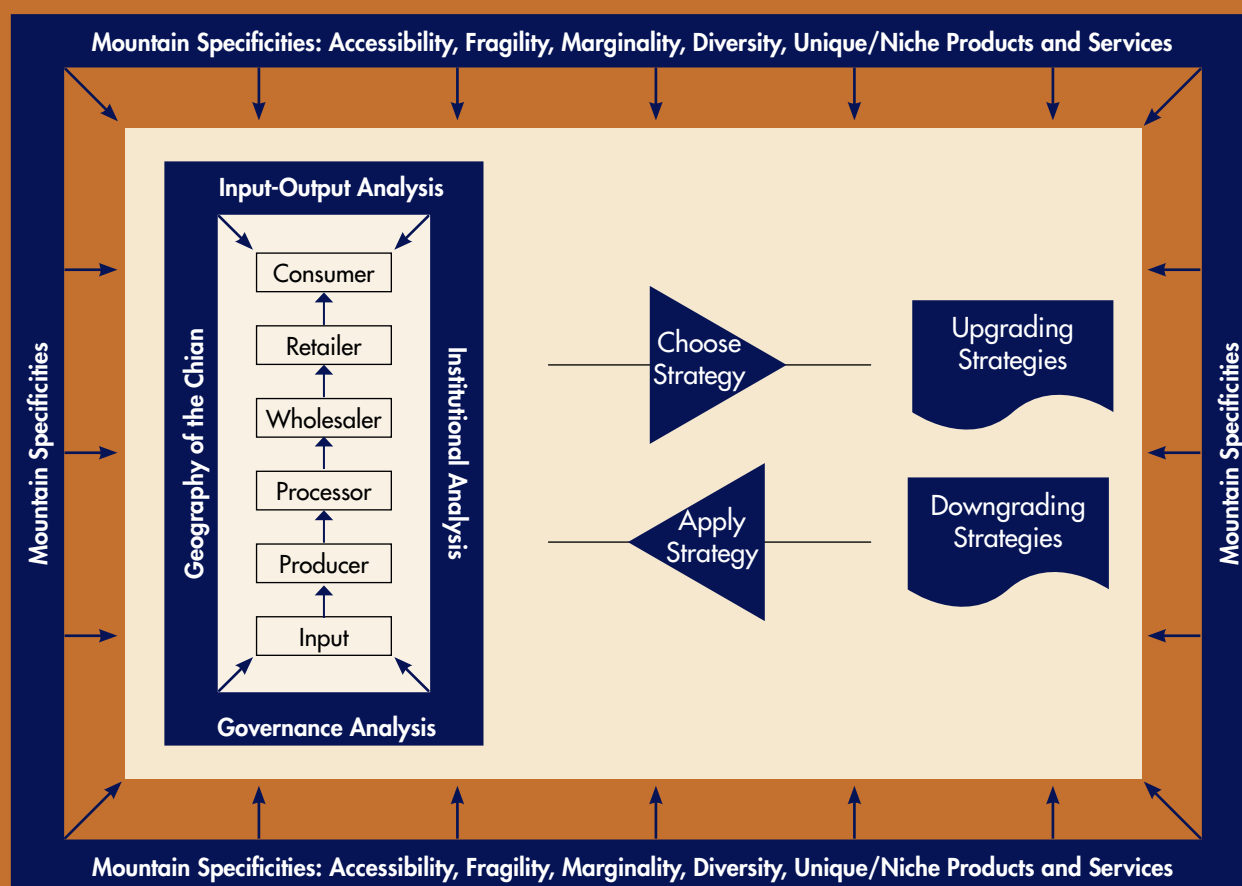
The term 'value chain' refers to the value added to products and services as they pass from one link in the chain to the next through combination with other resources such as tools, human resources, knowledge and skills, other raw materials, or preliminary products (Porter, 1985; ILO, 2006). Kaplinsky and Morris (2003) define value chain as the full range of activities required to bring a product or a service from its conception through the different phases of production to delivery to final consumers and disposal after use. From the institutional perspective, a value chain can be defined as the organisational arrangement linking and coordinating the producers, processors, traders, and distributors who perform different functions; the support markets that provide technical, business, and financial services to the industry; and the business environment in which the industry operates (GIZ, 2007; SDC, 2008; Haggblade et al., 2012; Microlinks, 2017). At its simplest, we can think of a chain as having four main functions: inputs or raw materials, production, processing (transformation), and marketing (wholesale/retailing). At each stage, services such as transport or finance may be needed to keep the process going (Joshi et al., 2016).

The value chain approach helps us understand the whole market system and identify leverage points along the sequence of activities which, properly addressed, can help disadvantaged actors increase their share of the yield as well as the overall yield. The approach is very effective in tracing product flows, showing the stages where value is added, and identifying key actors and their relationships in the chain (Schmitz, 2005).

ICIMOD has adopted a pro-poor, mountain-specific value chain development approach relevant to mountain contexts, challenges, and needs (Joshi et al., 2016; Hoermann et al., 2010). Selecting a value chain suitable to the mountain context/specificities (which involves preparing a list of potential products and services that the target community can offer to the market and short-listing of the most potential value chains for implementation) is the first step in this approach. Honey has been identified as a product that fits very well in the mountain perspective as it is a low volume, high value, non-perishable product with a long shelf life (Jodha, 1992; Shrestha et al., 2016). Moreover mountain honey is a niche product that comes from a variety of floral resources and is organic by default, as mountain beekeepers do not use any medicines or drugs to treat their bee colonies and farmers generally do not use pesticides and other agrochemicals. This honey has demand in local, national and international market. A large number of poor and landless people in mountain areas are engaged in beekeeping and honey production, thus any

intervention for the development of mountain beekeeping and honey production sector can benefit a large number of mountain households engaged in beekeeping. Beekeeping needs little investment and; there are opportunities for economies of scope, potential for income generation. Moreover, beekeeping is an environmentally friendly activity – it does not harm the environment (Figure 1.1); instead improves crop productivity and biodiversity through pollination service of honeybees. The next step is value chain analysis that involves gaining a better understanding of the market players, their roles and interrelationships, and constraints and opportunities facing these players that affect value chain growth and competitiveness. Identifying market-based innovations and leverage points for programme facilitators in the value chain that have the potential to utilise the opportunities and address the constraints in a sustainable manner is the third step, followed by drawing up a value chain upgrading strategy while setting operational and upgrading objectives, and packaging selected interventions for implementation; and finally, developing a plan for monitoring, evaluation and scaling out of good practices.

Figure 1.1: Mountain specific value chain framework



Source: Hoermann et al., 2010

1.5 Objectives of the Study

Value chain analysis of high-value products and services has been identified as one of the principal areas of work under the “collaborative action research” component of the Himalica Initiative of ICIMOD. The purpose of such analysis is to identify the value chain development strategies to support the development of rural livelihoods in the context of socio-economic and climate change and the conservation of ecosystem assets and services. As part of this programme component, the study teams conducted value chain analysis of *Apis cerana* honey produced by smallholder beekeepers in the hilly/mountain areas of the HKH, especially in Chittagong Hill districts of Bangladesh, southern Bhutan, and the Kalash valley of Chitral district in Pakistan. The goal of the analysis was to i) enhance the understanding of constraints faced by beekeepers and future scope for producing natural pure honey for expanding markets within and outside the HKH countries; and ii) suggest pro-poor, sustainable and equitable strategies with a particular focus on the role of gender for the development of *Apis cerana* honey value chain for securing benefits for poor mountain communities.

1.6 Scope of the Study

The HKH is rich in the diversity of bee floral resources. There is great possibility of producing mountain specific high value honey. *Apis cerana* honey collected from a variety of plant sources is in great demand in the local, national and international market and already fetches much higher prices than normal *Apis mellifera* honey. Therefore, the main purpose of this study was to support *Apis cerana* beekeepers in generating income from the production of high value niche honey and help build their resilience. The study was conducted in three districts of Chittagong Hill Tracts of Bangladesh, southern districts of Bhutan, and the Kalash valley of Chitral in Pakistan. The study covered the following:

- Document different actors, detailed functions/activities, the costs, prices and profitability at different functions of the value chain up to the end markets.
- Identify factors that determine profitability, functional division of production, processing and marketing, process and quality standards along the value chain.
- Document different value addition and quality improvement technologies and opportunities for *Apis cerana* honey.
- Identify risks and vulnerabilities faced by the value chain from environmental and market factors; carry out Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis for the *Apis cerana* honey value chain.
- Identify the competitive advantages/disadvantages of the value chain actors: access to information, access to market, access to technology, skills in using the technology, input supply (raw materials), access to finance, policy and operating environment, etc.
- Assess major gender-based constraints in honey value chain and analyse how these constraints can be addressed in the study area.
- Develop an equitable and sustainable upgrading strategy with a focus on gender aspects (for improving benefits for the farmers as well as to improve the competitiveness of the value chain) for poor producers/collectors.

2. Study Methodology

The framework for value chain development includes a value chain analysis (VCA), which helps us understand a particular value chain or a cluster including its existing situation (production practices, quality and quantity of the product), market for the product, constraints and potential and scope for development through a systematic chain mapping and analysis process. The present study on the value chain analysis of *Apis cerana* honey produced by the smallholder beekeepers in remote mountain areas was carried out by using the methodological framework developed by ICIMOD (Hoermann et al., 2010). The analysis covered different levels of value chain functions i.e., current production, production practices, product development and quality of honey, chain operators, assessment of the current market situation, identification of constraints and opportunities, assessment of the support service providers and review of the enabling environment including the role of government institutions, civil society and donors, and development agencies.

2.1 Selection of Study Sites

The study sites were selected purposively while the households were selected randomly. Study sites were selected based on the following criteria:

- Prevalence of *Apis cerana* in the area and many farmers engaged in beekeeping;
- *Apis cerana* beekeeping is an important source of cash income for the households; and
- Potential and scope for honey value chain development to enhance household income from *Apis cerana* honey – i.e., local and national markets exist for enhanced production, improved processing, value added product.

Based on these criteria the following *Apis cerana* dominated areas were selected for conducting the honey value chain study in each country:

- Bandarban, Khagrachari and Rangamati districts in Chittagong Hill Tracts of Bangladesh;
- Chukha, Dagana, Samtse, Sarpang and Tsirang districts in southern Bhutan; and
- Birir, Bumburet and Rumbur of the Kalash valley in the southern part of Chitral district, Pakistan.

2.2 Collaborating Institutions

2.2.1 Bangladesh

The study was conducted in Bandarban, Khagrachari and Rangamati districts in Chittagong Hill Tracts of Bangladesh (Figure 2.1) in collaboration with ECo-Development, a local NGO based in Bandarban.

2.2.2 Bhutan

In Bhutan the study was carried out in *Apis cerana* rich areas in Chukha, Dagana, Samtse, Sarpang, Tsirang districts in southern Bhutan in collaboration with Renewable Natural Resources Research and Development Centre (RNR-RDC) of the Ministry of Agriculture and Forests (MoAF), Jakar, Bumthang. In addition, Bumthang, the only *Apis mellifera* beekeeping district, was also included in the study (Figure 2.2).

2.2.3 Pakistan

In Pakistan the study was carried out in collaboration with Aga Khan Rural Support Programme (AKRSP) Chitral in *Apis cerana* rich Bumburet, Rumbur and Birir sub-valleys of the Kalash valley located in the southern part of the district Chitral (Figure 2.3).

Figure 2.1: *Apis cerana* beekeeping area in Chittagong Hill Tracts, Bangladesh

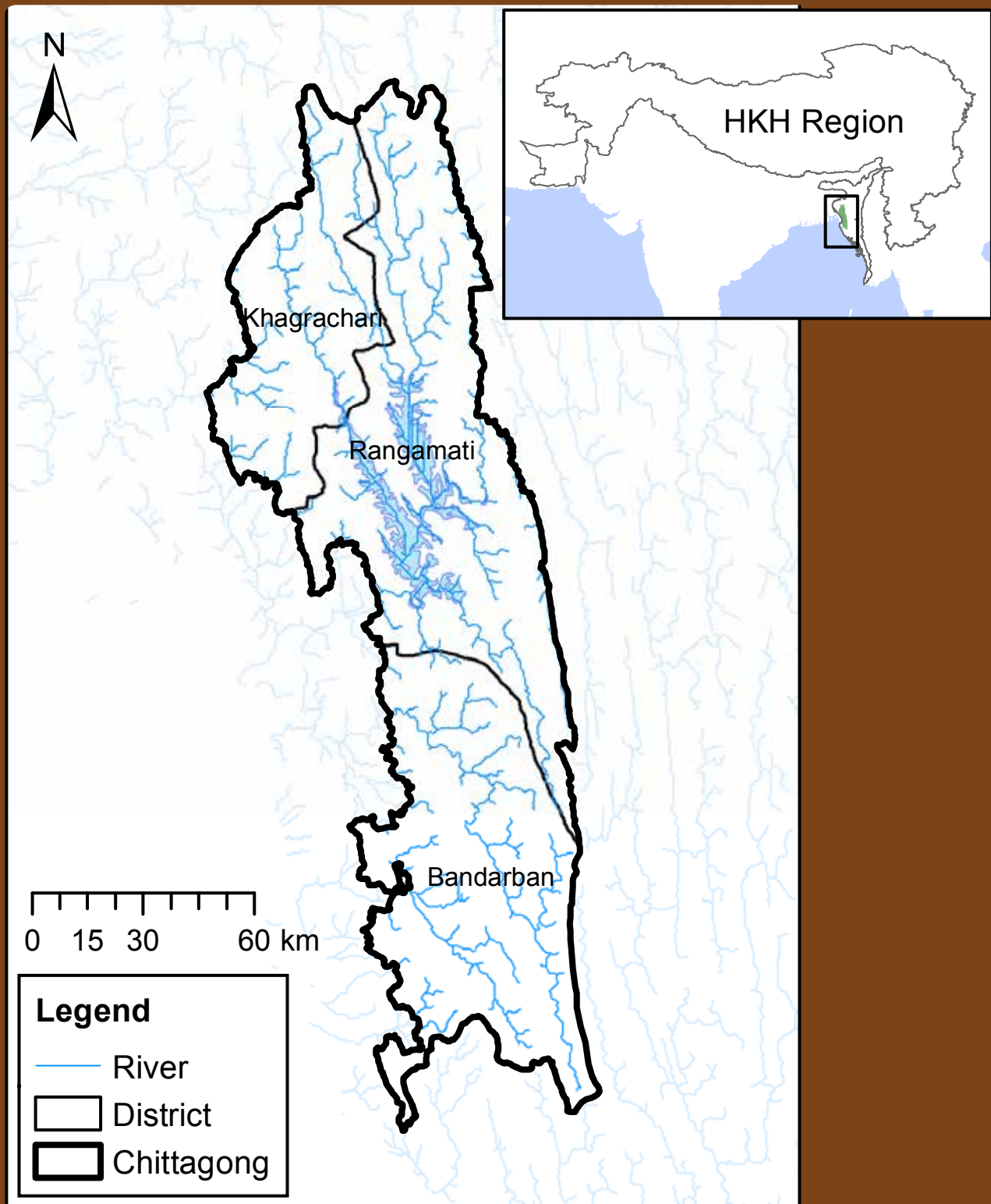


Figure 2.2: *Apis cerana* beekeeping area in south Bhutan

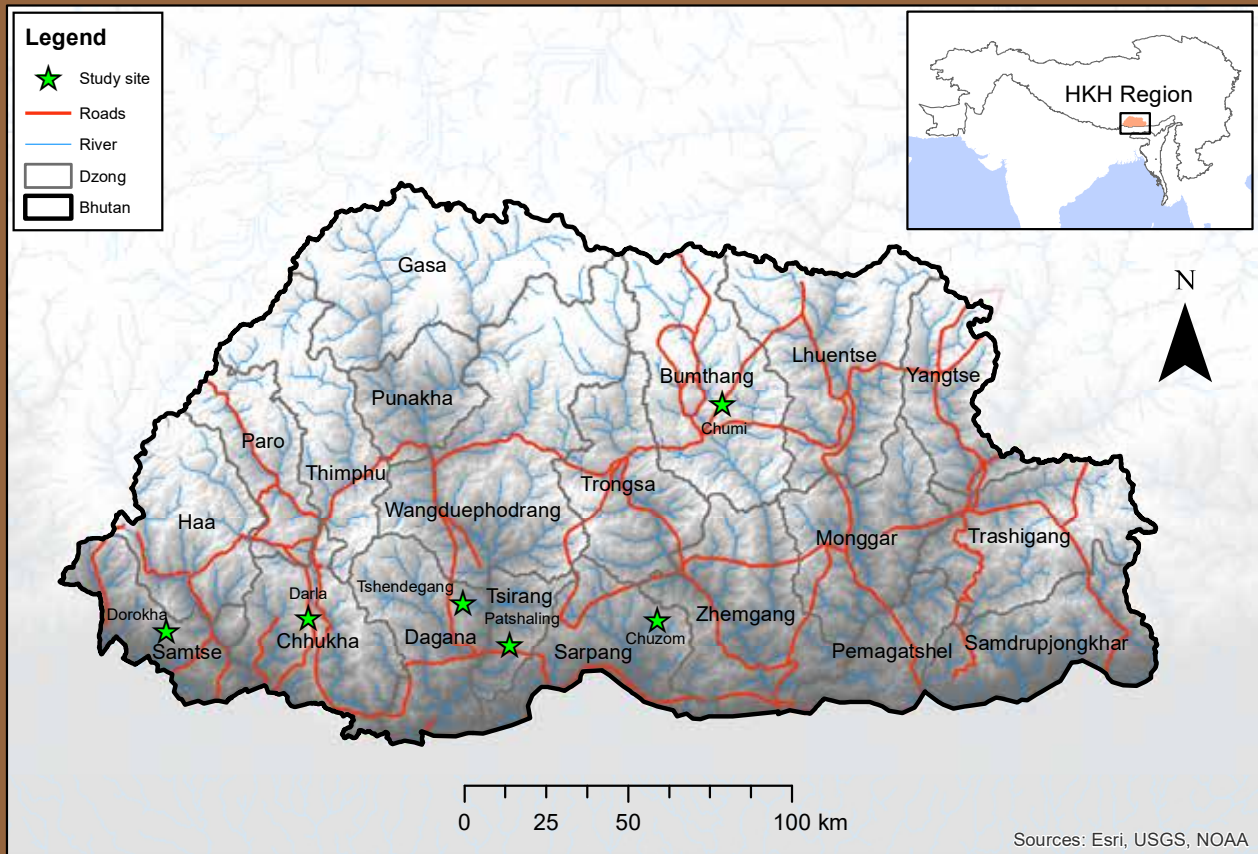
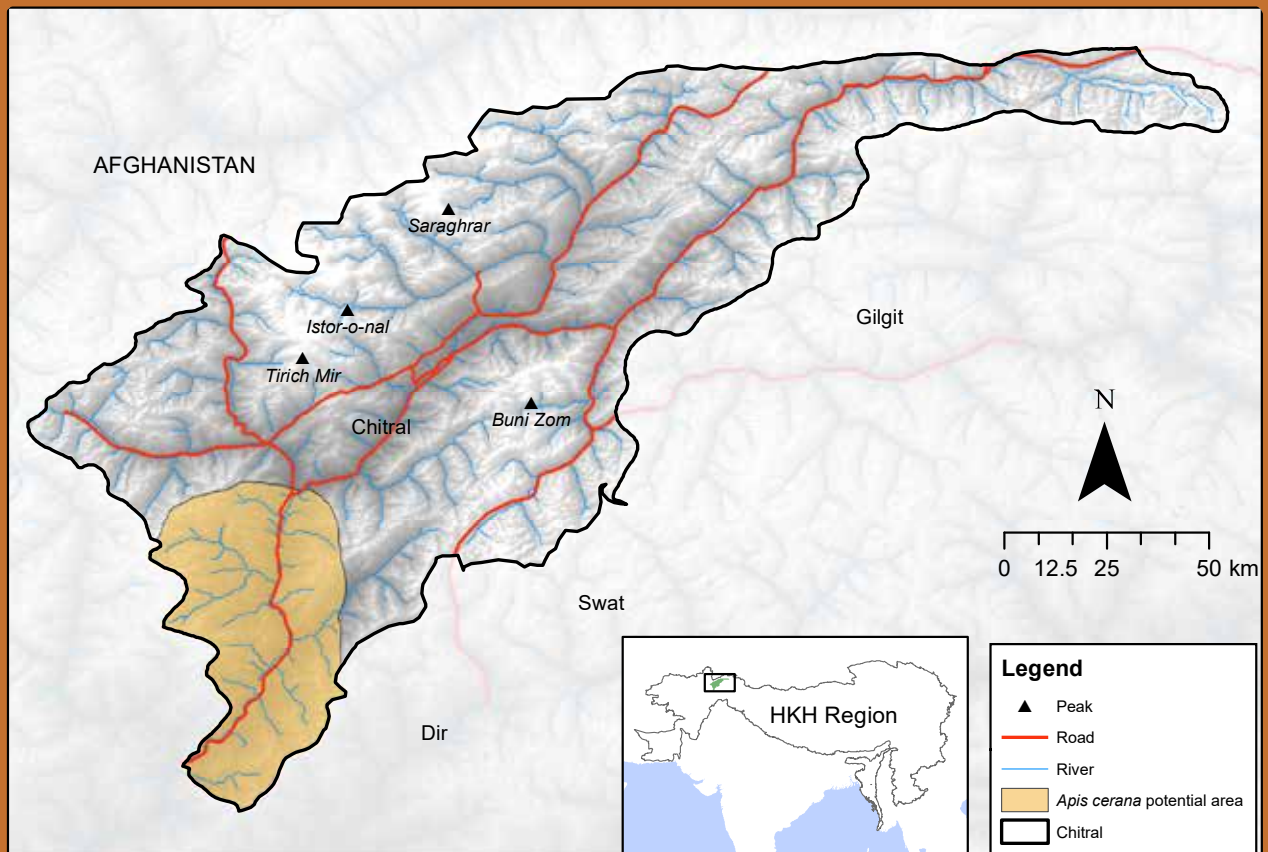


Figure 2.3: *Apis cerana* beekeeping area in Chitral, Pakistan



2.3 Data Collection

Data was collected from primary and secondary sources. Secondary information was collected through a review of available literature including published and unpublished reports of government and non-governmental organizations and online research on *Apis cerana* beekeeping and honey value chain.

Primary information was collected through household survey, market survey, key informant interviews, and focus group discussions using pre-tested structured tools/questionnaires. The generic parameters and indicators on which data was collected were:

- Beekeeping practices, honey production, cost of production, and processing of honey from the beekeepers and beekeepers groups/associations;
- Marketing, trading, and processing from traders, wholesalers, retailers, and processors; and
- Issues and constraints relating to bee management, honey production, processing, packaging, marketing, and trading from all stakeholders.

2.3.1 Collection of primary data

Household survey

To collect household data, the field research teams visited and interviewed households (both men and women) in selected villages in each district/country. The interviews focused on the number of bee colonies, bee floral resources/honey sources, quantity of honey produced, quantity of honey sold in the market and quantity kept for household consumption, production and processing practices, market for honey, value addition like packaging, branding and certification, cost of production and income generated, and constraints and opportunities, etc.



Focus group discussion, Kalash Valley, Chitral, Pakistan (left), Tsirang, Bhutan (right)

Market survey

Market related information was gathered by conducting interviews of the traders at the local and district level – including local shop owners, middlemen, and grocery shops in district headquarters in each country, focus group discussions and literature review, web search and workshops to identify important markets for honey within the region, country, and for export; assess demand (domestic and export) per year and its trends - price trends and quantity; import, export and distribution systems and sizes (volume) of different markets; geographical origin of honey produced/collected from remote areas, their respective volumes in the identified markets; identify competitors and competition factors (quality and cost benchmarking) from other sources; document policy, institutional and other barriers for domestic and international trade; and analyse the market risks and opportunities and suggest marketing strategies for the benefit of small producers

In Bangladesh, the study covered all the three hill districts of the Chittagong Hill Tracts (CHT). A total of 85 households in three districts including 39 households in 8 villages in Bandarban, 27 households in 11 villages in Khagrachari, and 19 households in 16 villages in Rangamati were interviewed to gather relevant information

(Table 2.1). In addition, 10 traders (3 traders in Bandarban, 4 in Khagrachari and 3 in Rangamati) were interviewed.

Table 2.1: Beekeeping households and households surveyed in Chittagong Hill Tracts of Bangladesh

District	Number of beekeeping households	Number of beekeeping households interviewed	Percentage of interviewed households (%)	Number of traders interviewed
Bandarban (8 villages)	112	39	32.5	3
Khagrachari (11 villages)	253	27	10.7	4
Rangamati (16 villages)	120	109	90.8	3
Total	485	175	44.7	10

In Bhutan the study was conducted in collaboration with Renewable Natural Resources Research Centre (RNR-RC), Jakar of the Ministry of Agriculture and Forests, Royal Government of Bhutan. A total of 120 households (20 households in one selected geog in each district) were surveyed in six districts located in the southern part of the country to collect information (Table 2.2). Though the sample size was small, it still provided a fair idea of the current scenario of beekeeping and honey production in the southern part of the country. Market related information was gathered by interviewing 28 traders including middlemen, local traders, traders selling honey on highways, beekeepers groups, Beekeepers Cooperative, Bumthang (BeCoB), and retailers in district headquarters and Thimphu (Table 2.2).

Table 2.2: Study area, beekeeping households and households surveyed in southern Bhutan

District	Geogs selected	Number of beekeeping households in the district	Number of beekeeping households interviewed	Percentage of interviewed households (%)	Number of traders interviewed
Chukha	Darla	769	20	3.3	5
Dagana	Tshendegang	361	20	2.1	3
Samtse	Dorokha	645	20	12.6	2
Sarpang	Chuzom	972	20	5.4	5
Tsirang	Patshaling	607	20	3.1	4 (3 retailers and 1 middleman)
Bumthang	Chumi	53	20	37.7	3 (2 wholesalers, and 7 retailers)
Thimphu	–	–		-	6 (3 wholesalers and 3 retailers)
Total		3,194	120	4.9	28

In Chitral, Pakistan, the surveys were conducted in collaboration with Aga Khan Rural Support Programme (AKRSP) Chitral. The study covered all three sub-valleys of Kalash including Birir, Bumburet and Rumbur located in the southern part of Chitral district. A total of 50 beekeeping households and 25 traders – local as well as those from Chitral town – were interviewed to gather relevant information (Table 2.3).

In addition to the household and market surveys, informal discussions were held with key informants (e.g., group chairpersons, village elderly/headmen, lead farmers, local leaders, and extension staff of government and non-government organizations supporting beekeeping development in the area) to add to and/or validate information gathered through household surveys.

Focus group discussions

Pre-selected farmers, beekeepers (women and men), local traders, support organizations and other concerned stakeholders were invited to focus group discussions at a centrally located place in each study site in each country. Group discussions were facilitated to assess gender situation among beekeeping households, constraints faced in

Table 2.3: Beekeeping households and households surveyed in Kalash valley, Chitral, Pakistan

District	Number of beekeeping households	Number of beekeeping households interviewed	Percentage of interviewed households (%)	Number of traders interviewed
Birir	22	10	45.4	5
Bumburet	39	20	51.3	5
Rumbur	44	20	45.4	5
Total	105	50	47.4	25 (including 10 in Chitral town)

enhancing honey production and marketing, changes in farming systems as affected by on-going socioeconomic and climate change, and suggestions were sought to improve the overall honey value chain in their respective areas.

Separate focus group discussions were organized for men and women to identify differential gender roles, gender-based constraints in value chain development of honey for developing equitable and sustainable strategies.

2.3.2 Secondary data

Secondary information was collected by consulting published and unpublished reports, online search and visiting concerned organizations. A review of available literature on the subject and project areas was carried out. Visits to government, non-government and private organizations were made to meet with relevant experts and gather relevant information. For market related information, previous surveys on national and global markets and their recommendations were reviewed. Since there was not enough information on *Apis cerana* honey value chain development, the research teams in each country also relied on experts and group discussions for information gathering.

2.4 Data Analyses

The data were entered in spreadsheets and cleaned for any outliers and entry errors. The first step of the analysis involved descriptive statistics, which were conducted to help characterize honey production, consumption and marketing. The answers to the questions were grouped; numerical data averaged; and answers coded. “Qualitative” answers that fell into a pattern were counted manually, and whenever practical, converted to a percentage. Observations and impressions were described.

The second step involved functional analysis of the honey value chain. This involved mapping of the value chain, identification of the roles of different actors at different stages, and quantification of volumes of honey along the value chain.

The third step was to undertake a financial analysis of the value chain, which involved attaching prices to the various quantities of outputs and inputs along the value chain. The aim of this analysis was to determine the financial returns to different actors of the value chain and also determine the value added at each stage of the chain.

Finally, a SWOT analysis of the honey value chain was conducted. Internal factors that influence the working of the chain were categorized into strengths and weaknesses, while external factors were categorized as opportunities and threats. The aim was to determine the factors that make the chain competitive so as to capitalize on them but also identify those that may weaken or threaten the chain so that their effects could be mitigated.

2.5 Sharing the Findings Through Multi-Stakeholder Workshops

Finally, a workshop involving different stakeholders of the honey value chain was organized in each of the three countries to share and validate the findings.

3. *Apis cerana* Honey Value Chain Analysis in Chittagong Hill Tracts of Bangladesh

3.1 Chapter Summary

This study was undertaken to enhance the understanding of the structure of the *Apis cerana* honey value chain originating from the Chittagong Hill Tracts (CHT) of Bangladesh and identify constraints and potential equitable and sustainable upgrading strategies with a focus on gender aspects to reduce risks and increase the benefit for the hill farmers in the changing climate and socio economic context.

Findings of the study revealed that beekeeping is still in its evolving stage in Chittagong Hill Tracts. Annually approximately 4,000 to 5,000 kg of honey is produced in Chittagong Hill Tracts. There are about 485 households keeping 787 colonies of *Apis cerana*.

The local market for honey in CHT is dominated by informal trading. Nearly 96% of the honey produced by the beekeepers is sold directly at the farmers' gates to final consumers from the local community. The current market of honey in Bangladesh is under-supplied and a significant amount of honey consumed is imported. Honey produced in CHT has a more favoured market than that produced in plains due to its distinctive characteristic and assurance of purity. Therefore, honey from CHT can easily reach the national market if production is enhanced and adequate processing, value adding and quality standards are ensured. As beekeeping in CHT is in its infant stage, the major actors in the honey value chain of CHT are input suppliers, producers, traders and consumers. Beekeepers themselves play most of the intermediate roles involved in the chain, including primary processing, bulking and trading.

Government institutions like Bangladesh Small and Cottage Industries Corporation (BSCIC) and many NGOs are working to promote beekeeping in CHT. They are providing training, necessary equipment and technical and financial assistance to the beekeepers.

In CHT, a beekeeper usually has 1 to 3 colonies (on average 1.6) of *Apis cerana* in modern movable frame hives and produces 7 to 11 kg of honey (average 10.3 kg) per year. Beekeepers sell honey at BDT 600 to 1,000 (USD 7.6–12.6) per kg; and receive highest price when selling it locally. Most (90%) of the beekeepers initiated their honey/beekeeping businesses with support and motivation from the local NGOs or BSCIC.

The supporting organizations initially invested BDT 6,000 to 7,000 (USD 76.6–88.2) per beekeeper for initiating their businesses with one colony of *Apis cerana*. To increase the number of colonies, a beekeeper needs BDT 3,000 (USD 37.8) per colony to purchase beehives, as other beekeeping tools are supplied by the support organizations, and bees are obtained mostly by catching the swarms or colonies from the wild. Excluding initial investment, average cost for producing per kg of honey is only BDT 45 (USD 0.6). Average income of households engaged in *Apis cerana* beekeeping is BDT 8,500 (USD 107.1). More than two-third (69%) of the beekeeping households earn BDT 6,000 to 10,000 (USD 76.6–126.03) per year from *Apis cerana* honey production. Average net margin of a beekeeper household from honey production is 94.6%. However, if the beekeeper increases the bee colony with an investment of BDT 3,000 (USD 37.8) in the following year, he eventually makes a profit of BDT 12,000 to 17,000 (USD 151.2–214.3) annually excluding the cost of production. The earning of medium-scale beekeepers (who have 3–5 hives) is almost double that of small-scale beekeepers. With an initial investment of BDT 12,500 (USD 157.5), they earn about BDT 4,000 (USD 50.4) additional profit in the first year and in successive years they eventually earn BDT 23,000 to 38,000 (USD 289.9–478.9) per year excluding the cost of production.

Most of the beekeepers do not have access to modern technology/equipment for harvesting honey. The study found that 90% of the beekeepers collect honey by squeezing with hand. A large majority (96%) of the beekeeping households pack honey in re-used plastic bottles. With regard to processing, 80% of the beekeepers place honey in the sun to reduce the moisture in honey and during the rainy season, 74% beekeepers place the honey container in a pot of boiling water.

Though majority of the beekeepers under the study were trained in beekeeping, the duration of the training was not adequate and there was little or no technical follow-up support. Most (90%) of the beekeepers in the region are organized into small groups formed either by NGOs to access inputs or by the BSCIC to access training. Women and men in the region have equal access to resources, training, information on production, organizations and services, and have equal skills and capacity for beekeeping management, honey production, processing and marketing. None of the beekeepers received any credit/loan support from any actors to expand their enterprise.

Beekeepers in CHT invariably depend on agriculture for their livelihood. They are usually small farmers who earn an annual income of BDT 40,000 to 70,000 (USD 504.2 – 882.3). Acute food shortage has been the most prevalent crisis faced by the beekeepers over the last five years, as reported by 69% of the households. A large majority (75%) of the respondents reported that changes in local weather and climate in the last five years has had adverse impact on agricultural production and 71% mentioned climate change has had adverse impact on beekeeping and honey production.

Annually approximately 4,923 kg of *Apis cerana* honey is produced in this region. Of this, 4,724 kg (96%) is sold and 199 kg (4%) left for household consumption. About 95% of the honey is sold directly to consumers, 2% to local traders/local shopkeepers and 3% to middlemen.

Problems faced by the traders in marketing honey are: a) severely low supply of honey, lack of financial services, lack of technology, lack of policy and absence of proper system. Honey traders in CHT are satisfied with the quality and cost of honey, but they say there is lack of reliable quantity timely supply and good packaging. Most of the traders are not aware of the quality standards and regulations for honey. Most of them buy honey from beekeepers and market it without further processing after packaging and labelling it. They usually pack the honey in glass containers, whereas bee farmers pack in re-used plastic containers.

Value chain analysis of honey is highly relevant to the development of honey value chain in the CHT. The analysis provided a clear picture of existing chain of *Apis cerana* honey in CHT. The strengths, weaknesses, opportunities and threats have been identified at each node of value chain and the information used in developing a strategy and action plan for the development of honey value chain in CHT. Key recommendations for strengthening the *Apis cerana* honey value chain include building the capacity of existing and potential beekeepers by facilitating access to financial services, such as credit/ loan schemes to enable them to expand their enterprises, training them in colony management, honey harvesting, processing and quality improvement, and packaging, followed by regular technical support by designing a comprehensive training/technical support package, promoting an integrated model of beekeeping-crop cultivation-organic pesticide/fertilizers throughout the CHT, organizing and strengthening beekeepers' institutions, e.g., groups and associations, establishing market linkages between the honey producers and traders at the local, district and country level.

3.2 Introduction

Chittagong Hill Tracts (CHT), located in the southeast of Bangladesh, is an hilly area inhabited by 11 ethnic groups and Bengalis. It consists of three hill districts, namely Bandarban, Rangamati and Khagrachari, and has a total population of 1.6 million. Ethnic people have lived in CHT for centuries and maintained their distinct culture, tradition, religion, language and lifestyle. Uneven terrain, remoteness of villages, scattered living pattern of the people and various political issues associated with a nearly three decade old conflict have seriously impeded the socio-economic development of the CHT people. Poverty remains widespread in the region, with over 60% of CHT households living in absolute poverty (CHTDF, 2015).

For centuries the people of CHT (the Jumiya) have been practicing a traditional system of cultivation, known as 'Jum' or 'shifting' cultivation. It is still a dominant method of cultivation in the remote hilly areas of CHT. However,

the productivity of Jum has been declining severely. Due to the declining crop productivity and lack of alternative sources of livelihood, Jumiya people are facing increased food insecurity and extreme poverty.

Government and NGOs are promoting horticulture to improve income and nutrition among the agriculture-dependent Jumiya. Hill farmers grow rice, fruit crops (bananas, guavas, jujube, lemons, oranges, litchis, mangoes, papayas), and vegetables (cucurbits, beans, leafy vegetables, and root crops such as ginger, turmeric, sweet potato, etc.). As access to the market has increased, the area under vegetable and fruit cultivation is increasing steadily.

Indigenous honeybee *Apis cerana* is commonly found in the area and many hill people harvest (hunt) honey from the wild colonies of this bee, while some local communities in some villages also manage this bee in hives. The area is rich in diversity of bee floral resources, thus there is great potential for promoting beekeeping as an income generating activity to improve people's livelihoods. Besides, crops such as various fruit, vegetable and oilseeds provide nectar and pollen for bees and in turn benefit from their pollination services. Recently, the Ministry of Chittagong Hill Tracts Development Affairs began promoting beekeeping as one of the income generating activities for improving the livelihoods of local communities.

3.3 Beekeeping Development in Chittagong Hill Tracts

Although honey hunting was an ancient practice in the country, domestic beekeeping started in the country only a few decades ago. In the 1960s Bangladesh Small & Cottage Industries Corporation (BSCIC) started promoting beekeeping in wooden hives at Jatrapur under Khulna. The result at that time was not satisfactory due to inappropriate technology, and the activities were eventually stopped in the same decade. In 1977 BSCIC again started beekeeping in a modern and scientific way. Encouraged by the success BSCIC launched efforts to promote and extend beekeeping throughout the country (Saha, 1990). Currently, there are around 25,000 beekeepers in the country. Three native bee species viz. *Apis dorsata*, *Apis cerana* and *Apis florea* are naturally found in Bangladesh, while *Apis mellifera* was introduced in 1992 (Sivaram, 2012) and is gaining popularity in many parts of the country because of its higher honey yield and proven potential for commercial beekeeping. Currently 1,600 tonnes of honey is produced in the country, including *Apis dorsata* honey in the Sundarban - the largest mangrove forest in the country (Saha, 1990).

ICIMOD initiated efforts to promote beekeeping in all three districts of Chittagong Hill Tracts through its projects including the ICIMOD-UNDP Livelihoods Project and the Austrian Development Agency (ADA) supported 'honeybees' project. These projects were implemented in collaboration with local development organizations – ECo-Development in Bandarban, Parbatiya Jumia Rehabilitation Environmental and Conservation Organization (PAJURECO) in Khagrachari, and Ashika Manobik Unnayan Kendra (ASHIKA) in Rangamati. They focus on capacity building and providing technical and equipment support to potential beekeepers in beekeeping management and honey value chain development. The piloting of beekeeping with local community members has proved successful: the local honey sells at almost double the price of honey produced in plain areas and is favored by the local markets. Many beekeepers are using the profits they earned to increase their number of bee colonies.

However, much still needs to be done to establish equitable and sustainable honey value chains that would enhance benefits for poor bee farmers/honey hunters, especially in the context of socio-economic and climate change. This study aimed to analyse existing value chains of honey to identify the current status, constraints and scope and provide recommendations for the development of the beekeeping sub-sector for securing benefits for local communities including women beekeepers.

3.4 Value Chain Mapping

3.4.1 Value chain functions and actors

The key players usually involved in a honey value chain include input suppliers, beekeepers (producers), bulkers, processors, traders, wholesalers, retailers, exporters and consumers. However, as beekeeping in CHT is in its infant stage, the major actors in the honey value chain of CHT are – input suppliers, producers and consumers. Beekeepers themselves play most of the intermediate roles in the chain, including primary processing, bulking and trading. In some cases, local traders (e.g., retailers) buy the honey from the producers and sell it in the local market.



Mongsanu Marma works towards finishing a beehive – a key input in honey value chain for improving honey yield and quality

In a very few cases, producers sell honey to mediators such as agents of wholesalers, who bring the honey to wholesalers, who in turn supply it to final consumers in urban areas through retailers.

Input supply

Input supply in the *Apis cerana* honey value chain in CHT includes beehives, bee colonies and other equipment. Local beehive manufacturers and entrepreneurs supply beehives to the beekeepers. There are also suppliers of bee suits, honey extractors, airtight buckets, smokers and gloves. Government institution (BSCIC) and local NGOs provide capacity building services on beekeeping to a limited extent.

Production of *Apis cerana* honey in CHT

Small and marginalized farming households in CHT are often engaged in beekeeping alongside their usual economic activities. Beekeeping is not a traditional economic activity among the indigenous communities in the CHT, although many of them are traditionally involved in hunting honey from wild sources. Currently 485 households are engaged in beekeeping and keep a total of 787 colonies: 112 households have 168 colonies in Bandarban; 253 households have 415 colonies in Khagrachari; and 120 households have 204 colonies in Rangamati. Some of the producers are organized into groups so that they have easier access to training services provided mainly by the government and by some NGOs. Other producers work individually as independent beekeepers. Invariably all beekeepers in three districts of CHT are involved in *Apis cerana* beekeeping, and have 1 to 3 colonies. In CHT, beekeepers are involved not only in production but also in harvesting, primary processing and trading of honey. A beekeeper produces 6 to 11 kg of honey per year on an average. A positive gender aspect seen in CHT is that women have almost equal access to beekeeping as an economic activity as men. Annually approximately 4,000 to 5,000 kg of honey is produced in Chittagong Hill Tracts (Figure 3.1). This includes 1,126 kg in Bandarban, 2,532 kg in Khagrachari and 1,265 kg in Rangamati district. Honey is collected from wild

colonies of *Apis cerana* in the forests and also by managing bees in movable frame wooden beehives. An estimated 787 bee colonies are domesticated in the CHT, all of which are of *Apis cerana* species. No colony of *Apis mellifera* was found in CHT.

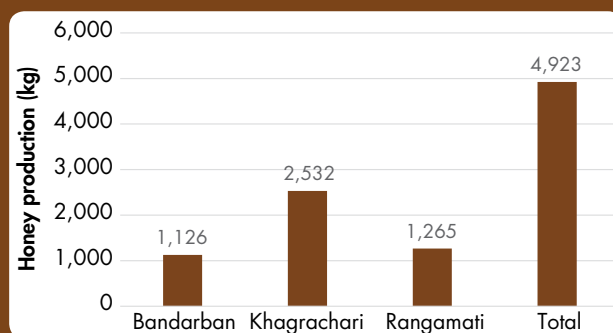
The honey market is segmented into local, national and global markets. The local market of honey in Chittagong Hill Tracts is dominated by informal trading. Nearly 95% of the honey produced by beekeepers is sold at the farmer's gate, and often the farmers sell directly to final consumers within the local community. They usually sell honey in re-used plastic containers at an average price of BDT 600 to 1,000. Currently, the retail price of *Apis cerana* honey in the local market of CHT is BDT 700 to 1,200 per kg.

Honey harvesting

Beekeepers in Chittagong Hill use two methods of harvesting honey– squeezing by hand and using a honey extractor.

In CHT, 55% of honey is harvested by squeezing. This is a traditional method of extracting honey from the honeycombs. Honeycombs are cut and broken into small pieces and honey is then squeezed out of the combs into a storage bucket using a clean cloth. In this method the combs get destroyed and bees have to work more to make

Figure 3.1: **Production of *Apis cerana* honey in different districts in Chittagong Hill Tracts, Bangladesh in 2015**



Honey production - Shila Marma shows a frame of *Apis cerana* bees.



new combs. This reduces the honey yield.

Some beekeepers with many bee colonies have started using a honey extractor to extract honey from the combs. Honey harvested with this method is of better quality than honey extracted by squeezing with the hand. Moreover, the combs remain intact, which saves bees effort to make new combs. Honey harvesting function is carried out by the beekeepers themselves.

Processing

Honey processing involves reducing moisture in honey to increase its shelf life. In CHT, honey is processed at household level to increase its longevity. Processing involves filtering of honey and reducing moisture by warming it indirectly by placing the honey container in boiling water. Some people also reduce moisture by placing it in the sun except in the rainy season. The honey processing function is taken up by the beekeepers themselves.

Packaging

After processing, honey is bottled in used plastic containers like mineral water bottles or beverage bottles of 100 ml, 250 ml and 500 ml and 1,000 ml capacity. Rarely, where the chain involves a wholesaler and retailer, the traders conduct some further value addition of the honey (like bottling and labelling).

The CHT beekeepers association, though in an early stage, is supporting some beekeepers for appropriate processing, packaging and labelling of honey. However, this initiative is at a very initial stage and covers only a few beekeepers in the region.

Trading

In CHT, trading is conducted mainly by the producers themselves; however, sometimes it involves local traders and retailers. Most of the beekeepers sell their honey directly to consumers, usually to people from the local community. Most of the trading occurs at the farm gate or local bazaar. Sometimes the beekeepers sell the honey to local

Abu Sayeed selling honey in used plastic bottles in a village



traders (e.g., local shop). The price is determined after bargaining between the beekeepers and the buyers. Some local traders like local shopkeepers visit the producers' homes and collect honey from them and then sell it at their shops. Some departmental stores and tourist shops in district towns are involved in retailing honey. As most of the honey is sold directly to local consumers, in CHT the chain rarely involves an assembler or bulker. In only a few cases, some traders carry out bulking of crude or semi-processed honey bought from the producers, which is then sent for further processing, bottling and labelling. Recently, the CHT Beekeepers Association began carrying out bulking of honey obtained from some beekeepers. Sometimes producers who buy honey from others package and sell it in local retail shops.

Consumption

In CHT and the rest of the country, honey is used in making traditional foods, e.g. payash, sticky rice and various kinds of pitha, and as a sweetener in drinks. There is growing demand for honey as an ingredient for herbal medicine, pharmaceuticals and cosmetic companies in Bangladesh. In CHT, honey is used widely by traditional healers as an ingredient of herbal medicine.

Although there is no study or data available on the demand for honey locally at CHT or around the country, it is evident that the demand for honey in the local and national market is several times higher than its supply.

Market for honey in Bangladesh

The national market of honey, especially in urban areas, is quality sensitive. The current honey market of Bangladesh is under-supplied and a significant amount of honey consumed in the domestic market is imported, mainly targeting the rapidly growing number of supermarkets and grocery shops in major towns such as Dhaka, Chittagong, Khulna, Rajshahi and Sylhet. A significant number of traders in the country collect honey from the *Apis dorsata* honey hunters and beekeepers and supply to the urban markets at prices ranging from BDT 400 to 800 (USD 5.04–10.08) depending on the type and quality. Natural honey collected from the Sundarban, the largest mangrove forest of the world, has high market demand within the country. About 75% of natural honey is produced in Sundarban forest

A honey shop in Mirpur, Dhaka



area by giant bees *Apis dorsata* (Moniruzzam and Rahman, 2009). However, as natural honey production declined at the rate of 6% per year (Paul, 1996), increased demand for apiculture/beekeeping honey has been generated in the country.

There is no specific policy on honey market in the country. Therefore many mischievous honey traders often sell adulterated honey in the market, giving bad reputation to honey produced in CHT. There are only a few registered brands in the country including AP, Ruchi, Fame, and Osmonic honey. They sell honey in glass or plastic bottles of different sizes, at a price of BDT 800 to 900 (USD 10.08–11.3) per kg. However, many middle and high-end consumers largely buy imported brands to ensure purity and quality of honey. Over one-third of the total annual demand of 2,500 tonnes of honey in the country is met with honey imported from abroad, mainly India, Australia, China and some European countries (Sarkar, 2015). Some of the popular imported brands are Dabur (India), Haradighi (India) and Wescobbe (Australia). Imported honeys are sold in small glass bottles of different sizes – 100 gm, 250 gm, 500 gm and 1 kg at the rate of BDT 925 to 1,050 (USD 11.6–13.2) per kg depending on the brand.

Honey produced in CHT has a more favored market than that produced in plains due to its distinctive characteristic and assurance of purity. Therefore, honey from CHT can easily reach the national market if adequate processing, value adding and quality standards can be ensured.

Bangladesh has great potential for exporting honey and penetrating the foreign market. However, the current production of honey in Bangladesh is low – only 1,600 metric tonnes per annum, which can hardly meet its domestic demand. Experts say that the amount of honey produced can be increased to 100,000 metric tonnes if modern technologies are applied in beekeeping activities. Currently, India is the only country where Bangladesh has been exporting honey since February 2014. In 2013-14 Bangladesh exported honey worth BDT 2 million (USD 25,208) to India (BSS, 2015). Earlier in 2015, Slovenia, a country in the EU, expressed interest to import honey from Bangladesh (BSS, 2015). The geography and weather of Chittagong Hill Tracts is favourable for beekeeping and there are many nectar and pollen producing plants throughout this mountain area. As the doors of foreign markets are opening for honey from Bangladesh, CHT can take this opportunity to increase its production by applying modern technology in this sector.

3.4.2 Value chain facilitators/supporters

Government institutions like BSCIC and many NGOs like Bangladesh Institute of Apiculture (BIA), ECo-Development, ASHIKA, PAJURECO, Trinamul Kalyan Samiti, and Alternative Livelihoods Organization (ALO) are working to promote beekeeping in CHT. They are providing trainings, input supply, and technical and financial assistance to the beekeepers. Several international donors like UNDP-CHTDF and ICIMOD are supporting NGOs in promoting the beekeeping sector. Figure 3.2 shows the honey value chain in Chittagong Hill Tracts.

3.5 Value Chain Analysis

3.5.1 Backward linkages

Honey production

In CHT, a beekeeper usually has 1 to 3 colonies (1.64 on average) of the *Apis cerana* species. Around 64% of beekeepers in the region have only one colony, 19% have 2 colonies and 11% have 3 colonies. A maximum of 25 colonies has been recorded among beekeepers in Khagrachari district (Figure 3.3).

A beekeeper produces 7 to 11 kg of honey (10.1 kg on average) per year. On average 6.3 kg honey is produced per colony, though in a few cases, amount as high as 18 kg honey per colony has been recorded in Bandarban district. Average production per household is highest (10.5 kg) in Rangamati, and lowest (9.8 kg) in Khagrachari. Although production is not very high, as a high-value product honey is sold at the rate of BDT 600–1,000 (USD 7.6–12.6) per kg, and therefore is an important contributor to household cash income.

Figure 3.2: Honey value chain map in Chittagong Hill Tracts

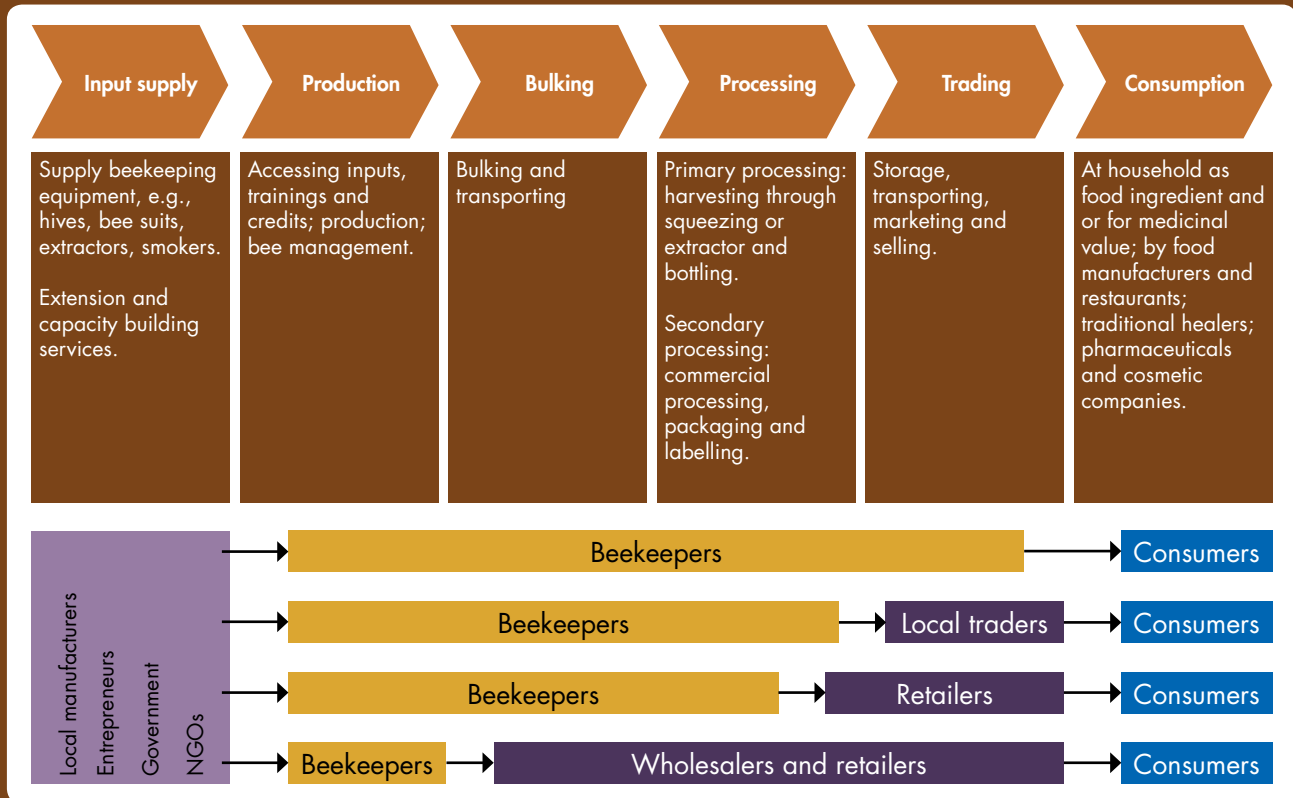
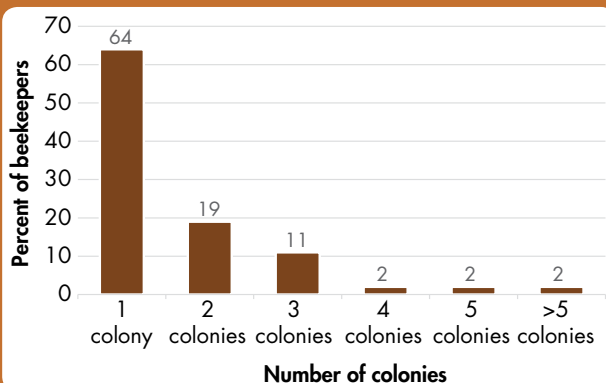


Figure 3.3: Number of colonies owned by beekeepers in Chittagong Hill Tracts, Bangladesh

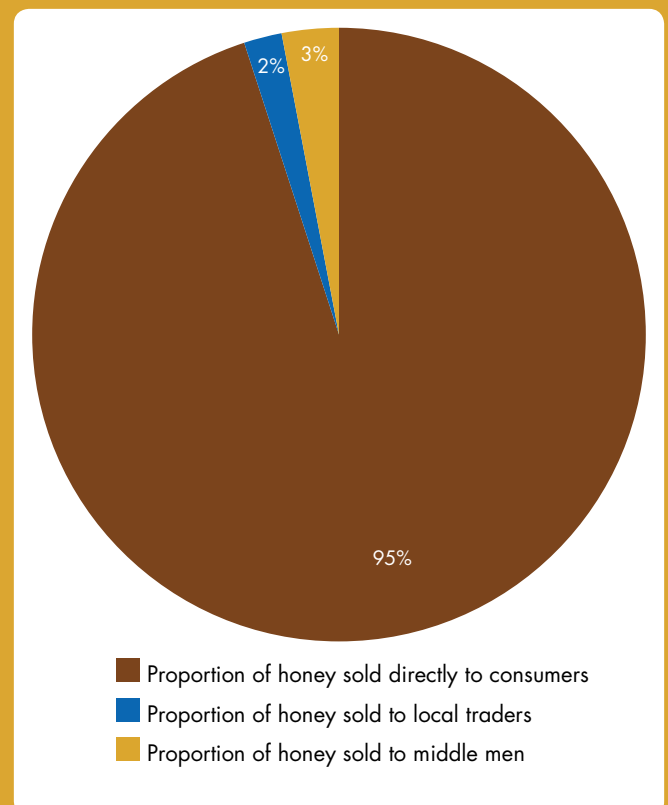


Honey production and marketing channels

Almost 96% of the honey produced is sold and 4% is kept for household consumption. Of the honey sold, 95% is sold directly to the consumers, 2% is sold to local traders/shopkeepers and 3% to middlemen (Figure 3.4).

Beekeepers get maximum selling price at the local level, BDT 700 to 1,000 (average BDT 830, or USD 10.1) per kg (Figure 3.5). Most of the honey is sold at the farmer's gate; only 4% of beekeepers transport

Figure 3.4: Marketing mechanism for honey in Chittagong Hill Tracts, Bangladesh

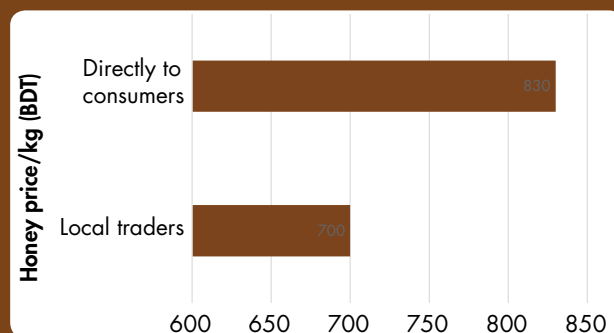


honey from their house to the place where it is sold. The distance usually ranges from 0.5 to 1.5 km.

Production cost

Most (90%) of the beekeepers initiated their beekeeping business with the support and motivation of the local NGOs or BSCIC. Initial production materials and equipment (e.g. beehive, veil, gloves and extractors) were supplied by the supporting organizations. Many of the beekeepers collected bee colonies from the wild (e.g., trees and mountain cavities). The findings revealed that supporting organizations initially invested BDT 6,000 to 7,000 (USD 75.6–88.2) per beekeeper for initiating their business, providing them one colony of *Apis cerana* each. However, if a beekeeper wants to increase the number of colonies, he only needs BDT 3,000 (USD 37.8) per colony to purchase a beehive and bees can be obtained by capturing swarms or bee colonies from the forest. Therefore, the production cost estimated here only includes the maintenance, processing and propagation cost. Excluding initial investment, average cost for producing one kilogram of honey is only BDT 45 (USD 0.6).

Figure 3.5: Average selling price of honey in Chittagong Hill Tracts, Bangladesh



Margins for beekeepers from *Apis cerana* honey production

The production cost of *Apis cerana* honey is very little – only BDT 45 (USD 0.6) per kg – while it sells at BDT 600–1,000 (average BDT 800, or USD 10.1 per kg). Thus, the net margin (the ratio of net profit and revenue) from beekeeping is very high. Average net margin of a beekeeping household from honey production is 94.4%.

The study also analysed the cost and return for the beekeepers. For the analysis the farmers were divided into two groups – a) small-scale beekeepers with 1 to 2 colonies and b) medium-scale beekeepers with 3 to 7 colonies. Only one beekeeper was found to have more than 7 colonies in Khagrachari. Table 3.1 shows the average cost and return for a small-scale and medium-scale beekeeper.

Nearly 83% of the beekeeping households in the study area are involved in beekeeping at a small scale. They

Table 3.1: Annual cost and return for small scale beekeeper having one bee colony

Year	No. of bee colonies	Production (kg)	Cost (BDT*)				Return	
			Initial investment (a hive with bee colony)	Production cost	Expansion cost	Total cost	Income (calculated @ BDT 900 per kg)	Net profit
1 st	1	8.5	6,500	400	-	6,900	7,650	750
2 nd	2	18	-	800	3,000	3,800	16,200	12,400
3 rd	2	20	-	900	-	900	18,000	17,100

* 79.34 BDT=1 USD

received initial support from local NGOs or BSCIC to start the enterprise with one bee colony. A small-scale beekeeper earns an average of BDT 7,650 (USD 96.4) in his first year of production, which is slightly more than the initial investment (usually made by the supporting organizations). Investment includes a beehive with a bee colony and basic equipment such as bee veil and queen gate. However, if the beekeeper increases the number of bee colonies with an investment of BDT 3,000 (USD 37.8) in the following year, he can eventually make a net profit of BDT 12,400 to 17,100 (USD 156.3–215.5) annually in the second and third year excluding the cost of production (Table 3.1).

Although there are very few medium-scale beekeepers in the region, their earning is almost double that of small-scale beekeepers. With the initial investment of BDT 12,500 (USD 157.5), they earn a net profit of about BDT 3,875 (USD 48.8) in the first year after raising their investment. In the successive years, if they increase their bee

colonies (2 new colonies per year), they can eventually earn BDT 23,000 to 38,000 (USD 298.9–478.9) per year excluding the cost of production (Table 3.2).

Table 3.2: Annual cost and return for medium-scale beekeeper

Year	No. of bee colonies	Production (kg)	Cost (BDT*)				Return	
			Initial investment	Production cost	Expansion cost	Total	Income	Net profit
1 st	3	25	12,500	1,125	-	13,625	17,500	3,875
2 nd	5	45	-	2,340	6,000	8,340	31,500	23,160
3 rd	7	67	-	3,015	6,000	9,015	46,900	37,885

* 79.34 BDT=1 USD

Honey harvesting, processing, and bottling

The study found that 45% of the beekeepers harvest honey using an extractor whereas 55% of them manually squeeze it from the combs due to the small number of colonies and unavailability of extractors in the vicinity. Honey collected using an extractor is purer and free of brood, dead bees and fragments of combs.

When it comes to processing honey, beekeepers in CHT only carry out filtering and moisture reduction. Nearly 70% of the households use a tea strainer for further purification of the honey; others (about 30%) use a clean cloth. Eighty percent of the beekeeping households vaporize the honey by placing it in the sun to reduce moisture and increase its longevity. During the rainy season, 74% of the beekeepers condense honey by placing the honey container in boiling water and indirectly heating it.

A large majority (96%) of the of the beekeeping households pack honey in small re-used plastic bottles (e.g., beverage, mineral water bottle) of different volumes, e.g., 100 ml, 250 ml, 500 ml and 1 litre. Only 1% of beekeepers pack honey in glass jars, while 3% of the producers sell honey in large containers.

Skills and capacities of beekeepers

Almost all beekeepers in the study area have received basic training in beekeeping. The content of the training package included beekeeping management, honey harvesting and processing, honey marketing, disease and pest management and the role and use of beekeeping in pollination management. Average duration of the training programme was 4 to 7 days with little or no technical follow-up. However, the beekeepers said that the duration of the training was not adequate for them and the follow-up system of the training should be further improved.

Majority of the beekeepers in the region are organized into small groups either by NGOs to access inputs or by the BSCIC to access training and other support from BSCIC and NGOs.

Involvement of women in beekeeping

Women and men in the region are equally engaged in beekeeping and have equal access to resources, information on production, organizations and services in beekeeping. Women and men have equal capacity for using beekeeping resources, production, processing and marketing, and there is equal participation. Men and women make collective decisions regarding the cost and investment for honey production and price of honey. Usually men make the initial decision but it is finalized only after discussion with women. In many cases, women lead the beekeeping enterprise with the support of men in the family.

Collection of honey from wild colonies

Of the surveyed beekeepers, 86% reported wild (natural) colonies of *Apis cerana* bees are found in the nearby forests and nearly 69% of them collect honey from these wild colonies. The study revealed that honey is derived from flowers of various sources of flora, including fruits like jujube (*Ziziphus mauritiana*), grapefruit (*Citrus paradisi*), lemon (*Citrus. limon*), litchi (*Litchi chinensis*), banana (*Musa spp*), date (*Phoenix dactylifera*), papaya (*Carica*

papaya), mango (*Mangifera indica*), gooseberry (*Ribes uva-crispa*) and guava (*Psidium guajava*); vegetable crops like cucumber (*Cucumis sativus*), pumpkin (*Cucurbita maxima*), cauliflower (*Brassica oleracea*) when grown for seed production, various species of beans (*Phaseolus* spp.) and okra (*Abelmoschus esculentus*); oil seed crops such as mustard (*Brassica juncea*); flowers like kadam (*Anthocephalus indicus*), silk cotton (*Bombax* sp); and many other wild herbs, shrubs and trees.

The majority (61%) of beekeeping households reported that the availability of wild bee colonies has decreased in the forest area. Specialists in the region also expressed the same opinion. The reasons behind the decline of bee colonies in the wild include rapid deforestation, widespread cultivation of tobacco, jum or shifting (slash and burn) cultivation, and use of chemical fertilizers and pesticides.

However, a small fraction of beekeepers (11%), especially from the locations where organic insecticides have been introduced, reported that both bee colonies and bee flora have increased due to the increase in the cultivation of vegetables and crops and use of organic insecticides and fertilizers.

Beekeepers' access to credit loans

None of the beekeepers get any credit/loan support other than from a couple of local NGOs that initially provide one beehive and a bee colony to the trainees as part of their programme to support beekeeping development.

Information flow

All the beekeeping households get information on beekeeping management and honey markets from a couple of local NGOs and BSCIC. Besides, these NGOs have organized the beekeepers into groups; therefore information is also shared among the group members.

Contribution of beekeeping to cash income

Beekeepers in CHT invariably depend on agriculture for their livelihood. They are usually poor farmers who make an annual income of BDT 40,000 to 70,000 (USD 504.1–882.3). Nearly 45% of the surveyed households have their own land measuring usually 1 to 2 acres; 51% have access to land usually measuring 2 to 3 acres based on their traditional rights; and the rest of them have either no land or cultivate on rented land. Over three quarters (76%) of the cultivated land is non-irrigated rain-fed land.

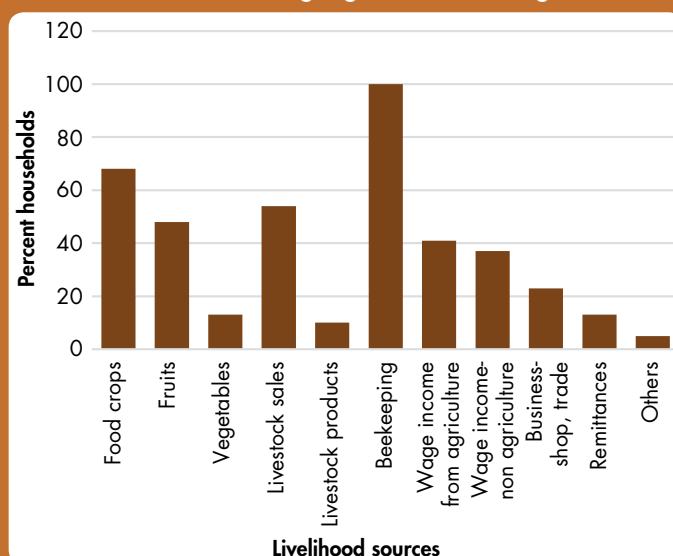
Farmers' livelihood sources

Ninety-five percent of the beekeeping households are dependent on various agricultural activities for their livelihood. Among them 68% are involved in producing food crops, e.g., paddy, maize, sugarcane; 48% are engaged in short-term and long-term fruit farming (banana, pineapple, guava, coconut, litchi, jackfruit and mango, etc.) on a small to medium scale; 43% make earnings from seasonal vegetable farming; and 54% rear a limited number of livestock like goats, pigs, cows and chicken, but not on a commercial scale. About 41% of the households work as agricultural and 37% as non-agricultural wage labourers, whereas 23% of the households run small to medium scale enterprises (Figure 3.6).

Annual income of beekeeping households

Nearly half of the beekeepers (48%) have an annual income of BDT 36,000 to 60,000 (USD 453.7–756.2). A little over one-fifth (22%) of the households are extremely poor with an annual income below BDT 36,000 (USD 453.7) and another one-fifth (21%) of

Figure 3.6: Livelihood sources of beekeeping households in Chittagong Hill Tracts, Bangladesh



the beekeeping households earn an income of BDT 60,000 to 90,000 (USD 756.2–1,134.3); the rest 9% make an income of more than BDT 90,000 (USD 1,134.3) (Figure 3.7).

Household income from *Apis cerana* honey/beekeeping

Apis cerana beekeeping is an important source of cash income for the hill community of CHT. On average a beekeeping household earns about BDT 8,500 (USD 107.1) per year from honey. Over two-third (69%) of the beekeeping households earn BDT 6,000 to 10,000 (USD 75.6–126.03) per year from *Apis cerana* honey production; about one-fifth (18%) earn between BDT 10,000 and 20,000 (USD 126.03–252.06) and 9% earn between BDT 20,000 and 30,000 (USD 252.06–278.1). Three percent of the surveyed households earn between BDT 30,000 and 40,000 (USD 278.1–504.1) and only 1% earn more than BDT 40,000 (USD 504.1) from beekeeping (Figure 3.8). In addition, annually 76% of the beekeeping households keep 0.25 to 1 kg of the honey they have produced for household consumption.

Impact of climate change on agriculture and beekeeping

Impact of climate change on crop production: Eighty-five percent of the beekeeping households reported that they experienced climatic variations over the last five years, and 75% of them reported that the change affected their agricultural production. The following chart shows different types of climate change experienced by beekeepers.

Impact of climate change on beekeeping and honey production: About 71% of the surveyed beekeeping households mentioned that climate change-induced changes in local weather has impact on beekeeping and honey production. The effects mentioned include a decrease in honey production, decline in the number of wild bee colonies, increased prevalence of bee diseases, and decline in bee flora in the locality and forest.

Risks and vulnerability associated with beekeeping in CHT

Use of chemical pesticides: Use of chemical pesticides on crop fields is the main threat for the beekeepers in CHT. Cash crop farming i.e., cultivation of fruit and vegetable crops is increasing in the hills and farmers use lot of pesticides on these crops. The findings of the study revealed that many households lost their bees due to the use of chemical pesticides in the locality.

Lack of skills for managing bees in unfavourable season: Lack of skills for proper bee management during unfavourable season, particularly in summer and rainy season, affects the survival of the colonies and honey production. Nearly one-fifth (19%) of the surveyed households reported that they face difficulty in managing bee colonies in the rainy season as diseases, parasite infestation and pest attacks increase during this season. Moreover, bee colonies are not fed in the slack summer season, leading to the starvation and absconding of the colonies.

Figure 3.7: Income range of beekeeping households in Chittagong Hill Tracts, Bangladesh

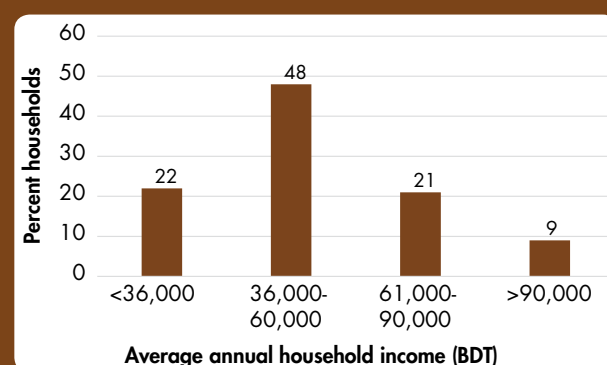
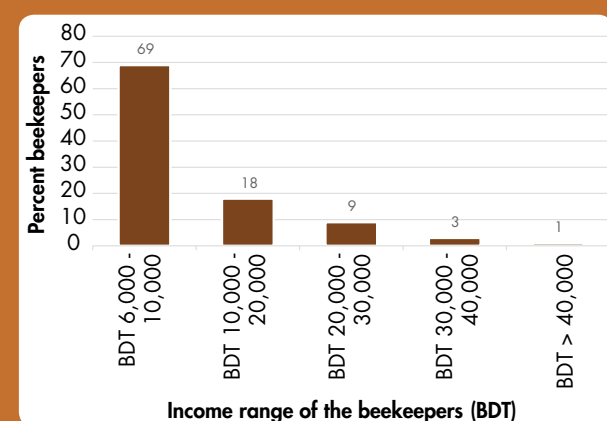


Figure 3.8: Yearly income (range) of beekeepers from beekeeping in Chittagong Hill Tracts, Bangladesh



Diseases, pests and parasite attacks: Dysentery is a prevalent disease among bees in CHT. It significantly reduces colony strength and honey production and even threatens the survival of bee colony. About 5% of the surveyed beekeepers reported their bees affected by diarrheal diseases.

Pests like wax moth, hornets, spiders, wasps, ants, and cockroaches are quite common in CHT due to its warm humid climate. Some colonies are also infested by mites. Beekeepers do not have adequate knowledge of pest management/control.

Decline in bee flora: Fifty-nine percent of the surveyed beekeepers reported a significant decline in bee flora in the forests. Causes reported for this decline are deforestation, cultivation of tobacco, jum cultivation and occurrence of extreme weather (drought, storms) conditions.

3.5.2 Forward linkages

Market and prices of honey

***Apis cerana* honey:** The study found that almost 96% of the honey produced by the beekeepers is sold locally at the farmer's gate (Figure 3.4). Table 3.3 provides information on honey production, quantity of honey sold directly to consumers and to local traders/shopkeepers and middlemen in three districts of CHT.

Table 3.3: Estimated production and distribution of *Apis cerana* honey in three districts of CHT

District	Total production (kg)	Quantity marketed (kg)	Quantity sold directly to consumers (kg)	Quantity sold to local traders (kg)	Quantity sold to middlemen
Rangamati	1,265	1,213	1,153	24	36
Bandarban	1,126	1,081	1,027	22	32
Khagrachari	2,532	2,430	2,308	49	73
Total	4,923	4,724	4,488	95	141

Table 3.4 provides information on the selling price of honey at different levels in CHT. To meet the local demand, some wholesalers trade in *Apis mellifera* honey from North Bengal. They supply *mellifera* honey to retailers at BDT 400 to 450 (USD 5.0–5.7) per kg, and the retailers then sell it at BDT 500 to BDT 550 (USD 6.3–6.9). Traders also bring *Apis dorsata* honey. *Dorsata* honey is the most expensive honey in CHT and sells at a higher price than *Apis cerana* honey (Table 3.4). The wholesale price of this honey is BDT 1,200–1,300 (USD 15.1–16.4) per kg while retailers sell it at BDT 1,400–1,500 (USD 17.6–18.9).

Table 3.4: Selling prices of different honeys at different levels in CHT

Type of honey	At production level (BDT)#	At wholesale level (BDT)	At retail level (BDT)
<i>Apis cerana</i>	600–800	1,100–1,200	1,200–1,400
<i>Apis mellifera</i>	300–350*	400–450	500–550
<i>Apis dorsata</i>	800–900*	1,200–1,300	1,400–1,500

* Not produced in CHT, traded in from northern districts; # 79.34 BDT=1 USD

Costs and returns for wholesalers and retailers

Table 3.5 provides an estimation of cost and returns for a wholesaler dealing with 25 kg of *Apis cerana* and 50 kg of *Apis mellifera* honey with the investment of about BDT 20,000 (USD 252.1) for each.

25 kg of honey of *Apis cerana* with an investment of BDT 19,500 (USD 245.8) yields a net profit of BDT 8,000 (USD 100.8). Unlike *cerana* honey, *Apis mellifera* honey is not profitable in CHT. As it is not produced in the region, it is traded in from North Bengal, which requires high transportation cost. With an investment of BDT 19,900 (USD 250.8) for 50 kg of honey, it yields a net profit of only BDT 2,600 (USD 32.8). Net margin for *Apis mellifera* honey trade is only 11.5%, whereas net margin for *Apis cerana* honey is 29%.

For retailers, 5 kg of honey of *Apis cerana* with an investment of BDT 5,500 (USD 69.3) yields a net profit of BDT 1,000 (USD 12.6), whereas dealing with 10 kg of *Apis mellifera* honey with an investment of BDT 4,500 (USD

Table 3.5: Estimation of cost, return and margins of wholesalers from honey in the country

Type of honey	Volume dealt per year (kg)	Cost (BDT)*		Revenue (BDT)		Net profit (BDT)	Net margin (%)
<i>Apis cerana</i>	25	Purchasing	16,500	Selling @ BDT 1,100	27,500	8,000	29%
		Transportation	300				
		Storage	500				
		Packaging	200				
		Administrative	2,000				
			19,500				
<i>Apis mellifera</i>	50	Purchasing	15,000	Selling @ BDT 450	22,500	2,600	11.5%
		Transportation	1,500				
		Storage	1,000				
		Packaging	400				
		Administrative	2,000				
			19,900				

* 79.34 BDT=1 USD

56.7) yields a net profit of BDT 750 (USD 9.4). Net margin for retailers is almost similar for both types of honey: 15% for *Apis cerana* and 14% for *Apis mellifera* honey (Table 3.6).

Table 3.6: Estimation of costs, returns and margins for retailers for honey produced through beekeeping

Type of honey	Volume dealt per year (kg)	Cost (BDT)*	Revenue (BDT)	Net profit (BDT)	Net margin (%)
<i>Apis cerana</i>	5	5,500	6,500	1,000	15
<i>Apis mellifera</i>	10	4,500	5,250	750	14

* 79.34 BDT=1 USD

Services provided by traders to beekeepers

Currently, traders in the region provide neither credit support nor technical assistance, training or market information services to beekeepers. The traders themselves lack access to financial services required for marketing honey on a large scale or for supporting the beekeepers to enhance honey production. They usually communicate with the suppliers through some local collectors or agents. However, they have started realizing that they should improve communication with the beekeepers regarding market demand, price and quality requirement. The traders also do not have any contractual arrangement with producers, because the supply is uncertain and the amount supplied is very small. All the trading with beekeepers takes place informally.

Problems faced by the traders in marketing honey

Honey traders in CHT face various problems in marketing honey. Low supply of honey is the main problem. Currently, the volume of honey supplied to the traders is negligible compared to market demand. Traders said that current supply does not even meet 5% of market demand.

Honey collected from wild nests of bees or through the squeezing technique requires further processing. However, such technology is absent in the region. There is no policy in the country for improving the honey sector, increasing its production and strengthening its value chain. Further, there is no system in the country to certify the quality, purity and standard of the honey.

Quality of primary product

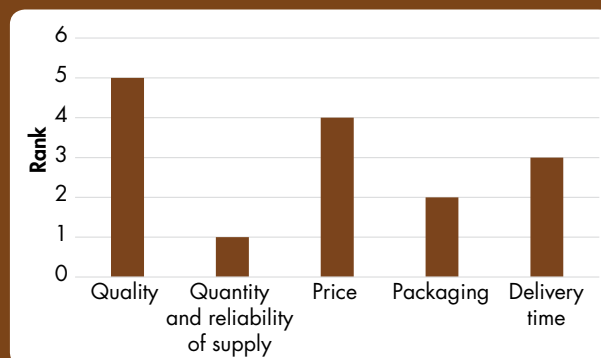
Honey traders in CHT are satisfied with the quality and cost of the product, but not with the quantity, packaging and uncertain timing of supply. They gave the highest score (5 out of 5, i.e., very good) to the quality of the honey supplied by the farmers, and second highest (4, i.e., good) to the price. However, as the supply is uncertain and very low compared to the market demand, the quantity/reliability of supply was ranked the lowest (very bad); the packaging was ranked second lowest as farmers pack honey in used plastic bottles; honey delivery time was

ranked 3 (average). Further, most of the local traders are not aware of international quality standards and regulations for honey; they have their own ways of determining the quality of honey (Figure 3.9).

Value addition to honey by the traders

Traders mostly buy processed honey from the producers and do not process it further. They usually pack the honey in glass containers. The traders believe that honey harvested using an extractor and primarily processed through condensation is already of high quality and does not require further processing. However, they recognized the importance of commercial processing for honey collected from wild sources by cutting and squeezing the combs.

Figure 3.9: Ranking of different aspects of *Apis cerana* honey supply by traders (5 highest, 1 lowest)



Institutional support for beekeeping/honey value chain development

The 7th Five Year Plan (2016-2020) of the Government of Bangladesh identifies expansion of beekeeping as a non-farm economic activity for rural development in Chittagong Hill Tracts. During this five-year plan special programmes/projects will be supported to promote sustainable and socially acceptable livelihood options to reduce dependency on traditional livelihood options such as jum cultivation. (Planning Commission, 2015).

BSCIC is committed to setting up and developing small and medium enterprises (SMEs) in the country to create employment opportunities and help increase GDP growth through the establishment and expansion of industries. Since the 1960s, the corporation has been working to meet the national demand for honey and increase production of quality honey by providing trainings, technical assistance and financial services to potential beekeepers for establishing beekeeping enterprises (especially with *Apis mellifera*) using modern technology.

The Ministry of Chittagong Hill Tracts is committed to promoting the beekeeping sector as one of the income generating activities for the livelihoods of local communities. It plans to provide interest-free loans from a revolving fund created for poverty reduction and women's advancement.

A couple of local non-government organizations, with the support of different national and international donor organizations, are working on strengthening in the beekeeping sector in the region. The organizations provide trainings and financial services to the beekeepers at the field level. However, they are mostly short-term interventions, and the beekeepers do not receive follow-up support after the projects phase out.

ICIMOD has been working in all three districts in Chittagong Hill Tracts in partnership with local NGOs, ECo-Development, ASHIKA and PAJURECO to improve the livelihoods of hill people through the development of pro-poor value chains of bee products and pollination services by specifically focusing on strengthening honey production base and market linkages by building human and institutional capacities.

Beekeepers are usually organized into small village based groups, e.g., Mou Dal and Para Development Committees. Various government and non-government organizations supporting honey value chain development are shown in Figure 3.10.

Volume and price of honey in CHT

Approximately 4,923 kg of *Apis cerana* honey is produced annually in CHT. Of this, 95.9% is sold while 4.1% is kept for household consumption. Out of the honey sold, 95% is sold locally at the farmer's gate directly to consumers at BDT 800 to 1,000 (USD 10.03–12.6) per kg and 3% to middlemen (e.g., local shopkeepers) and 2% to local traders. Retailers such as local departmental shops or tourist centres sell honey at BDT 1,000 to 1,200 (USD 12.6–15.1) per kg. A detailed value chain map of *Apis cerana* honey in CHT is presented in Figure 3.11.

Figure 3.10: Facilitators in beekeeping/honey sector

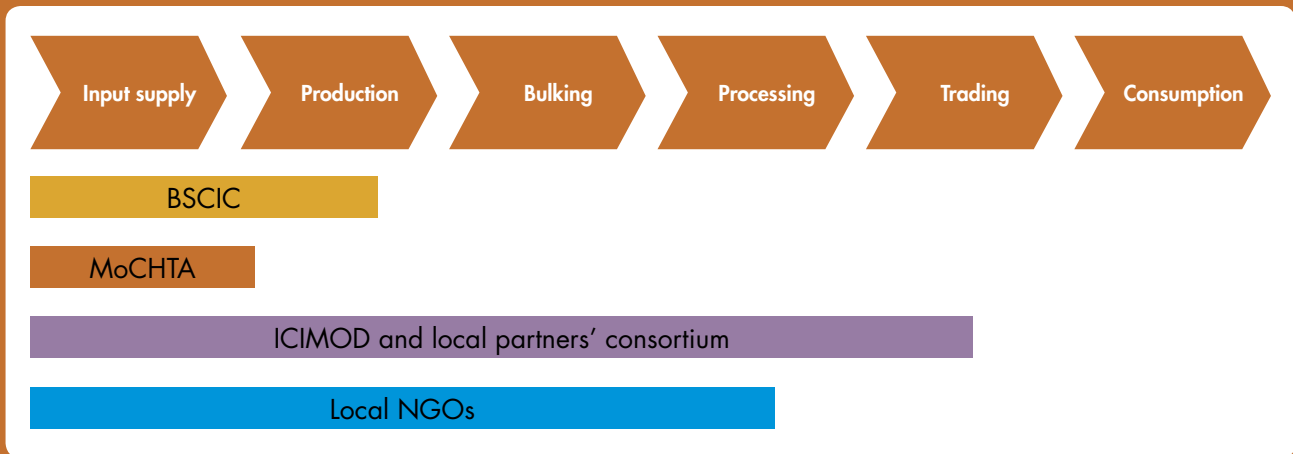
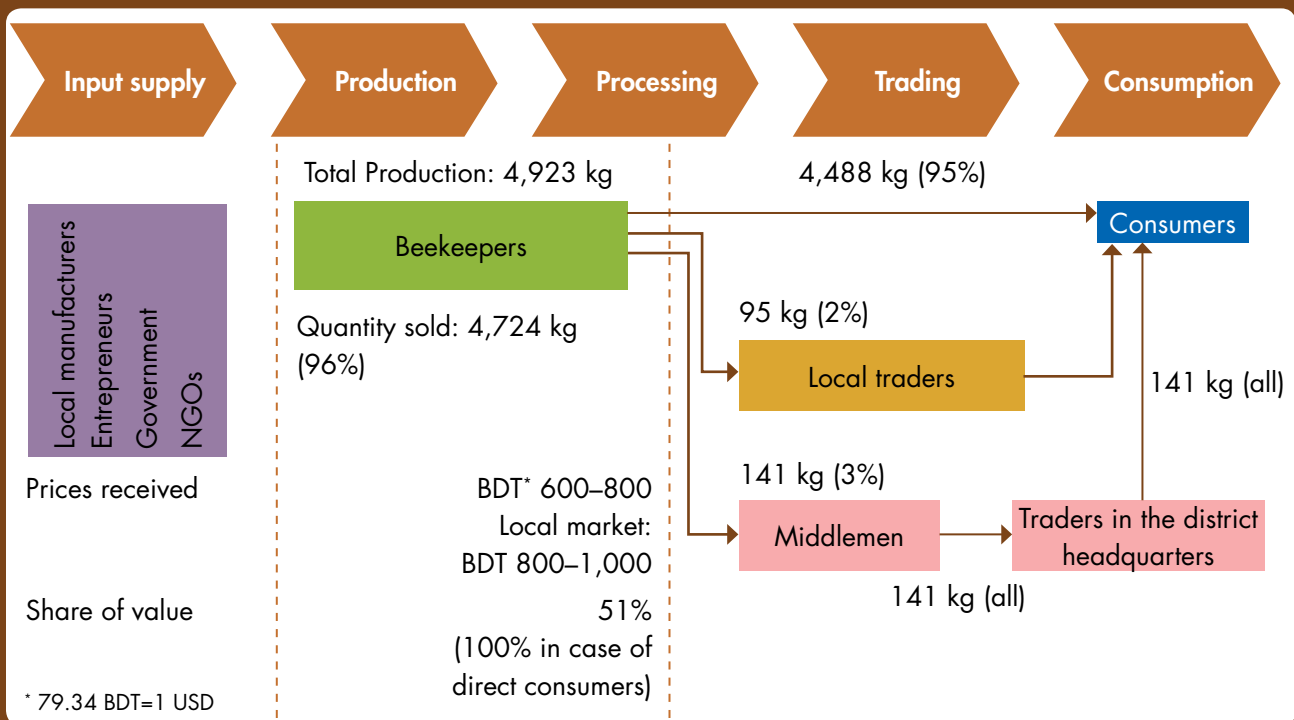


Figure 3.11: Detailed value chain map of *Apis cerana* honey in CHT



3.5.3 SWOT analysis

A SWOT analysis of the *Apis cerana* honey value chain in Chittagong Hill Tracts is presented in Figure 3.12. The figure shows the strengths, opportunities, weaknesses and threats at each node of the value chain.

3.6 Relevance of Findings

3.6.1 Upstream actors

Beekeeping – a constant source of income to households

Farming is a major source of income for the majority of households in CHT. Most of the beekeeping households have only 1 to 2 bee colonies. Even with this limited number of colonies, a beekeeping family earns an average of

Figure 3.12: SWOT analysis of honey value chain in CHT

Input supply	Production	Processing	Trading
Strengths			
<ul style="list-style-type: none"> Knowledge on how to make a standard beehive. 	<ul style="list-style-type: none"> Awareness and recognition of beekeeping as a viable economic activity among the beekeepers. Superior taste, flavour, colour and pattern of Apis cerana honey of CHT. Most beekeepers are trained in modern apiculture. Equal participation of men and women in production. Most beekeepers are organized into small groups. 	<ul style="list-style-type: none"> Traditional knowledge on primary processing. Awareness and knowledge on use of extractor. Honey produced and processed at household level is of excellent quality. Equal participation of men and women in processing. 	<ul style="list-style-type: none"> Interest of traders to expand the honey trade.
Opportunities			
<ul style="list-style-type: none"> NGOs are interested in and actively engaged in promoting economic development through beekeeping. Availability of government support and presence of international organizations. Availability of bee colonies from wild sources. Requires low investment. 	<ul style="list-style-type: none"> Availability of a wide range of bee flora in the region. Favourable climatic conditions of CHT for beekeeping. Low opportunity cost for honey production. Organic insecticides and fertilizers innovated for the region. Cultivation of flowering crops and fruits is increasing in the region. 	<ul style="list-style-type: none"> Some commercial processors are available at the national level. Processed honey has a higher price. Possibility of commercially processed honey to enter foreign markets. 	<ul style="list-style-type: none"> High local and national demand for honey. Export market for honey is opened for Bangladesh.
Weaknesses			
<ul style="list-style-type: none"> Poverty among households makes them unable to invest in commercial scale beekeeping. Limited availability of loan/credit schemes for farmers. 	<ul style="list-style-type: none"> Very few colonies per household has resulted in low production. Lack of knowledge on disease, parasite and pest control. Lack of access to technical support. Lack of knowledge on beekeeping management in different weather conditions. 	<ul style="list-style-type: none"> No commercial processor in the region. Absence of approval of BSTI Lack of linkage with commercial processors at the national level. Poor packaging materials. Collection cost is high for remote areas. Lack of transportation facilities. 	<ul style="list-style-type: none"> Lack of linkages between producers and traders. Lack of linkages with national market. Lack of access to financial services for large-scale investment. Lack of bargaining power of the beekeepers.
Threats			
<ul style="list-style-type: none"> Gradual decline of wild bee colonies due to deforestation and planting of foreign species. Widespread cultivation of tobacco. Lack of access to technological and business information. 	<ul style="list-style-type: none"> Deforestation has reduced bee food. Planting of foreign species in forest areas is reducing bee food. Cultivation of tobacco causes harm to climate and various species. Effects of climate change – excess rain, drought – have caused bees to abscond the hives. Use of chemical fertilizers and insecticides in crops and fruit orchards is killing bees. Absence of research on honey production 	<ul style="list-style-type: none"> High cost of commercial processing logistics No system for authentication of processed honey Absence of research on honey processing Lack of access to technological and business information 	<ul style="list-style-type: none"> Low price of Apis mellifera honey in the domestic market

BDT 8,500 (USD 107.1) per year, which is 15% of their total annual income. Although the earning seems very small compared to the overall income, it significantly helps poor farmers during periods of food crisis (usually from March to July). They can use the earning to pay their children's school fees, receive health care, and buy other household necessities. However, this income can be increased to BDT 38,000 (USD 478.9) or more if the beekeepers could increase the number of their bee colonies (3 to 5) with some additional investment. Beekeeping requires little labour, low investment and little time. Farmers can easily pursue it as a side activity alongside their usual economic activities. Beekeeping requires a very low production cost; and average net margin of a beekeeper household for honey production is 94.6%. The risk associated with beekeeping is minimal, as reiterated by 71% of the beekeepers. Beekeepers have identified this economic activity as a safety net for incomes. Therefore, beekeeping has high potential of lifting people of CHT out of chronic poverty.

Favourable climate and abundance of bee flora for beekeeping

The Chittagong Hill Tracts is one of the most forest-rich areas in Bangladesh with diverse flora and fauna. People in CHT mainly depend on agriculture for their livelihood, and cultivation of cash crops (fruits and vegetables) is increasing in this region. Therefore, bee flora is widely available in the region. The study identified huge availability of at least 23 species of bee flora in the study area.

The climate and weather of this region is favourable for *Apis cerana* beekeeping. This species of honeybee is indigenous to this region and widely available in the forests. The majority of beekeepers in the study area collected their initial colony of bees from the forest. Extensive availability of bee flora and favourable weather conditions for *Apis cerana* clearly enhance the potential for bee keeping in this region.

Huge demand for *Apis cerana* honey in local and national market

The *Apis cerana* honey in CHT is produced from a variety of plant sources and it has unique taste, colour, flavour and characteristics. Therefore, this honey has huge demand both within the CHT region as well as nationally. The current level of production cannot even meet the local demand at the village level. *Apis cerana* honey has a higher market price, i.e., BDT 800 to 1,000 (USD 10.1–12.6), which is more than double the price of *Apis mellifera* honey. The high demand for *Apis cerana* honey carries huge prospects of expansion of *Apis cerana* honey sub-sector.

Potential for contributing to poverty reduction

The production of honey per beekeeping household in CHT is quite low – only 10.3 kg. This is because beekeeping has not yet been commercialised among the producers. A beekeeper usually possesses only 1 to 2 bee colonies, producing 7–11 kg of honey per year. This small quantity of honey cannot be accounted for in the value chain of honey.

The study found that with an initial investment of BDT 6,500 (USD 81.9) a beekeeper can start with one bee colony, which can bring him/her an annual income of BDT 7,500 (USD 94.5). This would only be 15% of his/her total annual income. However, if s/he doubles the number of bee colonies, s/he can earn BDT 16,000 (USD 201.7), which is 30% of his/her annual income. And this can be further increased to 50–70% with a little investment in increasing the number of colonies. Thus, beekeeping has the potential to eradicate poverty from the Jumiya households, though currently it contributes only a little because the production is low owing to the small number of bee colonies.

Pesticide/agrochemical use – a constant threat for beekeeping

The progressive growth of cash crops farming in CHT has increased the prospects for beekeeping in the region. Beekeeping also increases the productivity of fruit and vegetable crops through pollination services of honeybees. However, with the increase in cash crop farming, use of chemical pesticides and fertilizers has also become more widespread in the region. This has resulted in the death of bees and a decline in honey production. The study found that beekeepers lost a large number of bee colonies due to the use of chemical pesticides in the locality. The farmers have limited awareness on the pollination effect of bees. Therefore, use of chemical pesticides and fertilizers poses a threat to the beekeeping activity in the region.

However, nowadays, the government and some NGOs, in particular ECo-Development, are promoting the use of organic pesticides and fertilizers in the fields. This is safe for bees and is expected to increase the number of bee colonies, which in turn will increase the productivity of organic farms through pollination.

Climate change induced changes in local weather affecting beekeeping and honey production

Climate change, especially frequent droughts and excessive rain, is affecting beekeeping and honey production, as reported by 71% of beekeeping households. Frequent droughts and increased intensity of rains lead to food shortage and increased incidences of diseases and pests, which cause the bees to abscond. Producers reported that climatic variation is causing decrease in honey production, decline of wild bee colonies, increased prevalence of bee diseases and decline of bee flora in the locality and forest. Therefore, research should be undertaken to identify appropriate adaptation measures to protect beehives from the effects of climate change.

Poor knowledge on management/control of bee diseases, pests and predators leading to decline in honey production

Bee diseases such as dysentery and febrile illness, attacks by different pests and enemies, and unfavourable weather conditions affect the beekeeping activity of 5 to 20% households. Inadequate knowledge on protecting bees from these hazards decreases honey production. All beekeepers in the region are trained in beekeeping management. However, the study found that the beekeepers still need more knowledge and skills for management and control of diseases, pests and predators for sustainable beekeeping in the region.

Value addition in honey a key concern among beekeepers

In the CHT, 45% of the producers use the honey extractor, local filter and moisture reduction techniques to enhance the purity and standard of honey. The shelf life of primarily processed honey in CHT is 3 to 5 years. However, packaging of honey in the region is substandard. The producers sell honey in re-used plastic bottles or containers leading to leakage of honey. These bottles are just filled with honey and sold without weighing. This reduces the profit for the beekeepers. As beekeepers produce very small quantities of honey and these are sold locally at the farmer's gate, they do not bother packaging it well and maintaining quality standards. However, if production is increased, this issue should also be addressed.

Weak institutional capacity affecting beekeeping/honey development

Most of the beekeepers in the region belong to small village based groups formed usually with the facilitation of NGOs. As production per household is very low and most of the honey is sold locally, the groups lack the capacity for commercial processing and marketing of honey. Strengthening these groups or forming a beekeepers' association is one of the leverage points for commercial production and economy of scale, processing and packaging, establishing market linkages, providing assurance to the traders for sustainable supply of honey, and meeting market demand.

3.6.2 Downstream actors

Low supply of honey to formal traders in CHT

The study found that the beekeeping households produce and supply less than 146 kg of *Apis cerana* honey to the local traders. Such low supply can hardly be accounted for in the value chain of honey. Meanwhile, there is growing demand for honey among local people, tourists in CHT, food manufacturers and pharmaceuticals. Some traders have reported that with the current supply they cannot even meet 5% of the market demand. Therefore, commercial production of large quantities of *Apis cerana* honey and supplying it to the market is a crucial leverage point in CHT.

Producers not informed about market demand, market requirements and market prices

Beekeepers in CHT have no idea about the market demand, market price and market requirements of honey with regard to quality and quantity. Due to this, many beekeepers are not confident to take up beekeeping on a commercial scale. Therefore, there is need to create a mechanism for providing them information on honey trade, national and international market demand for honey and quality standards.

Lack of institutional arrangement for commercial processing and branding of honey

There is no formal brand registration institution in CHT. The local traders usually purchase honey from beekeepers, pack it in glass containers and then supply it in the local market. There is no institutional mechanism for processing honey, measuring its quality and certifying it.

Weak linkages between beekeepers and formal market

There is a lack of linkage between beekeepers and the formal market in the region. Contractual agreement between beekeepers and traders does not exist and honey trading takes place informally. At the national level, there are a number of commercial producer and processor companies. However, no attempt has yet been made to connect the beneficiaries with these processing companies, which could open doors for CHT honey to enter the national market. But for this beekeepers need support to enhance honey production. The current production is not profitable to either the beekeepers or the companies.

Lack of financial services for the traders

Some traders said that they lack access to financial services for marketing honey on a commercial scale. Access to financial services would enable wholesalers or traders to enter into a contract with beekeepers and support them in enhancing honey production, undertake commercial processing of honey and establish a wider market for honey within and outside the CHT.

3.6.3 Facilitators and enablers

Government and NGOs identified beekeeping as one of the profitable economic development activities for the poor and disadvantaged households in CHT. Following concerns have been identified for the facilitators and enablers.

No policy for development of honey sector in the country

Beekeeping has been identified in the draft 7th Five Year Plan (2016-2020) as one of the non-farm rural development activity that will be expanded in Chittagong Hill Tracts. However, there is no specific policy in the country or at the CHT regional level for improving this sector.

Lack of research on beekeeping and honey sector

Neither government nor non-government organizations have conducted adequate research on beekeeping and honey sector in Chittagong Hill Tracts. Research needs to be undertaken to cover different nodes of the honey value chain including quality inputs (e.g., beehives), bee management, disease control, pest control, integrated approach for beekeeping, adaptation to climate change and appropriate processing and value addition of honey.

Short-term funding for beekeeping development affects sustainability

The few NGOs involved in this sector are funded for a short period of time. Within this period the NGOs provide trainings and technical and financial assistance to beekeepers. Due to lack of funds, they can hardly monitor and follow up on their activities beyond the project period.

3.7 Recommendations for the Development of *Apis cerana* Honey Sub-sector in CHT, Bangladesh

There is high market demand for *Apis cerana* honey produced in CHT and it fetches a much higher price than *Apis mellifera* honey produced in the plains. As most households in CHT traditionally depend on agriculture, and as beekeeping increases agricultural production, this activity is very feasible in this hilly region. With proper guidance, support, linkage and follow-up, a beekeeper can lift his/her family out of poverty.

However, a lot needs to be improved to establish a pro-poor, sustainable and effective honey value chain in the region.

- The government, donors and NGOs should undertake appropriate strategies to promote beekeeping as a highly potential source of income for economic empowerment of the poor and disadvantaged agriculture-dependent hill people in CHT. Involving a large number of households in beekeeping will not only lift these families out of poverty but also strengthen the *Apis cerana* honey sub-sector in the country.
- The existing and potential beekeepers should have access to financial services, such as credit schemes, so that they can start their production with a reasonable number of bee colonies. The government banks and the NGOs should widely extend such services with low interest rates.
- Innovations and experiences of NGOs show that cash cropping, beekeeping and use of organic fertilizers and organic pesticides are mutually beneficial to one another in a dynamic triad. Cropping, vegetable cultivation and fruit farming increase food for bees, and beekeeping in turn increases production through its pollination service. Use of organic fertilizers and pesticides increases agricultural production and improves the quality of yield, and also helps protect bees by replacing chemical fertilizers and pesticides. Therefore, government and NGOs should scale up this integrated model throughout the CHT for the economic development of CHT people and to strengthen the honey value chain.
- Training service providers should design a comprehensive training package laying more emphasis on appropriate management of locally prevalent diseases, pests and enemies and natural hazards. The training should also emphasize the vital role of beekeeping in pollination. International quality standards for honey and appropriate packaging techniques should also be incorporated in the package.
- Existing beekeepers institutions (e.g., beekeepers' groups) should be strengthened and new associations should be formed, made functional, and strengthened to enhance honey production, processing and branding and to establish strong marketing linkages with traders and large consumers (e.g., pharmaceuticals). Individual beekeepers should be brought under these institutions.
- Strong marketing linkages should be established between honey producers and traders at the local, district and country level. Formal agreements should be made between beekeepers' institutions and commercial traders or processors. Traders and processors of different levels should be made aware of the superior characteristics and quality of *Apis cerana* honey produced in CHT.
- Government and donor agencies should extend technical and financial services to the traders for the collection of large quantities of honey, safe transportation, commercial processing, quality control and storage to strengthen the honey value chain in the region. A system should be put in place for the authentication of honey and its quality.
- A regional framework should be developed and implemented to improve and expand beekeeping and the honey sector in the region with the involvement of all actors related to the honey sector.
- Finally, research work should be carried out in this region on different nodes of the honey value chain, especially quality inputs (e.g., beehives), disease control, and pest control, integrated approach for beekeeping, adaptation to climate change and appropriate processing of honey.

4. *Apis cerana* Honey Value Chain Analysis in Southern Bhutan

4.1 Chapter Summary

Past interventions to promote beekeeping in the rural villages of Bhutan with support from the International Centre for Integrated Mountain Development (ICIMOD) and other donors are steadily bearing fruits. However, present constraints faced by beekeepers, and the future scope for producing natural, pure honey and expanding markets within and outside Bhutan are yet to be understood. To have a better understanding of the entire structure of the honey value chain in Bhutan, a study was conducted in all potential beekeeping districts of the country. Primary data was collected by interviewing 120 households in 12 geogs in 6 districts using structured questionnaires and by holding focus group discussions. Secondary data was gathered from different published and unpublished sources.

Findings show that the study area has an abundance of bee flora to support beekeeping development. Over 61% of the beekeepers confirmed that the natural environment and bee forage sources have either remained the same or improved over the years. Similarly, 65% of the beekeeper respondents reported that honey production has increased over the years. Strong environment protection law has contributed to production and has been a boon for the conservation and sustainable use of existing flora and fauna including honeybee resources. Besides, the royal government is also persuading farmers to grow organic vegetables on a commercial scale in some beekeeping districts. This has progressively increased bee flora, leading to the growth of the beekeeping activity. Such measures are expected to greatly contribute in building resilience against the adverse effects of climate change.

About 11% of the total households (3,370 out of the total 33,115 households) in Chukha, Dagana, Samtse, Sarpang, Tsirang and Samdrup Jongkhar districts in southern Bhutan are engaged in *Apis cerana* beekeeping. All together they have 6,605 colonies, 37% of which are kept in moveable frame hives and 63% in traditional log or wall hives. They produce a total of 13,129 kg of honey every year. Most of the respondents (80%) have received at least basic training on beekeeping. This has improved their knowledge and skills to a great extent, giving them the confidence to take up the beekeeping venture in an accelerated mode. However, about 20% of the interviewees had not received training. Even among those who had received training, some had been out of practice and lost track of improved beekeeping techniques. Training and skills development and awareness creation thus needs to be an ongoing process.

Institution for farmer-to-farmer extension has been strengthened. Farmers/beekeepers trained by ICIMOD and the Department of Livestock in the past can now serve as resource persons and train interested beekeepers from other areas. Besides, beekeepers trained in hive making are making incremental earnings by selling improved hives to other farmers.

Over three-quarters (76%) of *Apis cerana* honey is harvested by squeezing the combs and draining the honey. More than half (57%) of the beekeepers pack honey in re-used plastic bottles or liquor bottles. The product is marketed without labelling because the beekeepers have limited knowledge and awareness of market needs and customers' preferences. Honey produced is mostly sold from their homes and villages to visiting customers and through informal markets such as roadside vendors/local retail shops.

Cost of production of *Apis cerana* honey is slightly lower (Nu 184/kg, USD 2.8) than that of *Apis mellifera* honey. Farm gate price varies across the sampled districts, ranging from Nu 350 to 519/kg (average Nu 400/kg, USD 6.1). In Thimphu, the final destination for most of the rural agricultural products, average price fetched for one kilogram of locally produced *Apis mellifera* honey is Nu 727/kg (USD 11.1), which is double the price of Dabur honey imported from India. This price is higher than the maximum retail price of honey of other imported brands but lower than locally produced *Apis cerana* honey, which is sold at Nu 1,000/kg (USD 15.4).

Trade in *Apis mellifera* honey offers a maximum profit margin of 39% for wholesaler/retailers in Thimphu because of the high selling price. Retailers in Bumthang also obtain a good profit margin of 36%; beekeepers get a profit margin of 30% above the cost of production and the beekeepers' cooperative gets only 28% profit. For *Apis cerana* honey trade, local retailers/roadside vendors get a maximum profit margin of Nu. 300/kg (USD 4.6), (43%), while farmers in the vicinity of the highway enjoy a favourable profit margin of Nu 216/kg (USD 3.3), (54%) over the cost of production. Beekeepers away from the highway are at a little disadvantage and their profit margin is minimal Nu.116/kg (USD 1.8), (29%) owing to the low farm gate price offered.

Bumthang is the only district in Bhutan producing honey from *Apis mellifera* honeybees. About 53 households are engaged in beekeeping in the district. On an average each household owned 26 colonies and produced 63 kg/colony of honey. In 2015 honey production was 21 tonnes and the annual turnover to beekeepers was Nu 6.83 (USD 105,076) million.

There is favourable market demand for locally produced *Apis mellifera* and *Apis cerana* honey and both types of honey are commanding higher prices. Because of higher production, hygienic packaging and labelling, *Apis mellifera* honey is able to capture wholesale and retail markets in major towns, but *Apis cerana* honey, because of its low production, crude nature, poor packaging and labelling, has not been able to do so and is traded informally.

However, lack of awareness on markets and price offered for *Apis cerana* honey, limited business management skills, little or no knowledge of value-addition, weak linkages with markets and input suppliers, inadequate infrastructure (e.g., processing units) and lack of facilities for purchasing basic beekeeping inputs (veils, hive tools, etc.) are the inherent difficulties faced by smallholder *Apis cerana* beekeepers. Hence, concerted efforts to facilitate *Apis cerana* beekeepers to boost honey production through organizing beekeepers, strengthening forward and backward linkages and facilitating access to information, technology, financial support and markets, hygienic extraction, and bottling and labelling is a necessity. This will go a long way in improving product attractiveness to the customers, who are willing to pay a premium price/value for the local honey, thereby ensuring a continuous flow of income to the beekeeping community.

4.2 Introduction

Bhutan is a mountainous country located on the southern slopes of the Eastern Himalayas. With an area of 40,077 sq.km, its altitude varies from 200 m to 7,500 m. The forests in Bhutan, the natural habitat of pollinators, occupy 72.5% of the area of the country. Bhutan's economy is based on agriculture, forestry, tourism, and hydroelectricity. Agriculture is one of the main sources of livelihood for a large majority of the rural population in Bhutan. An estimated 69% of the population in rural areas is engaged in subsistence agriculture and livestock rearing. The main food crops are rice, wheat, maize, and potatoes (Tobgay, 2005). Rice is by far the most important and preferred food crop among the Bhutanese. Cash crops include fresh vegetables, fruits and large cardamom. Among vegetables, fresh vegetables such as asparagus, chilli and potato are cultivated. About 28% of rural households own orchards. The main fruit crops are apples and oranges, though walnut, plum, peach, pear, guava and areca nut are also cultivated to a small extent (Tobgay, 2005).

The southern subtropical districts of Bhutan viz. Tsirang, Sarpang, Dagana, Chukha, and Samtse are home to many species of honeybees such as *Apis dorsata*, *Apis laboriosa*, *Apis florea*, *Apis cerana* and *Trigona* species. Owing to favourable climatic conditions and taking beekeeping as an opportunity to earn subsidiary income, smallholder beekeepers have successfully hived *Apis cerana* and *Trigona* species of honeybees for generations to produce honey. In temperate Bhutan, Bumthang district has been at the forefront rearing *Apis mellifera* honeybees in commercial mode.

Bhutan has abundant bee flora in the natural vegetation. Fruit and vegetable crops that bloom in different seasons sustain honeybee population and honey production. Bhutanese people regard honeybees as a sign of good luck as bees contribute in increasing their crop yield (because of better pollination) and help families stay in good health (locals believe bees ward off evil spirits).

As of now, the quantity of honey produced, especially from *Apis cerana* honeybees, is minimal. However, production trends have been improving over the years. The quantity is expected to grow, as beekeeping requires few resources and government agencies and international donors have been making continuous interventions.

The International Centre for Integrated Mountain Development (ICIMOD) and the Ministry of Agriculture and Forest, Royal Government of Bhutan initiated efforts for improving management of *Apis cerana* bee colonies in the southern districts of Bhutan in 2006. Efforts were made to build the capacity of potential beekeepers in different aspects of beekeeping and honey production. The past pilot community-based honey village approach to promote honey production using improved bee management technology has been a success. Apart from increasing honey production, the interventions have broadened the beekeepers' horizon. They are beginning to realize that beekeeping can be a potential income generating activity and many have now chosen to expand the number of improved hives to enhance honey production for better income.

Although the initial efforts have been encouraging, much still needs to be done to improve beekeeping in Bhutan. Little information is available on production, processing and marketing of honey. The best ways to improve and sustain honey production for increasing household income are yet to be explored. This study therefore was undertaken to gain a deeper understanding of how honey value chains for *Apis cerana* honey operate, including present constraints and future opportunities to develop a robust pro-poor honey value chain to enhance its benefits for local smallholder beekeepers.

4.3 Beekeeping in Southern Bhutan

Average landholding in sampled households was 6.3 acres with greater proportion of dry land (49%) but respondents also had wetland, pasture, orchard and kitchen garden. Area farmers practiced rice and maize based farming. Rice is cultivated in irrigated terraced wetland. Rice is used mostly for subsistence. After the harvest of rice, mustard/buckwheat is cultivated in some portion of wetland/dryland. Maize is cultivated as a dry land crop. Millet is grown after maize harvest. Cardamom and citrus mandarin are the main cash crops. Varieties of vegetables and other fruits such as guava are also grown. Farmers rear livestock such as cattle, goats, sheep, chicken and honeybees. The villages have abundant tree/forest cover.

Beekeeping has been a long tradition in most of the households in the study area with 62% of the households in sampled geogs keeping honeybees for honey production. However, keeping honeybee is only a part-time occupation as the only effort required is to make hives, clean them before the arrival of migrating bees and harvest honey periodically.

Unlike in countries such as Kenya and Uganda, where honey is used for brewing liquor and wines, in Bhutan honey is mostly consumed in its pure form or used as a sweetener or spread for bread. Local people have long used honey to treat sore throat, chickenpox, stomach pain, foot and mouth disease of livestock, wounds and so on (Molan, 1999). Dorji and Tshering (1999) reported that oral drenching as well as application of a mixture of honey and molasses on lesions is a common method of treating foot and mouth disease in villages.

Seasonal crops such as maize, vegetable and fruit trees provide nectar and pollen to bees most of the year in subtropical districts. Bees in turn help crops and plants by providing pollination service essential for the production of viable seeds for sustainable agriculture. However there is reported decrease in domestic bee flora, especially buckwheat and mustard cultivation, in all sampled districts. This was mainly due to the availability of cooking oil and edible flour in the local shops and encroachment of dryland and wetland by cardamom, a high value cash crop that fetches about Nu 1,300/kg.

Although most farmers have seen colonies of wild bees, only some have occasionally attempted to harvest honey from the wild *Apis cerana* honeybees. However, no one has attempted to harvest honey from other wild honeybee species (*Apis dorsata* and *Apis laboriosa*).

4.4 Role of Women in Beekeeping

Assessment of gender situation revealed that there is no social and religious taboo restricting women to carry out beekeeping activities. Good participation of female beekeepers in interview and group discussions (28%) illustrated this. It was also noted that roughly 15% of women in the sample geogs are heads of their household.

Focus group discussions further showed that men and women share the beekeeping workload equally. Work requiring physical strength such as hive making was usually carried out by men. Similarly, catching and hiving bees and honey harvesting was mostly the responsibility of men. However, inspection and management of the beehives was jointly carried out by men and women, or they took turns depending on who was available at home. Women helped men to filter, bottle and sell honey and in deciding how to use the money earned from the enterprise.

Both men and women participate in trainings or study visits according to their interest and availability of time. Evidence suggests that beekeeping activities in some households are managed solely by females. In the words of Ms Asal Gurung from Tshendegang geog, Dagana, *“I carry out all the beekeeping activities as I am a trained beekeeper with adequate skills and confidence to undertake modern beekeeping,”* (Personal communication, 2015). Thus, it can be deduced that women have equal role as men in beekeeping. In fact they hold the purse strings after the household makes earnings from the sale of honey, while the men do the work that needs physical strength and courage.

4.5 Value Chain Mapping

4.5.1 Value chain functions

Input supply

Input supply for beekeeping includes beehives and other beekeeping equipment. In the study area beekeepers use traditional fixed comb beehives made by the beekeepers themselves. They also make and use other equipment for various purposes such as catching bee swarms and producing smoke.

Production

***Apis cerana* honey:** Nearly 11% of the total households (3,370 households) in six southern districts viz. Chukha, Dagana, Samtse, Sarpang, Tsirang, and Samdrup Jongkhar owned 6,605 beehives with honeybee colonies (Table 4.1).

A woman beekeeper in Tshendegang, Dagana



Table 4.1: Estimated number of households engaged in beekeeping and colonies of *Apis cerana*

District	Total HH in district	Total HH engaged in beekeeping	% of HH engaged in beekeeping	Total bee colonies in district
Chukha	7,690	769	10.0	899
Dagana	3,899	361	9.3	794
Samtse	9,176	645	7.0	1,419
Sarpang	4,964	972	19.6	2,138
Tsirang	3,278	607	18.5	1,335
S/Jongkhar	4,108	16	0.4	20
Total	33,115	3,370	10.8 (average)	6,605

Source: Livestock statistics 2014, District Livestock Sectors, 2014, HH=households

In the surveyed households 37% of total hives are improved movable frame hives and the rest are traditional fixed-comb hives (log, wall and box hives). Among traditional hives, 88% have *Apis cerana* bee colonies while the remaining 12% have stingless bee, *Trigona* colonies. Average honey production per harvest from traditional hives is 1.7 kg and 5.1 kg from movable frame hives. About 65% of the respondents reported an increase in honey production over the years.

Estimated annual production of *Apis cerana* honey in all these districts is over 13,000 kg, as shown in Figure 4.1.

Methods of honey extraction

The prevailing (traditional) method of honey extraction consists in squeezing the combs by hand and draining/filtering it through a clean cloth. About 76% of the respondents reported that honey is extracted in this way i.e., by squeezing the combs. However, 12% of the beekeepers with improved beehives and honey extractors extracted honey using a honey extractor; 10% use both extraction and squeezing methods; and 2% used a metal container with holes to drain/ sieve honey (Figure 4.2). Most beekeepers do not use an extractor either because the right type of extractor is not available or they cannot extract honey using an extractor as honey solidifies when it gets cold and trying to warm the comb is futile. In such cases, some of them resort to selling comb honey (cut comb) instead of squeezing and draining.

Processing

Honey is seldom processed to reduce its moisture as there are no facilities available. The practice of heating honey to reduce the moisture is not common. However, beekeepers have learned to harvest honey only from matured capped combs and therefore the honey they harvest is generally pure.

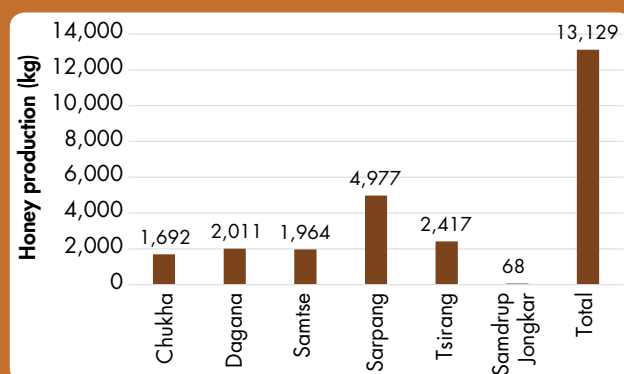
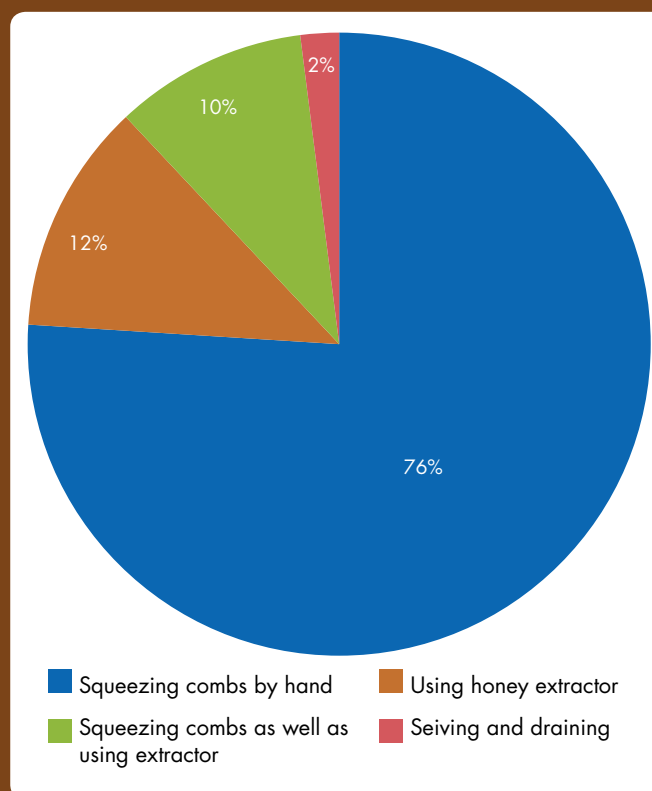
Figure 4.1: Production of *Apis cerana* honey in different districts in South Bhutan in 2014

Figure 4.2: Honey extraction methods used by beekeepers in southern Bhutan



Honey quality standards in Bhutan

There are no standards set for honey produced in Bhutan. None of the beekeeper respondents were aware of quality standards for honey or the need to maintain quality. However, the Ministry of Agriculture and Forests has set regulations on imported food items including honey, which need to be followed.

Category 1: Crude honey

Crude honey is produced in traditional log, box or wall hives. It contains a mesh of combs and honey including brood extract and dead bees. This is the lowest grade of honey and has the least price (Nu 250/kg). Crude honey can only be sold in the local market as it contains impurities and is not very attractive to customers.

Category 2: Semi-pure honey

Semi-pure honey is liquid honey produced in improved movable frame hives but harvested by squeezing by hand. This type of honey still contains particles of wax and other debris but is cleaner than category 1 honey. It fetches a higher price than crude honey (Nu 350/kg). This honey can be sold in formal retail shops if packed and labelled properly.

Category 3: Pure honey

Pure honey is produced in improved hives. It is extracted using a honey extractor and strained to remove all particles of beeswax and other material. This grade of honey fetches high farm gate prices (Nu 400/kg) and can compete favourably with imported honey. If the honey is properly labelled and packed, it can be sold at high-end hotels and supermarkets.

Other categories

Comb honey (cut comb honey): A comb honey consists of honey carefully harvested from the beehive. Pieces of the comb are put into a bottle along with liquid honey. In Bhutan it is sold at centenary farmers' market in Thimphu and roadside shops in Tsirang. It is reported that this type of honey assures consumers that the honey is not adulterated and fetches the same price as pure liquid honey in the market. If promoted well, this type of honey can be sold in supermarkets.

Trigona honey (putka honey): *Trigona* honey is believed to have high medicinal value. It is used to treat common ailments such as cough and cold, pneumonia, indigestion, wounds and fractures, and infectious diseases. The farm gate price is as high as Nu 3,000–4,000 (USD 46.1–61.5, 1 USD=Nu 65); retail price is Nu 4,000–4,500 (USD 61.5–69.2) in the local market and Nu 5,000–6,000 (USD 76.9–92.3) in markets in the capital city Thimphu. The high price fetched by this honey carries an opportunity to develop niche products that can fetch even higher prices.

Packaging

About 57% of the respondents pack the honey in re-used plastic bottles (mostly 750 ml capacity) available from liquor shops and also 1,000 ml capacity old mineral water bottles; 8% of them use glass bottles procured from Post-Harvest Centre of the Ministry of Agriculture and Forests and these can hold about 750 kg of honey; 26% use plastic containers purchased from local shops; and 9% of the beekeeper respondents use glass containers (Figure 4.3). But when middlemen/agents such as Bio-Bhutan procure bulk honey, it is transported in plastic containers of 30 kg capacity.

Labelling of honey

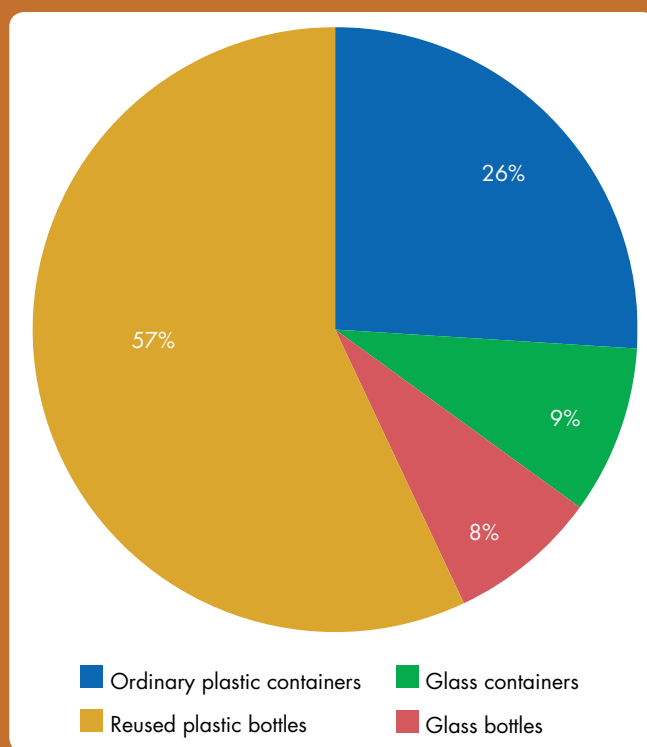
Apis cerana honey sold at local retail shops/roadside vendors is not labelled. Beekeepers often fill honey in empty whisky bottles without even removing the whisky label (see the picture above). The customers get confused whether it's honey or whisky. But in the capital city, Thimphu, Bhutan Agriculture and Food Regulatory Authority (BAFRA) insists on labelling products, and therefore the whisky label is replaced by handwritten or typed labels indicating the origin, quantity and price of the honey.

Beekeepers Cooperative of Bhutan in Bumthang, the only producers of *Apis mellifera* honey in Bhutan, extract honey in a hygienic manner, fill it in bottles (275 g and 500 g capacity) using a semi-automatic filler, put caps on the bottles, label them as pure honey from Bhutan and pack them in cartons for sale.

Trading/marketing

Apis cerana honey is mostly traded informally with sourcing from spot markets. Traders/individual buyers and middlemen buy it directly from the beekeepers or from roadside stalls. About 74% of the *Apis cerana* honey sold is mostly in crude form and 25% is semi-processed and extracted using a honey extractor; a very small amount (1%) of the honey sold includes combs. Usually a portion of the honey produced (7%) is kept at home for home use. Majority of retailers/roadside hawkers/middlemen rated the quality, reliability, price and packaging of local *Apis cerana* honey as average (neither too good nor too bad).

Figure 4.3: Types of bottles used by beekeepers for packing honey in southern Bhutan

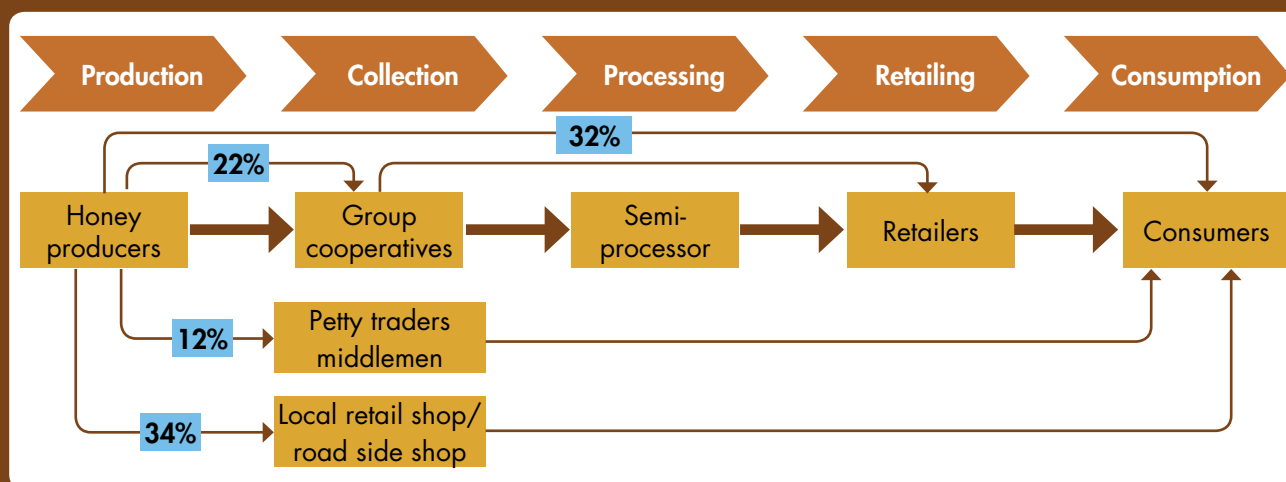


Honey filled in whisky/brandy bottles at a roadside shop, Tsirang



About 34% of the respondents reported that they sell the product to local retail shops. About 32% sell directly to the customers from their home/village itself. About 22% sell their honey to the group chairperson, who further explores the market. Another 12% sell it to buyers/middlemen (Figure 4.4). These middlemen buy honey from producers to sell it to customers directly or to retailers in Thimphu and other towns. Respondents said that demand for this honey is highest at the local level and major towns (e.g., Thimphu) and less in the district towns. But none of the respondents reported that they sell their products to major towns themselves.

Figure 4.4: Trade flow of locally produced *Apis cerana* honey in Bhutan



Roadside honey sales counter at Thangrey (Tsirang)





Roadside honey sales counter at Chanchey Dovan (Tsirang)

Apis cerana honey produced in Tsirang, Sarpang and Dagana finds its way into the informal Centenary Farmers Market in Thimphu, roadside stalls in Changchey Dovan and along the Gelephu-Thimphu national highway, Sunday markets in towns and small retail shops in the villages. Honey from Chukha and Samtse is sold at the weekly market in Samtse and Phuntsholing town and at the vegetable market in Thimphu. As such, *Apis cerana* honey could not penetrate the wholesale and retail market in major towns mainly because of its limited quantity.

Comparative prices of local and imported honey:

For Dabur honey, the wholesaler provides 14% commission to retailers who sell them at the maximum retail price (MRP) of Nu 380/kg (USD 5.8) or a little less. A kilogram of locally produced *Apis mellifera* honey fetches Nu 727/kg (USD 11.2) on average, which is double that of Dabur honey at Thimphu retail shops and higher than honey of other imported brands but lower than locally produced *Apis cerana* honey, which is sold at Nu 1,000/kg (USD 15.4) in Thimphu (Table 4.2).

It is indicative that high demand for locally produced honey in the domestic market has allowed the local honey to fetch a favourable price and can thus motivate producers to enhance production.

Domestic market capacity for honey: Most beekeepers reported that there is no dearth of market for honey produced in Bhutan. Further, it is estimated that the domestic market can absorb at least 58 tonnes of honey annually considering the current production, i.e., 21 tonnes of *A mellifera* honey, an estimated 12 tonnes of *Apis cerana/Trigona* honey and 25 tonnes of imported honey in 2014 (Bhutan Trade Statistics, 2015).

Table 4.2: Price comparison of local and imported honey in retail shops, Thimphu

Honey types	Price (Nu/kg) (in Thimphu)	Origin
Dabur Honey	380	India
Beez Honey	364	India
Real Honey	440	India
Aussie Honey	657	Australia
Locally produced <i>mellifera</i> honey	727	Central Bhutan
Locally produced <i>cerana</i> honey	1,000	South Bhutan

Source: Tamang and Gurung (2015) (1 USD = 65 Nu)

Market demand for *Apis mellifera* honey: Locally produced *Apis mellifera* honey in Bhutan has low price sensitivity and the product is appreciated in the major towns. This was confirmed by 85% of the wholesalers/retailers interviewed; they said that there is no problem selling this honey. Retailers in Bumthang reported that the quantity procured is sold out within three to four months of bulk extraction and distribution by the Beekeepers Cooperative of Bumthang in June-July each year. By November the stock of honey is already exhausted and there is shortage in the market. Some retailers in Bumthang therefore hoard the honey and do not sell it till December. As the lean season starts in December, honey is sold at a much higher price than the normal selling price. Some retailers reported that the price of honey (275 g bottle) when purchased from BeCoB is Nu 140 (USD 2.1). From July till November, the price charged to customer is Nu 180–185 (USD 2.8). But in December when scarcity strikes, the price of the same quantity of honey soars to Nu 220–225 (USD 3.4), which is Nu 40 (USD 0.6) more than the normal price and Nu 80 (USD 1.2) more than the cost price/purchasing price.

Market competitors and share of locally produced honey: As per the products survey conducted in the major towns of Bhutan, three to four Indian brands of honey are brought into the country. Besides, an Australian brand is also imported in small quantities and is available in a few shops in the capital city Thimphu and other major towns.

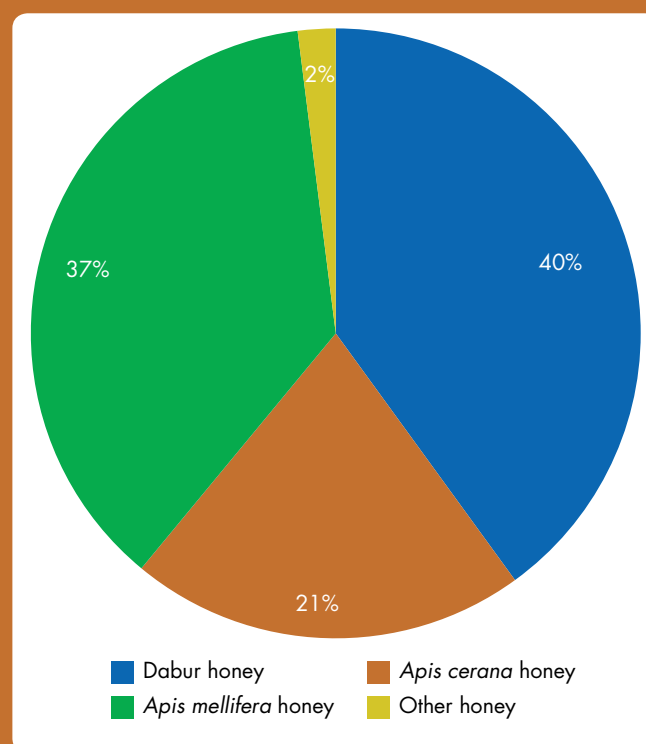
Dabur honey is the main competitor for honey produced in Bhutan. It is widely distributed across all major towns of Bhutan by wholesaler Tashi Groups of Companies through door-to-door delivery services. Of the total estimated consumption of 58 tonnes in 2015, Dabur honey had over 40% market share. Other brands such as Beez Honey and Real Honey from India and Aussie Honey from Australia has about 2%, Bumthang *A mellifera* honey has 37% and local *A cerana* honey has 21% domestic market share respectively (Figure 4.5).

However, competition from Dabur honey is not very severe, as majority of regional and international customers visiting Bhutan prefer local products. Informal discussions with hoteliers from the tourist hub in Bumthang revealed that tourists prefer local honey; when there is acute shortage, they sometimes put Dabur honey in BeCoB-labelled bottles and serve it to tourists as local honey. Local consumers also prefer domestic products if the price charged is reasonable and products are properly packed and labelled. Therefore, acceleration of *Apis mellifera* honey production in Bumthang and other feasible areas is unlikely to face any marketing problems in the immediate future.

Information flow and service providers

There are various mechanisms for the flow of information on the production, market and prices of honey in the country. Market information on honey products and prices of inputs and technical support is provided by the Research and Development Centre, Jakar, Bumthang and the Department of Livestock through awareness campaigns involving live panel discussions on honey production and marketing on national television (TV) channels, various advocacy programmes that encourage honey producers to participate in trade fairs and exhibitions, telephonic discussions, person-to-person contact between livestock staff and beekeepers and beekeepers-to-beekeepers within and outside their groups.

Figure 4.5: Market share of different types of honey produced and imported in Bhutan





Apis mellifera honey produced BeCoB, Bumthang, Bhutan

However, majority of beekeepers rarely obtained any information on honey marketing from TV, newspapers or radio. Many farmers do not have TV at home, and use of radio is not common nowadays and many illiterate farmers do not read newspapers. Limited information flow on honey production and marketing takes place through mobile phone contacts (47%), face-to-face contact (29%) and through email.

4.5.2 Value chain actors

Input suppliers

They include local beekeepers who collect tree trunks to make traditional beehives. A few beekeepers sell traditional hives to other beekeepers. Bhutanese beekeepers who have gained carpentry skills through training at ICIMOD also manufacture and supply improved beehives to beekeepers both within and outside their villages/geogs.

Producers (Beekeepers)

Beekeeping is mainly a rural-based income generating activity practiced by local beekeepers in villages. They produce honey either individually or in a group. They control apiaries and manage honey production. Honey is the major product derived from the apiaries. Apart from this, unprocessed beeswax is produced in a very limited quantity. Other beekeeping products such as propolis and pollen have not been thought of yet. Beekeepers provide honey to collectors/ middlemen (local traders) or sell directly to consumers.

Honey collectors/middlemen-women

There are two types of honey collectors: petty traders or vegetable vendors, and middlemen. Petty traders/vegetable vendors generally go door to door to collect *Apis cerana* honey from honey producers, bottle the honey and sell it at roadside stalls or the Centenary Farmers Market in Thimphu along with vegetables and other local farm products. Middlemen/agency collect bulk honey from individual beekeepers/beekeepers groups and sell it to customers in major towns.

Processors

In the case of *Apis cerana* honey, beekeepers themselves assume the role of processors in the honey value chain, whereas in the case of *Apis mellifera* honey, the Beekeepers Cooperative of Bumthang (BeCoB) takes the role of processor. In addition, some middlemen/agents such as Bio-Bhutan also carry out some value addition/semi-processing tasks such as filtering, bottling and labelling the products collected from beekeepers.

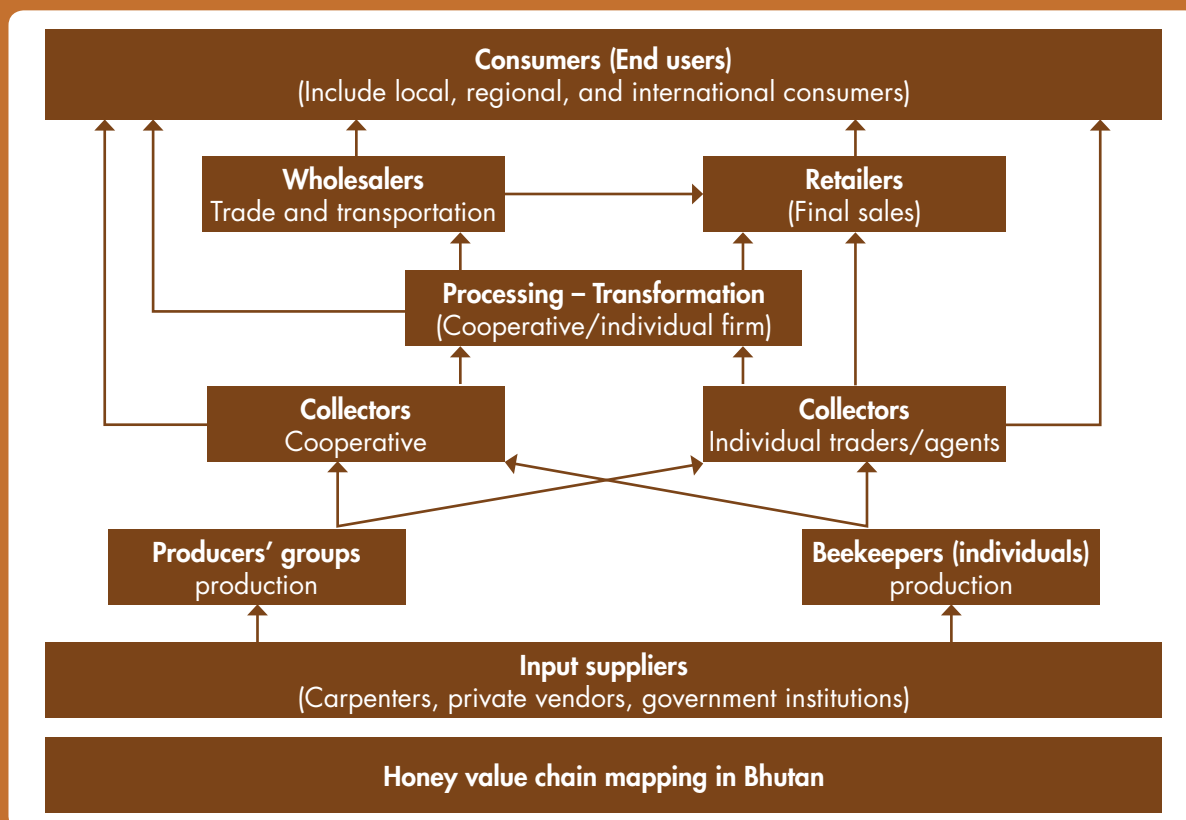
Wholesalers/retailers

The wholesalers and retailers mostly collect *Apis mellifera* honey from the Beekeepers Cooperative of Bumthang (BeCoB) and sell it to consumers and clients. Since *Apis cerana* beekeepers are scattered and honey is produced in small quantities, wholesalers do not collect this honey.

4.5.3 Value chain facilitators/enablers

Service providers/ facilitators in the honey sub-sector include ICIMOD based in Nepal, development agencies such as the UNDP, which provided small grants from the Global Environment Facility to Dunglagang (Tsirang) and Chuzom (Sarpang), and HELVETAS - Swiss Development Agency, which provided additional fund to Chuzom to start honey production. Recently a European Union fund of Nu 5 million (USD 78,186) was re-appropriated to set up an apiary of 500 bee colonies for research and development purposes at the Research Centre, Jakar, Bumthang. Donors set a landmark in the provision of services in Bhutan's beekeeping sector through facilitating the formation of beekeepers groups to promote dialogue and joint learning, capacity building of the beekeepers, providing improved beehives, bee management and harvesting equipment. Technical support is provided by the Royal Government of Bhutan through Renewable Natural Resource Research and Development Centre (RNR-RDC), Jakar, Bumthang, and the Department of Livestock. Figure 4.6 shows the *Apis cerana* honey value chain of southern Bhutan.

Figure 4.6: Existing value chain of *Apis cerana* honey in southern Bhutan



4.6 Value Chain Analysis

4.6.1 Backward linkages for *Apis cerana* honey

There is no established backward linkage between wholesalers/retailers and local (*Apis cerana*) honey producers. This is indicated by the absence of short-term or long-term contracts between the two parties. Similarly, wholesalers and retailers have little idea about *Apis cerana* honey production. Further, the chairperson of the Beekeepers Cooperative, Bumthang (*Apis mellifera*) indicated that they are not eager to make any formal alliance with the traders. They feel that establishing contracts with a few wholesalers/retailers will distort the market for honey, resulting in honey hoarding and overpricing during the lean season, and honey will not be evenly distributed. As many as 46% of vendors/retailers interviewed suggested improving market linkages, 31% improving product quality and 23% suggested ensuring timely supply of honey to traders to have a functional chain.

As there are no formal agreements between wholesalers/retailers and local honey producers, wholesalers/retailers have no obligation to address the needs and aspirations of the producers. They are also not obliged to provide any support (credit, inputs and so on) to boost honey production or to ensure hygienic honey harvesting and supply to the firm. Also, given the low volume of production and unreliable supply, traders are not coming forward to establish any alliance with the producers.

Further, there is no agreed-upon price at which middlemen/traders procure honey from the producers. Hence traders pay the producers a very low price. For example, Bio-Bhutan, a firm that has been buying local honey in bulk for several years, pays beekeepers Nu 300 (USD 4.7)/kg in Chuzom and Nu 400 (USD 6.2)/kg in Jigmecholing; these prices are 45% and 33% lower than the farm gate price when sold to other middlemen. After some value addition – filtering, bottling and/labeling – the firm sells this honey in the local market under the brand name Bio-Bhutan “Wild Flower Honey” at Nu 1,000 (USD 15.5)/kg (Nu 500, or USD 7.8 for a half kg bottle), which is three times higher than the cost price. Beekeepers in Sarpang, Tsirang and Chukha are frustrated with the low price they get and delayed payment of dues. They do not want to sell their honey to Bio-Bhutan anymore unless the price is revised; they’d rather sell it to other honey collectors/middlemen who are willing to pay a better price for their honey.

Skills and capacities of the beekeepers

A large majority of the respondents (80%) have received at least basic training on beekeeping. Some have even received advanced training including study visits and hive making training sponsored by ICIMOD and they are now acting as resource persons to train other beekeepers. Enhanced skills and awareness has given them the confidence to take up beekeeping venture in accelerated mode. However about 20% of the respondents have not had the chance to get any training. Further, some of the beekeepers who received training have lost the skills they learned due to lack of practice. Thus there is a need to continue training and skills development and awareness raising on the entire honey value chain.

4.6.2 Forward linkages for *Apis cerana* honey

Linkage between producer, (semi) processor, trader and consumer is reported to be very weak on every front for *Apis cerana* honey. There are weak linkages between individual producers and honey producer group; producers and middlemen; producers and wholesaler/retailer. Producer cooperative and individual producers for *Apis mellifera* honey are better linked, and honey production and price fixation is well coordinated, but they do not have any formal linkage with wholesalers or retailers.

Weak linkages between individual producers and middlemen/traders could be a result of the producers’ lack of knowledge about business management/marketing strategy and the importance of building linkages with traders for promoting and selling their products. Because of poor information flow, wholesalers/retailers who would like to trade varieties of products remain unaware of the product availability, farm gate price and location of the producers’ groups. Similarly, consumers who are looking for quality local honey cannot find it in formal retail shops and have to get someone to buy it from the beekeeping villages. This gap in information flow has a negative effect because many producers (especially from Tsirang) who are producing more honey than the local market demand are not

able to trade in bulk but can only sell a small quantity at a time from roadside shops and from home, and it takes them months to sell all of their produce. Beekeepers complain that the business is not rewarding or that there is no market for their produce.

However, the *Apis mellifera* honey producers' cooperative is aware of its potential buyers. As it has earned a reputation over the last two decades, the products easily find a market in Bumthang, Thimphu and Phuntsholing and are also supplying to high-end hotels and tourist lodges in other areas. This has had positive impact on beekeepers as they are able to earn some cash in one go and can put the money to good use.

4.6.3 Profitability analysis

Cost price of *Apis cerana* honey

Average variable cost of managing an improved hive is Nu 1,490 (USD 23.1)/year. This includes the labour cost, i.e., Nu 1,290 (USD 20)/year (average 6 person days in a year at current wage rate of Nu 215 (USD 3.3)), and miscellaneous cost per hive for nails, wires and wax, i.e., Nu 200 (USD 3.2). Fixed cost includes the cost of hive, i.e., Nu 3,500 (USD 54.3)/hive. The hive is expected to last 10 years with minor repairs; annual depreciation cost of the hive is Nu 280 (USD 4.3)/year. Thus, the estimated cost of producing one kg of *Apis cerana* honey is Nu 184 (USD 2.8)/kg. On average, improved hive produces 10 kg of honey in a year (two harvests), generating a revenue of Nu 4,000 (USD 62) (at the farm gate price of Nu 400 (USD 6.2)/kg). Thus the beekeeper earns a total profit of Nu 2,160 (USD 33.8) per colony per year.

Profit margins in *Apis cerana* honey for various actors

Local retailers/roadside shop owners along the Gelephu-Thimphu highway and Gelephu-Trongsa highway derive a maximum profit of Nu 300 (USD 4.6) over the purchase price and enjoy a profit margin of 43% (Table 4.3). However, these retailers explained that the profit is earned over a period of time as the sale is slow and on

Table 4.3: Profit margin in *Apis cerana* honey

Particulars	Profit/kg (Nu)	Profit (%) (over the cost price)
Beekeepers near the national highway	216	54
Beekeepers away from the national highway	116	29
Local retailers/roadside shops	300	43
Middlemen	256	30
Retailer Thimphu/Changchey Dovan using middlemen	150	15
Retailer Thimphu/Changchey Dovan without middlemen	371	37

an average it takes two months to sell about five kilograms of honey. Beekeepers in the vicinity of the highway enjoy a profit margin of Nu 216 (USD 3.3)/kg and earn a profit margin of 54% over the cost of production. But farmers away from the highway (incurring high transportation cost) earn a profit of only Nu 116 (USD 1.8) (29%) over the cost of production. Similarly profit margin of retailers in Thimphu and Changchey Dovan (who are middlemen as well as petty retailers) enjoy a profit margin as high as Nu 371 (USD 5.7)/kg; however, if they buy honey from middlemen, they have to share their profit with the middlemen and their profit margin goes down drastically to Nu 150 (USD 2.3)/kg.

4.6.4 Honey price and production trend

For *Apis cerana* honey

Honey production and price trends in the sampled households (2011-2015) indicate that there has been a gradual increase in honey production in most of the districts (Figure 4.7) except Sarpang and Dagana. In Sarpang (Jigmecholing), rampant use of weedicide to control weeds in rice, citrus and even large cardamom farms is believed to have reduced the honeybee population. Moreover climate change induced changes in local weather also affect beekeeping and honey production. For example, in Dagana, strong winds that blew off the roofs of at least 84 houses along with the beehives affected honey production in the past years.

However the price of honey has been rising quickly across the five districts. The overall average stands at Nu 436.4/kg (USD 6.7) (Figure 4.8). The rising market price of honey bodes well for producers, who can increase the volume of production accordingly.

4.6.5 Constraints faced by value chain actors

Inputs suppliers

- Non availability of basic accessories in the domestic market (such as bee veils, queen gates, smokers, etc.) required for beekeeping
- Limited skills and financial constraints to produce these equipment at the local level to support the production of honey in improved hives

Figure 4.7: *Apis cerana* honey production trend in sampled households in southern Bhutan

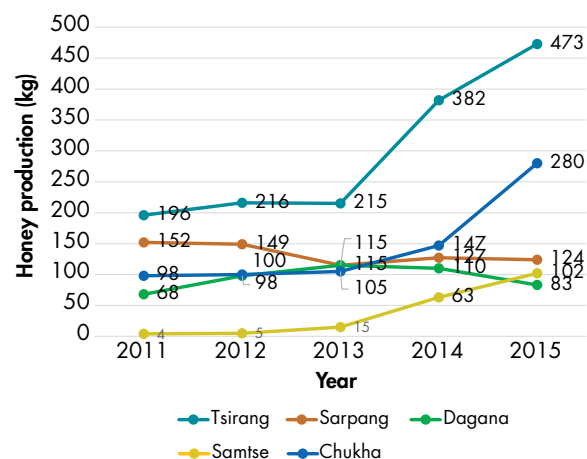
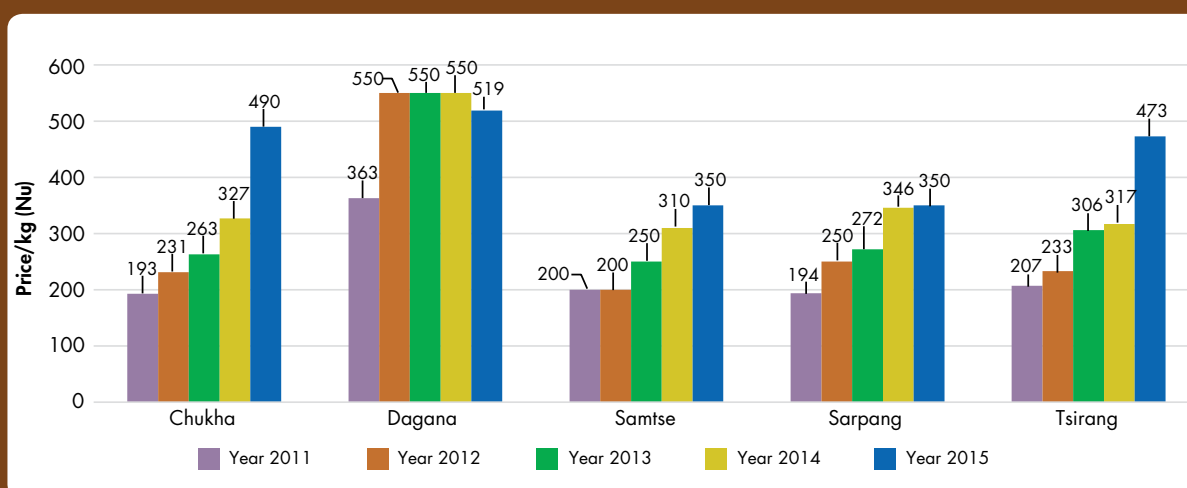


Figure 4.8: Price trend in *Apis cerana* honey produced in sampled households in southern Bhutan



Honey producers (beekeepers)

- Change in farming system whereby most farmers are converting their cultivable fields (dryland and wetland) to cardamom orchards to earn higher cash income. This has affected the cultivation of crops such as buckwheat and mustard, which served as important bee flora and source of honey for beekeepers.
- Weedicides used to control weeds in rice and orchards is reducing bee forage for bees.
- Some trained beekeepers have stopped rearing bees because of other economic opportunities; some have got married and left the place.
- Income from bees is unreliable and unpredictable as honey production is dependent on weather and flora. This has discouraged some farmers from continuing beekeeping and expanding their apiaries.
- Lack of knowledge and awareness on proper packaging and labelling for the market.

Processors

- BeCoB based in Bumthang is the only group with basic processing equipment such as honey extractor and semi-automatic filling machine but it still lacks proper equipment for sealing bottles.
- Laboratory for testing food products including honey is yet to be fully functional.

Honey collectors/traders

- Low production and poor quality of honey collected from traditional hives
- Inconsistent and limited supply of locally produced *Apis mellifera* and *Apis cerana* honey

Accessing markets

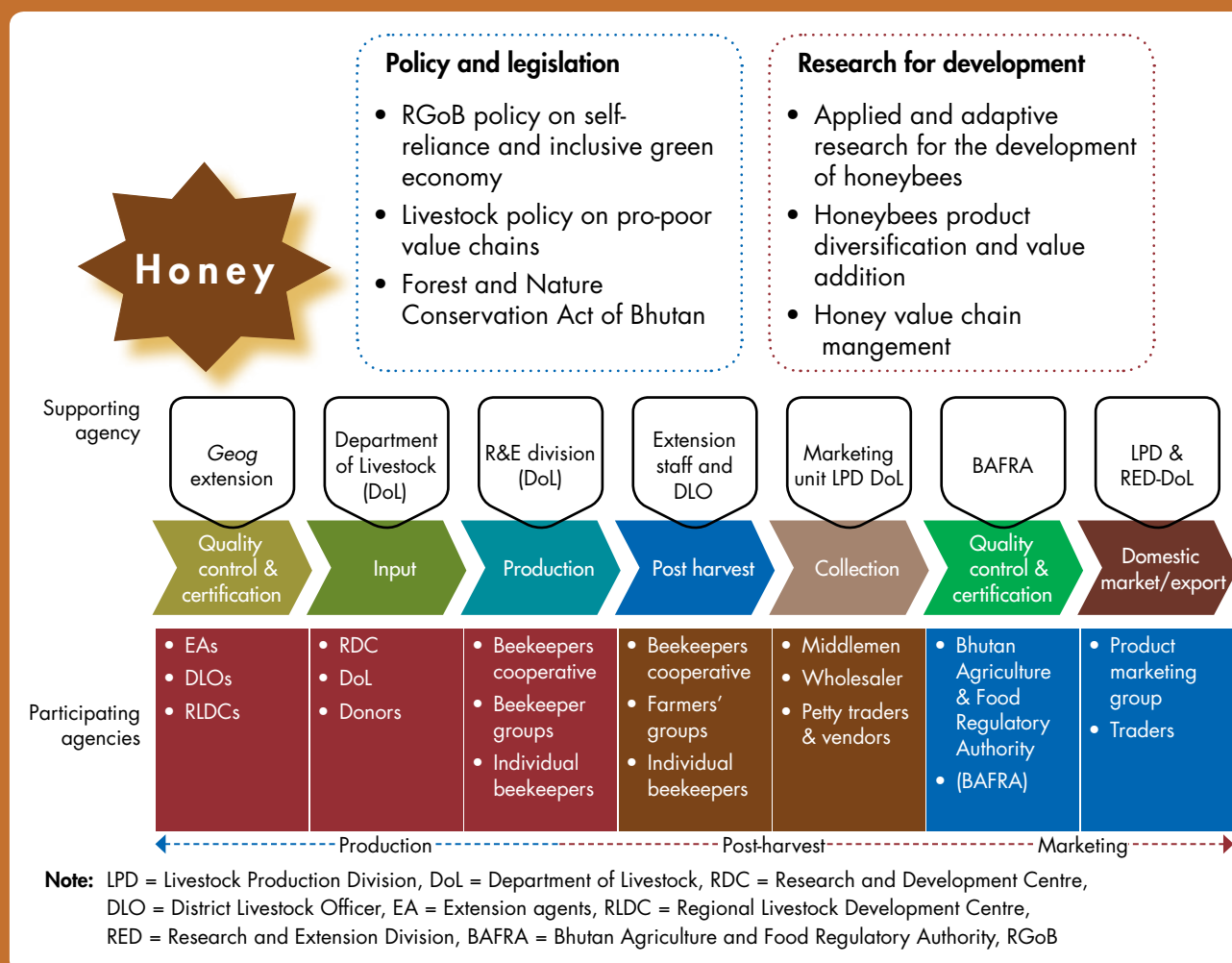
- Quantity and quality issues; absence of grades/standards for locally produced *Apis cerana* honey
- Inadequate information on markets and prices among beekeepers
- Low value-addition, weak market linkages

4.6.6 Honey value chain governance

The 11th Five Year Plan (2013–2018) of the Department of Livestock, Ministry of Agriculture and Forests, envisages adopting the vision of “self-reliance and commercialization in livestock products”. Policy objectives outlined in the Livestock Development Policy of the Kingdom of Bhutan (DOL, 2012) emphasize “Developing and Promoting Comprehensive Livestock Product Value Chains”, and strengthening animal-source value chains (meat, milk, eggs, fish, honey, fibres, hides and skins). The measures include product tracing and handling/processing across the entire chain from the production to the consumption stage, with a focus on advancing productivity and competitiveness of the livestock product value chains to enhance national food self-sufficiency.

In addition, national strategies emphasize providing encouragement and support for forming farmers groups and cooperatives all over Bhutan to give farmers a competitive edge in determining market price for products (Figure 4.9). The Beekeepers Cooperative of Bumthang has been formed and is operational. Efforts have also been made to form groups in the entire ten pilot geogs sampled and the groups are in various stages of development and operation.

Figure 4.9: Honey value chain network and institutional mapping



4.6.7 Employment in honey value chain

For the *Apis mellifera* honey value chain, on average 90 person days of labour per annum is required for honey production. Beekeepers managing more than 50 improved hives either share the work or hire workers on a temporary basis to manage honey production. Many women are employed as casual labourers at this stage and paid an average daily wage of Nu 300 (USD 4.6). However *Apis cerana* beekeeping and honey production is practiced on a small scale, with a few improved hives per household, therefore most of the work is managed without hiring workers.

4.6.8 SWOT analysis

Figure 4.10 presents a SWOT (strengths, weaknesses, opportunities and threats) analysis of the honey value chain in southern Bhutan.

4.7 Recommendations for the Development of *Apis cerana* Honey Sub-sector in Southern Bhutan

Although *Apis mellifera* beekeeping has been practiced in Bumthang for over two decades, improved ways of beekeeping for *Apis cerana* honeybees are a recent innovation. Beekeepers of Bumthang are now gearing towards commercial beekeeping with enhanced production. Many *Apis mellifera* beekeepers are taking up beekeeping as a full-time job. But for *Apis cerana* beekeepers, pursuing beekeeping as a main source of cash income will take time. But enthusiasm for improving and scaling up beekeeping is growing among beekeepers. Further, locally produced *Apis cerana* honey fetches a high price because of consumers' preference for honey produced in a pristine environment. This can be an opportunity to develop mountain specific high-value niche honey for elite customers.

The honey value chain and linkages are stronger for *Apis mellifera* honey than for *Apis cerana*. This is because *Apis mellifera* honey is produced in marketable quantities and is of acceptable quality. However, *Apis cerana* honey is produced in small quantities in isolated pockets of southern Bhutan and often from traditional hives, which makes it difficult to produce clean honey for the formal market. But with several rounds of training provided to *Apis cerana* beekeepers in the past, the level of skills and awareness on modern beekeeping has drastically improved. Beekeepers trained by ICIMOD and the Department of Livestock in the past are now acting as resource persons to train other beekeepers. Besides, beekeepers have been able to earn a side income by selling improved hives to other farmers. This positive development has to be capitalized on so that the knowledge of using modern technology for honey production can be disseminated to all interested beekeepers in the country.

Apis cerana beekeepers of Bhutan are yet to understand the value or price consumers are willing to pay for hygienically produced, properly packaged and labelled high quality honey. Hence they are yet to reap the benefits of enhanced honey production, higher income and better livelihoods.

Government's effort to promote organic vegetable production has steadily improved the availability of bee flora, resulting in increased honey production. Such efforts need to be fostered to enable beekeepers to take up beekeeping in accelerated mode, so that this environment friendly intervention (beekeeping) can become a viable alternative income generating activity for the rural poor, a potential enterprise for school leaving youth and an opportunity for self-employment for rural women.

Improving input supply and facilities for interested beekeepers

Beekeepers lack basic inputs such as bee veil, queen gate and swarm bag because they are not available in the domestic market. Supporting institutions such as Renewable Natural Resources Research and Development Centre (DNR-RDC), Jakar need to identify potential beekeepers (entrepreneurs) and build their capacities to source and supply beekeeping materials and equipment.

Figure 4.10: **SWOT analysis of *Apis cerana* honey value chain in southern Bhutan**

Input supply	Production	Processing	Trading
Strengths			
<ul style="list-style-type: none"> Knowledge and skills to make movable-frame beehives Availability of bee swarms/ colonies and bee flora in the area 	<ul style="list-style-type: none"> Beekeeping recognized as a viable economic activity by beekeepers and the government Many beekeepers have gained the skills and confidence to take up beekeeping as an income generating activity Involvement of women in beekeeping 	<ul style="list-style-type: none"> Traditional knowledge of honey harvesting and processing 	<ul style="list-style-type: none"> Preference for <i>Apis cerana</i> honey among consumers
Opportunities			
<ul style="list-style-type: none"> Booming tourism industry demanding high quality locally produced honey Local honey commanding a higher price than imported brands Government policy supporting honey value chain development Availability of a diversity of bee flora Requires low investment Hive making skills have helped beekeepers to earn additional income from hive sales. 	<ul style="list-style-type: none"> Strong policy support to advance beekeeping in the 11th Five Year Plan Intact bee flora and fauna due to strong conservation policy of the government There is increased farmer-to-farmer extension in beekeeping Trained progressive farmers are acting as resource persons and training other farmers/beekeepers Changing food habits are making people realize the importance of honey in daily diet. 	<ul style="list-style-type: none"> Processed honey has high market demand and fetches a high price. 	<ul style="list-style-type: none"> Market demand for honey Demand for <i>Apis cerana</i> honey
Weaknesses			
<ul style="list-style-type: none"> Wood for making beehives is very expensive. Hive makers do not have financial resources to establish the facility. Beekeepers do not have adequate financial resources to take up commercial beekeeping. No schemes to provide loan/credit to beekeepers. 	<ul style="list-style-type: none"> Changing farming system with beekeepers focusing on more lucrative options such as cardamom cultivation, dairy or poultry farming Decrease in the cultivation of buckwheat and mustard has reduced bee food. Low production of honey, quality issues, grading/standards Lack of technology/skills poses a challenge in adopting improved hives <i>Apis cerana</i> bees in Bhutan are still wild. Absconding of these bees due to disturbance by pests and human actions results in inconsistent harvest and unpredictable income, and at times beekeepers in the southern foothills lament that their beekeeping enterprise is less rewarding. 	<ul style="list-style-type: none"> Honey harvested from traditional log/wall hives by cutting and squeezing the combs contains impurities. Poor packaging and labelling of local <i>Apis cerana</i> honey Inadequate value-addition skills and facilities Inadequate facilities (e.g., processing unit, beekeeping shops for inputs) 	<ul style="list-style-type: none"> Beekeepers lack access to information on market, market requirements and prices Inadequate market and price information, weak linkages everywhere along the chain
Threats			
<ul style="list-style-type: none"> Rampant use of weedicide in Jigmecholing geog has decreased bee population. Changes in local weather induced by global climate change are affecting beekeeping. 	<ul style="list-style-type: none"> Diseases, pests and parasites, and predators (hornets, bears) attack beehives. Absconding nature of <i>Apis cerana</i> honeybees reduces honey production and often makes income from honey sale uncertain. 	<ul style="list-style-type: none"> Beekeepers unable to afford processing facilities 	<ul style="list-style-type: none"> Availability of cheaper brands of honey in the market

Support to own improved hives to enhance production

Due to the lack of hive making skills and high cost of wood in the open market, many beekeepers have been unable to increase the number of improved hives. The Research and Development Centre Jakar and the District (Dzongkhag) Extension system should train interested local carpenters (and farmers with basic carpentry skills) in hive making using the expertise of the beekeepers already trained by ICIMOD, support beekeepers/hive carpenters to obtain wood for hive making at subsidized rural rates and encourage beekeepers/farmers to work in groups to share their expertise. Extension staff and local government should also support beekeepers to obtain small loans to buy improved hives and equipment.

Production

Imparting skills to enhance honey production: Many beekeepers are willing to take up modern beekeeping but lack the necessary skills. Hence basic training followed by regular refresher courses should be organized. To motivate them, selected beekeepers should be sent on exposure visits to neighbouring countries to gain new knowledge and experience in beekeeping.

Research to enhance honey production: Loss of *Apis cerana* bee colonies due to absconding has hampered the income of beekeepers. There is need to conduct scientific research on breeding and propagation of productive queens to control absconding among *Apis cerana* bees.

Imparting skills on value addition and post-harvest management

Production of honey has increased in some districts, but beekeepers are unaware of value addition and post-harvest management such as proper filtration, packing and labelling of honey. They sell honey packed in re-used bottles without even removing the original labels. This has downgraded the value of the product and therefore it does not get sold in time. Rigorous efforts are required to create awareness; beekeepers should be provided training and information on the importance of product presentation so that their product can fetch a fair price. Dzongkhag Extension System should provide farmers groups with properly labelled packing bottles for the first batch of honey, and the cost of the bottles may be recovered from the honey sale proceeds and retained by the group to purchase labelled bottles for the successive batches. The Research and Development Centre, Jakar should provide coordination and funding support to set up honey extraction and packaging units in potential districts to enable beekeepers to produce better quality honey.

Marketing, business management and pricing

For beekeepers accustomed to subsistence farming, product marketing and business management is a new area, and the same is true for extension staff. Hence, production often precedes market requirements. In order to reverse the process and ensure the product finds a market, it is necessary train both concerned staff and beekeepers on market development. Beekeepers should also be trained in basic business management and pricing of products.

Building linkages and collaboration

Building linkages among beekeepers: Although beekeepers' groups have been formed in most of the pilot geogs, they are in various stages of development and operation. It is necessary to strengthen the groups and make them active so that the group members can improve their bargaining power, share their expertise and build better linkages.

Building market linkages and collaboration outside: There is a need to ensure participation of poor smallholder beekeepers in the commercial honey value chain through strong collaboration, coordination and integration of beekeepers. Inclusive cluster village approach to include all beekeepers interested in modern beekeeping, facilitation to link them to market by encouraging them to participate (with their products) in trade fairs/shows and local exhibitions/festivals and periodic discussion forums/meetings organized by the groups themselves and by Dzongkhag extension can improve collaboration and linkages.



5. *Apis cerana* Honey Value Chain Analysis in the Kalash Valley of Chitral, Pakistan

5.1 Chapter Summary

The Kalash valley in Chitral district, Pakistan, has a rich tradition of beekeeping. The valley has an abundance of bee flora and a wealth of indigenous knowledge on *Apis cerana* management in traditional hives. Honey produced by *Apis cerana* in the Kalash valley of Chitral is considered to be pure and of high quality and sells at more than double the price of *Apis mellifera* honey, bringing cash income to poor mountain communities living in these remote areas with poor access. Farmers in these valleys keep a few colonies of *Apis cerana* bees in traditional fixed comb hives, known locally as *katores*, and harvest small quantities of honey. So far no research or development organization has made efforts to improve bee management practices for *Apis cerana*.

This study was therefore undertaken to enhance the understanding of existing *Apis cerana* honey value chain, identify constraints faced by beekeepers, assess the scope for enhancing the production of natural pure honey so as to expand the markets in and outside Chitral, and make recommendations for the development of *Apis cerana* honey value chain to increase its benefits for poor mountain people.

Findings of the study reveal that there are 265 colonies in total and average production is 2,110 kg in the region. The average number of *Apis cerana* colonies per surveyed household in the Kalash valley is 3.4. Profitability (cost and profit) analysis of the *Apis cerana* honey value chain in the Kalash valley showed an annual profit of PKR 52,000 (USD 498.1) per household.

The findings revealed that half (50%) of the surveyed households have received training related to *Apis cerana* beekeeping management using improved hives and in harvesting, processing and value addition of honey. *Apis cerana* beekeepers of the Kalash valley in southern Chitral are not organized and there are no beekeepers' associations in the area. These beekeepers work on an individual basis and have received very little support from government and non-government organizations for the development of beekeeping. However, beekeepers of northern Chitral are more organized and they have also developed different beekeeper associations, which serve as an umbrella for small beekeepers of the area for trading their honey. Hashoo Foundation has made efforts to introduce *Apis mellifera* in the area and trained farmers who had tried to keep *Apis mellifera* bees but were not successful and lost their colonies.

In the Kalash valley 79% of the beekeepers sell honey directly to consumers and only 21% of the beekeepers sell it to middlemen. The consumers and retailers visit the beekeepers to purchase honey. The beekeepers usually do not prefer to sell their honey to retailers as they offer a low price. In the Kalash valley there is a system of credit loaning. Retailers provide credit loans to the beekeepers in winter when they don't have money to fulfill their basic needs, and in honey production season the beekeepers sell the honey to the retailers to pay back their loans. The price of honey ranges from PKR 1,800 to 2,200 (USD 17.2 – 21.1) per kg depending on the remoteness of the village.

After harvesting honey, the people of the Kalash valley store it in local containers called 'chidin' in the local language. After that the honey is packed in small bottles to be sold to middlemen and end users. The findings of the study show that 27% of the beekeepers in the Kalash valley use one kg bottles for packing honey while 19% of them use two kg bottles. The other bottle sizes used for packing honey are 250 gm, 3 kg, 4 kg and 5 kg. These bottles are made of different materials including plastic, glass and stainless steel and are of varying quality.

A large majority of the beekeepers (65%) rely on word-of-mouth communication among themselves for obtaining information, while 45% get information through extension workers i.e., group meetings, development workers, NGOs, extension offices, etc.

The value chain development of honey is mainly facilitated through donor-assisted programmes implemented by both international and national NGOs. However, most of these organizations are focusing on promoting *Apis mellifera*, and therefore *Apis cerana* remains a neglected species.

A large majority of the traders are not satisfied with the quantity of *Apis cerana* honey because the production of *Apis cerana* honey is low and the traders are not able to fulfill the market demand. This means that there is demand for *Apis cerana* honey and potential for increasing honey production. This demand can be met by increasing the production of honey by building the capacity of beekeepers through training in improved methods of bee management, and by providing technical and equipment support.

Other major concerns of the traders are that the beekeepers usually sell *Apis cerana* honey in crude form, which reduces the market demand for honey. There are no mechanisms in the region for processing *Apis cerana* honey. In order to create market demand for *Apis cerana* honey, beekeepers need to be trained on proper packaging and packing of wild honey. Also, there should be proper downstream marketing of honey to increase the demand.

Most beekeepers of the Kalash valley have poor bee management skills and are not familiar with modern and scientific techniques. Women of the Kalash valley are strictly prohibited from taking part in beekeeping. Majority of the functions of the honey value chain including input supply, production and marketing are performed by the beekeepers themselves, and most of the honey produced in the Kalash valley is sold directly to consumers; only a small quantity is sold to retailers. Beekeepers of the Kalash valley have no idea about the market, market requirements, or the price for honey.

The findings show that improvement is needed at each node of the value chain – input supply, bee management, honey harvesting, processing, and packaging and branding – to strengthen the *Apis cerana* honey value chain in the Kalash valley, Chitral. Currently, the production of honey is low and the quality is poor. Improving both production and quality is necessary to enhance the income of beekeepers. It is hence important to introduce modern beekeeping management technology and enhance the skills and capacities of the beekeepers through training, technical and material support, and exposure visits. Facilitating access to financial services such as credit/loan schemes will enable them to expand their enterprises. Promoting *Apis cerana* honey as a unique niche product will be important to sell it in high-end markets at a premium price. Organizing beekeepers into groups/associations will enable them to make their voices heard by concerned government and non-government organizations and get support for beekeeping development and to collectively sell honey to buyers. Government, non-government, or private entrepreneurs in the region could support the establishment of an input supply facility to strengthen input supply and help the beekeepers to purchase required kits/tools. In addition, linking the beekeepers to buyers can help strengthen the *Apis cerana* honey value chain and bring higher benefits to beekeeping households.

5.2 Overview of Beekeeping in Chitral

Beekeeping has been carried out through many generations in Chitral. Twenty years ago southern Chitral was the main source of honey used for medicinal purposes (NTFP Chitral, 2010). The main reason for this was that southern Chitral is comparatively warmer than the other parts of the district; secondly, it is covered with natural forest that provides habitat for the bees; and thirdly, flora is available for 6–8 months in a year. Beekeeping plays a significant role in the livelihoods of rural communities: one, it is an income generating activity; two, honey and other hive products have a high medicinal value; three, it supports agricultural production through pollination service and improves crop and seed yield; and four, it plays a role in biodiversity conservation. It is also a low-investment and low-input enterprise that directly generates economic gains for poor farmers and can be integrated well with agriculture, which is the main economic activity of people in the rural areas. Another advantage of beekeeping is that people of different gender and generations – men, women and youth – can practice it, and if developed properly it can become an important sub-sector and will contribute directly to poverty reduction and enhancing the quality of life of poor people. The sub-sector has great potential for enhancing rural incomes and promoting sustainable development, especially considering the varied players and activities along the broader chain. Despite

these advantages/benefits associated with beekeeping, most beekeepers and other actors in the sub-sector remain largely unorganized and underdeveloped. This is because beekeeping is still carried out as a part-time activity in most households. As such most beekeepers, especially those in the Kalash valley, have not fully recognized its potential for expansion and income generation in the area.

5.3 Introduction to the Kalash Valley of Chitral

5.3.1 Culture of the Kalash people

The Kalash valley including Birir, Bumburet, and Rumbur is located in the southern region of Chitral district. The Kalash people have their own religion, culture, customs and ways of life. They are a minority group in the region, as the majority of people have become Muslims.

The Kalash valley is known for its distinctive culture and belief system, which differ significantly from those of the various ethnic groups surrounding them. The Kalasha believe in Mahadeo (Khodai, the Khovar – a word for God), and also worship other deities that offer protection to different aspects of life (such as Jeshtak, who represents family, pregnant mothers, and marriage). Nature plays an important role in their spiritual life. As part of their religious tradition, they make sacrifices and hold festivals to offer gratitude for the abundant resources of their three valleys. They celebrate the Joshi or Chilimjusst (spring) festival at the end of May each year. The first day of Joshi is “Milk Day”, on which the Kalasha offer libations of milk that has been saved for ten days prior to the festival.

5.3.2 Main crops produced in the Kalash valley

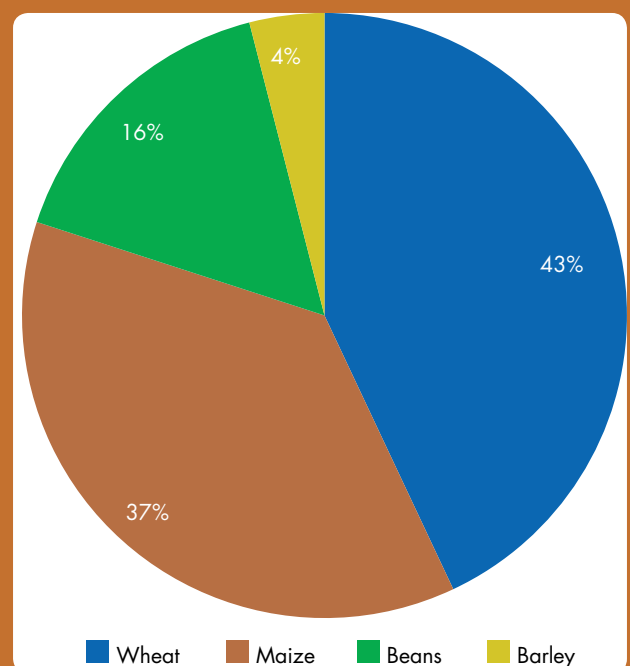
Agriculture and pastoralism are the main sources of livelihoods in Chitral. Traditionally, the people of Chitral have practiced subsistence agriculture focused on grain production and livestock rearing. Wheat, corn, barley, potato and kidney beans are the main crops produced in the Kalash valley (Figure 5.1). Wheat is the most abundantly produced crop and covers 43% of the total crop production, though all the wheat produced is consumed at the household level. Corn is the second largest crop produced in the area and covers 37% of the total crop production. Corn is also consumed at the household level and not used for commercial purposes. Red beans and potatoes are commercial crops and are produced in all three valleys.

5.3.3 Fruit crops produced in the Kalash valley

Kalash people are now shifting towards a cash-based economy and moving away from the traditional practice of measuring wealth by livestock numbers and crop production.

Walnut and grapes are the most abundantly produced fruits in the Kalash valley; they cover 30% and 26% of the total fruit production. Apple and apricot are also grown but are not used commercially because of their poor quality (Figure 5.2). These fruits are consumed fresh and in dried form at the household level. On average, fruits are grown on 0.049 hectare of land per household in the Kalash valley.

Figure 5.1: Main agricultural crops produced in Kalash valley, Chitral



5.3.4 *Apis cerana* beekeeping in the Kalash valley

Apis cerana beekeeping is practiced in southern Chitral including the border villages of Afghanistan. Some valleys in the district, such as Kalash, Arandu, Shishi Koh and Jinjiret Koh, have a rich tradition of beekeeping. Among these, the Kalash valley has a rich tradition of keeping *Apis cerana* bees. Farmers across the three sub-valleys of the Kalash valley – Birir, Bumburet, and Rumbur – have been keeping *Apis cerana* bees in traditional bee hives, known locally as *katore*, for ages. A *katore* is a hollowed-out log hive, preferably made of deodar wood (*Cedrus deodara*), fixed to the wall of a house at the time of its construction. These valleys have an abundance of bee flora and a wealth of indigenous knowledge on *Apis cerana* management in traditional hives.

Apis cerana is kept by the poorest of the poor in the remote villages. However *Apis cerana* beekeepers have huge social capital and are more strongly integrated within the society compared to *Apis mellifera* beekeepers. Selling honey brings cash income to poor mountain communities in these remote areas with poor access. However, honey production per household is low due to the small number of bee colonies and the quality is poor as honey is harvested by manually squeezing it from the combs.

These valleys are inaccessible because of poor transportation and communication infrastructure in the area. This makes migratory beekeeping with *Apis mellifera* a highly expensive, vulnerable and high-risk activity. On the other hand, stationary beekeeping with *Apis cerana* greatly supports the livelihoods of the poor rural households. Moreover, beekeeping with *Apis cerana* does not require a lot of management and inputs like sugar feeding, disease control and migration. Therefore, it is easy for an isolated farming community to practice beekeeping with this bee species on the basis of their indigenous knowledge.

Beekeeping has a spiritual significance among the Kalash community of Pakistan and is considered *oshniru* or sacred. Only male members of the community practice beekeeping; women are not allowed near beehives and cannot eat the honey produced by bees in their homes. So far, there have been no attempts to promote *Apis cerana* beekeeping using scientific bee management methods. People – farmers as well as development organizations – believe that these bees cannot be managed scientifically in modern movable-frame hives and produce less honey compared to *Apis mellifera* bees.

Thus, government and non-government organizations have made no attempt to promote commercial beekeeping with *Apis cerana* and many farmers in these valleys, including the Kalash valley, continue using traditional methods of beekeeping management and honey production. Table 5.1 provides information on the number of households engaged in beekeeping in the Kalash valley of Chitral.

Figure 5.2: Main fruits produced in Kalash valley, Chitral

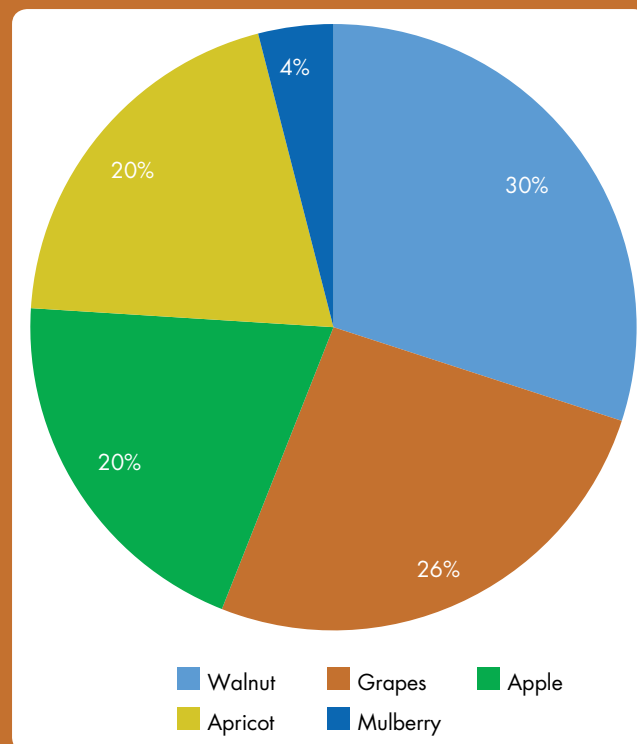


Table 5.1: Beekeeping in the Kalash valley of Chitral, Pakistan

Valley/village	Total number of households	Number of beekeeping households	Percentage of beekeeping households (%)
Birir	212	22	10.4
Bumburet	867	39	4.5
Rumbur	372	44	11.8
Total	1,451	105	8.9

5.4 Value Chain Mapping of *Apis cerana* Honey in the Kalash Valley

5.4.1 Value chain functions

The *Apis cerana* honey value chain originating from the Kalash valley of Chitral is very traditional. It involves a number of operators, facilitators and enablers. The main functions involved in the *Apis cerana* honey value chain are input supply, beekeeping, honey harvesting and wholesaling and retailing. The functions in the value chain are briefly discussed below.

Input supply

The input supply function of *Apis cerana* honey produced in the Kalash valley differs from that of *Apis mellifera* honey. Inputs for *Apis cerana* beekeeping include traditional hives known as *katore* and a basket for collecting bee colonies from the wild, called *bellu* in the local language. *Katores* are made by local artisans from *Cedrus deodara*, a special type of wood that is called deodar in local language. Deodar is a species of cedar native to the western Himalayas and found in eastern Afghanistan and northern Pakistan. According to beekeepers, *katores* made from this type of wood are *Apis cerana* friendly and the smell of this wood usually does not permeate honey. *Bellu* is also a local product of Chitral district and made by local artisans. In the Kalash valley *bellu* is used to collect bees from the wild before they are put in a *katore*.

Input suppliers for *Apis cerana* honey produced in the Kalash valley are local artisans or beekeepers themselves. Most of the beekeepers in the region can construct their own *katore* and *bellu*. A single *katore* costs approximately 1,500 PKR (USD 14.3) while a single *bellu* costs 300 PKR (USD 2.9).

In the Kalash valley there is no such concept of purchasing *Apis cerana* bees from anyone. People make a *katore* and fix it on the wall of their house and wait for *Apis cerana* bees to occupy the *katore*. The beekeepers of the valley rarely bother to collect these bees from the forest; rather, if the bees come to their *katore*, they consider them a gift of God. Most of the *katores* in the Kalash valley are empty and are not occupied by bees. One of the reasons is that the beekeepers have no idea how to capture swarms of bees and put them in another *katore*. Swarming is called 'boll boxhik' in the local language. When swarming occurs, the beekeepers usually do not collect the bees

A house with several wall hives (*katores*)



to put them in their own *katores*; rather they let the bees choose a *katore* on their own. The findings of the study also suggest that in the Kalash valley there is an average of 18 *katores* per household; out of these, 13 *katores* are without bees and 5 with bees.

The other thing used for beekeeping in the Kalash valley is bellu. Beekeepers also make bellu locally and use it to collect honeybees from the wild before putting them into their *katores*. The beekeepers of the Kalash valley do not use modern smokers for harvesting honey; rather they burn cow dung cakes to release the smoke.

The beekeepers in the northern part of Chitral usually do not practice *Apis cerana* beekeeping because of the low presence of *Apis cerana* in the area. Most of the beekeepers in the northern part of Chitral keep *Apis mellifera* introduced by AKRSP and other development organizations.

Production practices

Generally only men engage in honey production in the Kalash valley of Chitral district. Women are not supposed to take part in beekeeping. Honey production takes place through individual beekeeping entrepreneurs in the Kalash valley. Each beekeeper has at least 5 *katores* with bees. During the construction of houses the Kalash communities fix the *katores* on the walls. Migratory beekeeping is not practiced as the *katores* are fixed on a wall and the beekeepers do not practice movable frame hive beekeeping.

In the northern part of Chitral where *Apis mellifera* beekeeping is mostly practiced, women take active part in bee management and honey production. In these areas honey production is based on two types of ownership systems i.e., individually owned hives at household level and group owned hives located in one of the members' farm. Individual *Apis mellifera* beekeepers were found to have at least 5 bee colonies and up to 900 bee colonies each. Beekeeping in this part of Chitral is based on both inherited indigenous knowledge and new skills. Beekeepers in these areas are well organized; there are different beekeeping associations in these regions. Beekeepers are well-trained and different government and non-government organizations are focusing on these areas to strengthen beekeeping practices.

Collection and processing

The mechanism used for harvesting *Apis cerana* honey is quite traditional. Beekeepers use traditional or indigenous ways of harvesting honey. The *katore* is normally opened on both sides, and to harvest honey, farmers pacify the bees on one side using smoke released from burning cow dung cakes. When the bees move to the other side, farmers harvest the honeycombs manually; and the same method is used for extracting honey on the other side of the *katore*.

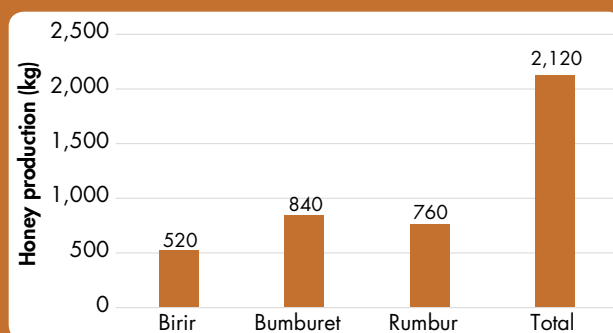
After harvesting, the honey is normally packed in large containers called *chidin* in the local language and in small bottles without further processing. Honey is normally used for medicinal purposes; therefore, farmers prefer to market the honey in crude form.

So far research and development organizations have not made any efforts to improve bee management practices for *Apis cerana*. The quantity of *Apis cerana* honey produced in the three sub-valleys of the Kalash valley including Birir, Bumburet, and Rumbur is provided in Figure 5.3.

Close-up view of a *katore*



Figure 5.3: Production of *Apis cerana* honey in different sub-valleys of Kalash in 2013



Transportation

In the Kalash valley primary transportation of honey is not really practiced. The beekeepers are not organized and there are no cooperatives or associations to provide them support in marketing their honey. Beekeepers of the Kalash valley normally pack the honey in bottles and keep it in their homes. Retailers and wholesalers visit them to purchase the honey.

There are some honeybee associations/companies in the northern part of Chitral where *Apis mellifera* beekeeping is practiced. These associations usually do not purchase *Apis cerana* honey from the Kalash valley as the quantity of honey produced in the valley is very low and the beekeepers sell it at a much higher price than *Apis mellifera* honey.



Bellu – a basket to collect bee swarms

Trading - retailing and wholesaling

Retailing and wholesaling of *Apis cerana* honey produced in the Kalash valley is done in a traditional way. Beekeepers usually sell most of the honey they produce directly to consumers who visit them. There is also a concept of credit loaning in the Kalash valley. Local retailers in the area provide credit loans to beekeepers in the winter season. The beekeepers pay off these loans in the honey-producing season by providing their honey to the retailers. Honey produced in the Kalash valley is only sold to local retailers and consumers who visit the beekeepers. This honey is not sold to associations operating in Chitral town or to retailers outside the Kalash valley.

Certification

Apis cerana honey produced in the Kalash valley is sold to end consumers without any certification. *Apis mellifera* honey produced in northern Chitral and sold in the local market of Chitral is not certified either. But honey sold to hotels in big cities is mostly certified. Hashoo Foundation purchases honey in bulk and gets it certified by a relevant institution. In Pakistan, certification of honey is the responsibility of Pakistan Council of Scientific and Industrial Research (PCSIR) and Honey Bee Research Institute (HBRI). These two institutions undertake all activities pertaining to the development of standards and quality assurance for the honey sub-sector in the country.

5.4.2 Value chain actors

Most functions of the *Apis cerana* honey value chain, including input supply, beekeeping/production, harvesting, packing and marketing, are carried out by the beekeepers themselves. The *Apis cerana* honey value chain in the Kalash valley does not include the processing function. After harvesting, honey is packed in containers without processing it. Nearly 80% of the beekeepers make their own *katores*, *bellus*; they harvest, pack and sell honey directly to consumers. Only about one-fifth of the beekeepers sell honey to middlemen.

5.4.3 Value chain facilitators

The value chain development of honey is mainly facilitated through donor-assisted programmes implemented by both international and national NGOs. As such, these programmes have overshadowed the role of the public sector institutions i.e., government agriculture extension and research institutions. However, most of these organizations focus on promoting *Apis mellifera*; and therefore *Apis cerana* remains a neglected species.

Among the non-government organizations Aga Khan Rural Support Programme (AKRSP) is the pioneer in supporting the value chain of honey in Chitral. AKRSP introduced modern hives in the region back in the mid-nineties and has since been building the capacity of rural communities in the honeybee sector, especially *Apis mellifera*. AKRSP has also created awareness among the general public about the importance of *Apis cerana* beekeeping in the area but the efforts were not sufficient. Another non-government organization called Sarhad Rural Support Programme (SRSP)

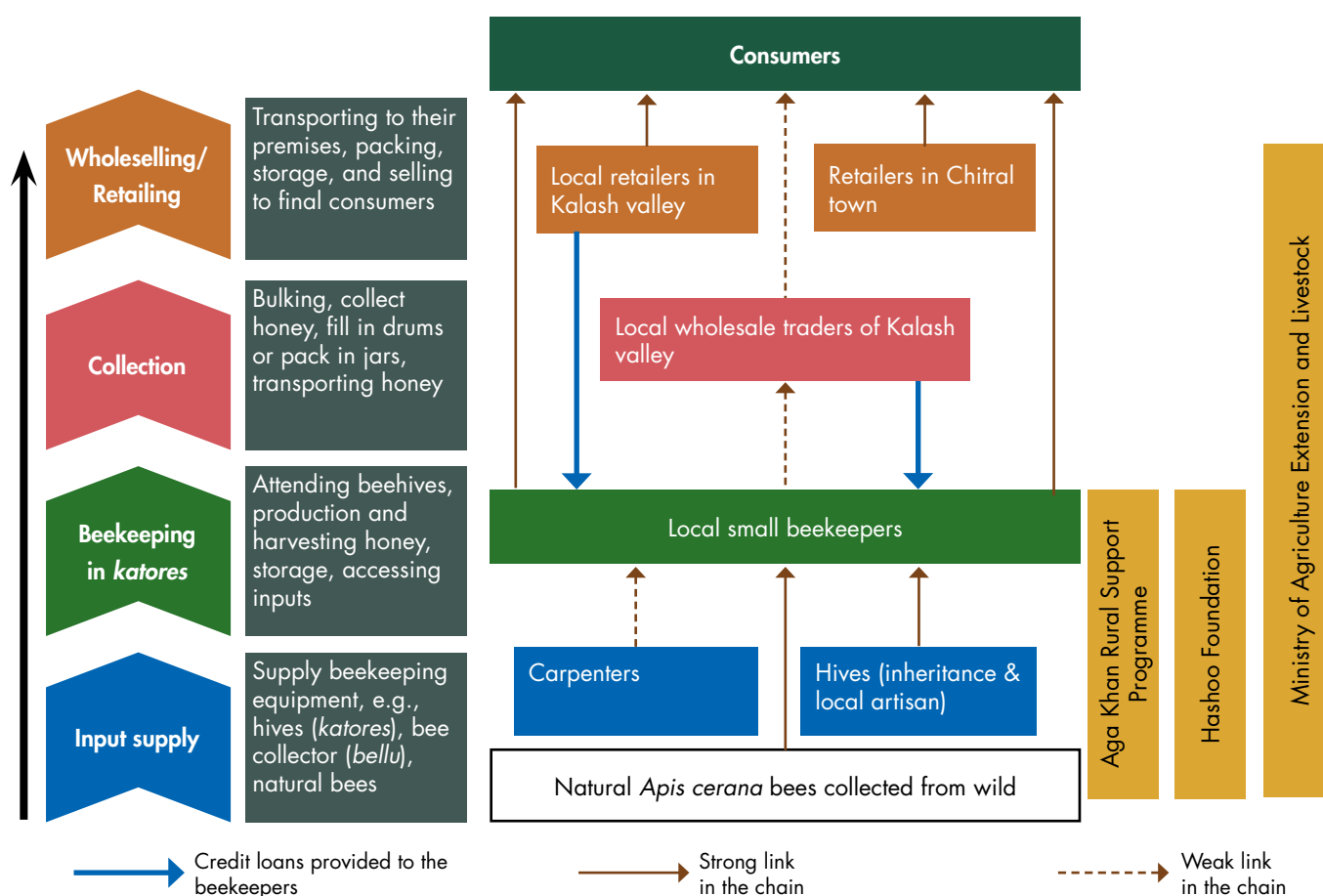
has been supporting the honey value chain (*Apis mellifera*) in Chitral for the last 2–3 years by providing beehives to poor communities.

Similarly, Hashoo Foundation (HF) has been working in the honey sub-sector of Chitral since 2008 through its economic development programme. The EDP programme of Hashoo Foundation (HF) began in Gilgit and was replicated in Chitral in 2008. The Foundation started working with Kalash communities through its one-year project funded by the International Fund for Agriculture Development (IFAD) in 2009. Under this project 61 women and 19 men in three Kalash valleys were trained in *Apis mellifera* beekeeping. However, due to the marketing constraints and day-to-day price hiking, the poor communities in the Kalash valleys did not continue working with HF. The Foundation now concentrates on activities related to marketing such as collection and processing of honey and marketing honey in down-country markets through its Mountain Honey brand.

In addition, some government institutions like the forest department, other NGOs like Aga Khan Economic Planning Board (AKEPB) and some local support organizations are supporting the *Apis mellifera* honey value chain in the region. However, none of these organizations provided any support to develop *Apis cerana* beekeeping and honey value chain in the Kalash valley.

For the development of honey sub-sector, it is important that all these supporting organizations work together. Through an integrated approach the honey sub-sector can be developed in the region to bring benefits to the marginalized communities. Figure 5.4 shows the *Apis cerana* honey value chain map in the Kalash valley of Chitral.

Figure 5.4: Value chain map of *Apis cerana* honey produced in Kalash valley



5.5 Value Chain Analysis

5.5.1 Backward linkages

Production, price and its variation in *Apis cerana* honey

The details of *Apis cerana* honey production in the Kalash valley including the quantity of honey collected, sold and consumed by the beekeepers each year and its price structure are provided in Figures 5.5, 5.6, and 5.7. The findings suggest that the quantity of *Apis cerana* honey produced in the Kalash valley has been decreasing since 2009 as most of the *katores* available in the households have become empty due to lack of knowledge and bee management skills. The other reason for the decrease is the introduction of *Apis mellifera* in the valley, which, according to the respondents, has spread diseases in the area, resulting in high mortality of *Apis cerana* bees. The average quantity of honey produced, sold and consumed at the household level in the Kalash valley during different years from 2009 to 2013 also shows a decreasing trend (Figure 5.5).

The findings suggest that in year 2009 the average quantity of honey collected by each beekeeper was 33 kg out of which 28.1 kg was sold and the rest was consumed at household level. In 2010 the average quantity of honey collected per beekeeper in the region was 31.5 kg and the honey sold was 26.1 kg and the rest was consumed at household level. In 2011 the average quantity of honey collected was 30 kg and the honey sold was 25.1 kg. Similarly, in 2012 the average quantity of honey collected per household was 29.0 kg and the average quantity of honey sold was 24.1 kg. In year 2013 the average quantity of honey collected by per household was 27 kg and the average quantity of honey sold by the beekeepers was 23.3 kg and the rest of the honey was consumed at the household level (Figure 5.5). These findings suggest that most of the honey, i.e., 85% was sold and 15% was consumed at household level.

Accordingly, the total quantity of honey produced, sold and consumed by the beekeepers in the Kalash valley also shows a decreasing trend from 2009 to 2013 (Figure 5.6).

Figure 5.5: Average production, sale, and consumption of *Apis cerana* honey per household in Kalash valley, Chitral

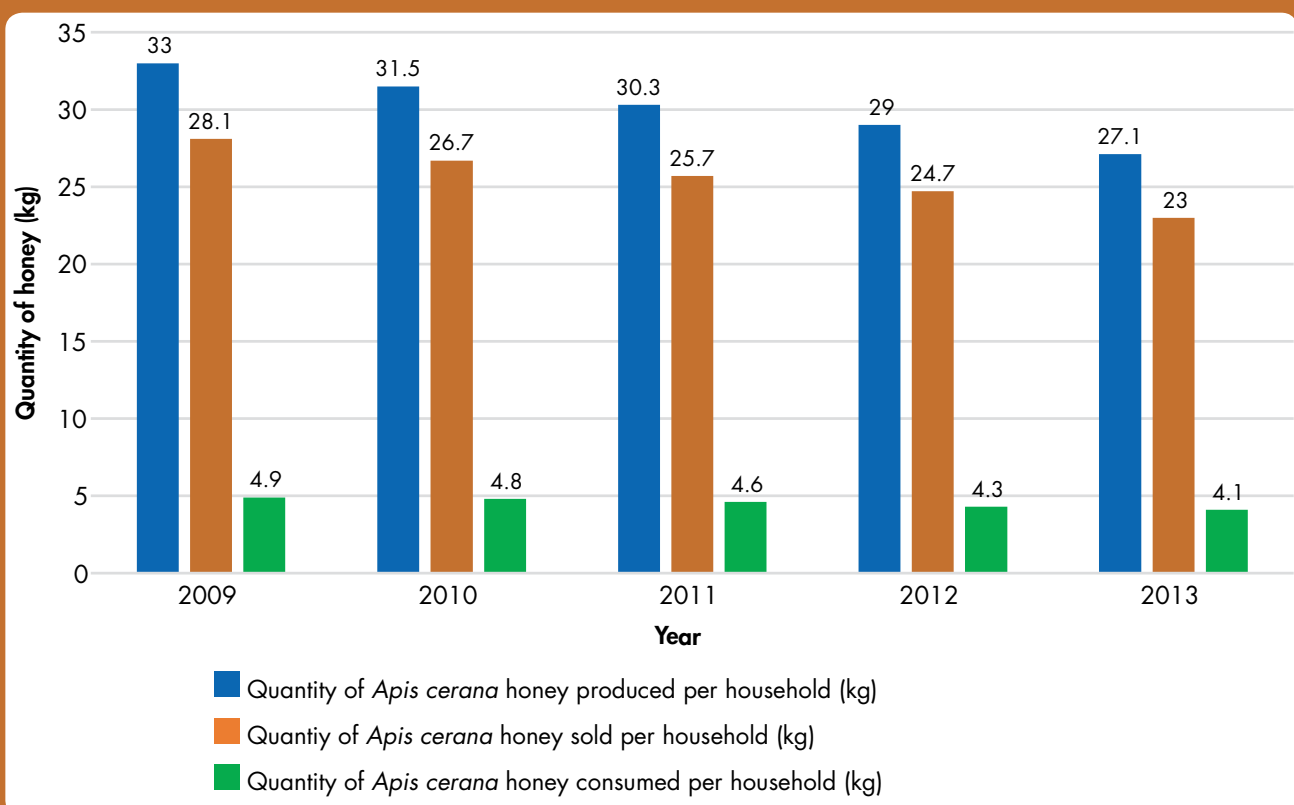
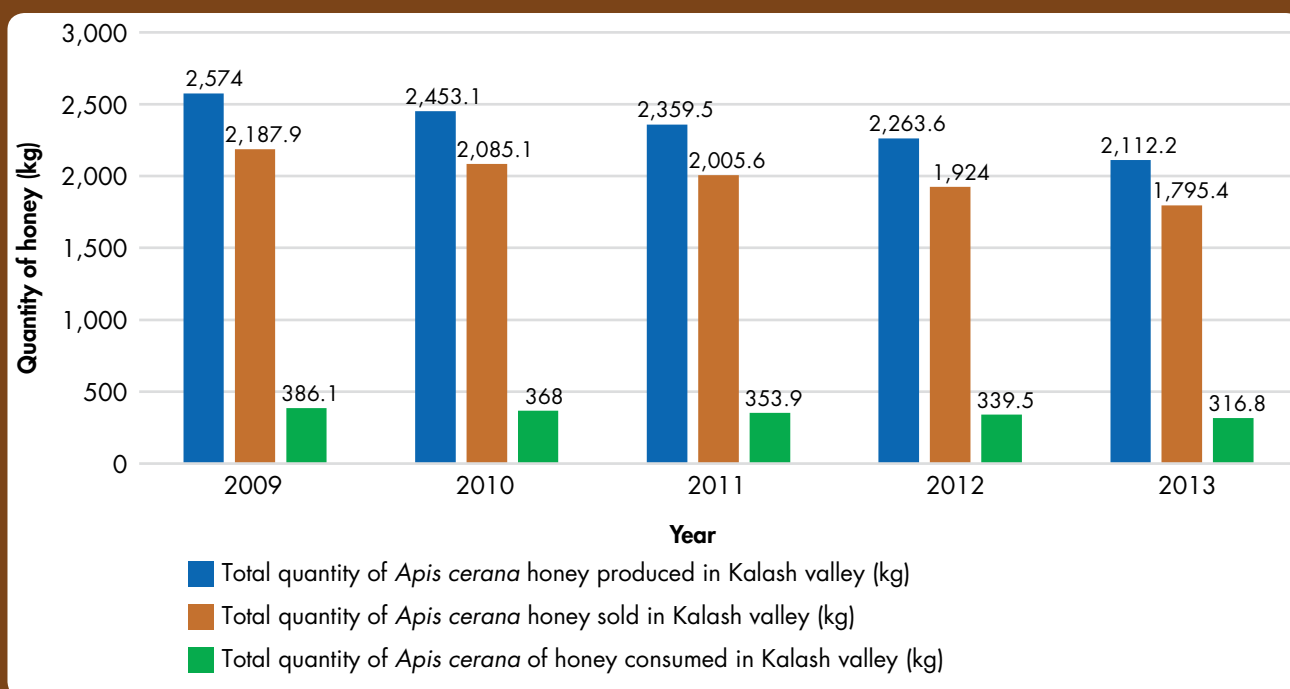


Figure 5.6: Total quantity of *Apis cerana* honey produced, sold and consumed by the beekeeping households in Kalash valley, Chitral

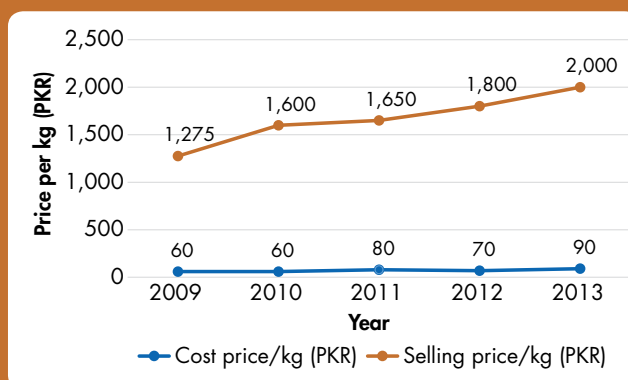


The figures show that in 2009 the total quantity of *Apis cerana* honey collected in the Kalash valley was 2,574 kg, out of which 2,187.9 kg was sold and 386.1 kg was consumed at household level. Similarly in year 2010 the total quantity of honey collected was 2,453.1 kg; the quantity of honey sold was 2,085.1 kg; and the rest was consumed at household level. In 2011 the total quantity of honey collected was 2,359.5 kg, out of which 2,005.6 kg was sold and the rest was consumed at household level. In 2012 the total quantity of honey collected was 2,263.6 kg and the quantity of honey sold was 1,924 kg. In 2013 the total quantity of honey collected was 2,112.2 kg; 1,794.4 kg was sold; and 316.8 kg was consumed at household level.

Information on the cost price and selling price of honey produced in the Kalash valley is provided in Figure 5.7. The figure shows an increasing trend in both prices. An increase of 56.8% has been observed in the selling price of honey since 2009. There is a general perception in district Chitral that *Apis cerana* honey is purer and of better quality than honey produced by *Apis mellifera*. *Apis cerana* honey produced in the Kalash valley is also believed to have medicinal properties and is used to treat many diseases. Therefore beekeepers in the Kalash valley are selling *Apis cerana* honey at a higher price, while the price charged by the beekeepers for *Apis mellifera* honey in northern Chitral is much lower. Honey produced by *Apis mellifera* bees is generally sold at PKR 600–900 (USD 5.7–8.6) per kg, which is less than half the price of *Apis cerana* honey, i.e., PKR 2,000 (USD 19.1) per kg.

The cost price of *Apis cerana* honey produced in the region also shows an increasing trend with a 50% increase. However, the cost price is already very low as farmers use traditional beekeeping methods that involve using *katores*. The Kalash people do not use modern equipment for beekeeping and honey production.

Figure 5.7: Cost price and selling price of *Apis cerana* honey in Kalash valley, Chitral



Profitability analysis

Profitability analysis of the value chain of *Apis cerana* honey produced in the Kalash valley has been conducted for the period 2009-2013. The cost of goods includes the cost of packaging, packing and cost of katore and bellu. Usually the transportation and marketing cost is borne by the trader. The calculation of profitability of *Apis cerana* honey per household is provided in Table 5.2.

Table 5.2: Profit and loss statement for *Apis cerana* honey produced per household in Kalash valley, Chitral

Details	2009	2010	2011	2012	2013
Revenue from sale (PKR)	42,075.0	50,320.0	49,912.5	52,236.0	54,160.0
Cost of goods sold (katore, bellu, packaging and packing)	1,683.0	1,604.0	2,057.0	1,726.7	2,071.6
Gross margin	40,392.0	48,716.1	47,855.5	50,509.3	52,088.4
Admin and marketing cost	0	0	0	0	0
Profit before interest/taxes	40,392.0	48,716.1	47,855.5	50,509.3	52,088.4
Interests	0	0	0	0	0
Taxes	0	0	0	0	0
Net profit	40,392.0	48,716.1	47,855.5	50,509.3	52,088.4

The above table shows the average net profit per household. The net profit shows an increasing trend from year 2009 to 2013 as the price of *Apis cerana* increased according to the demand and supply ratio.

This can be seen clearly in Figure 5.8. The figure shows the trend of average profitability of *Apis cerana* honey produced in the Kalash valley including Birir, Bumburet and Rumbur at household level since 2009. Profitability increased from 2009 to 2013, though there was a slight decline in net profit in 2011.

Skills and capacities of the beekeepers

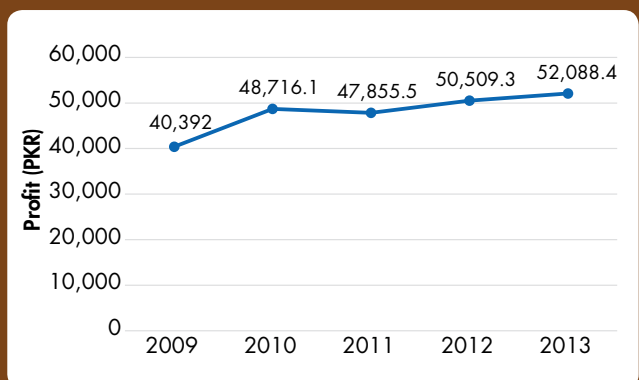
The findings of the study reveal that half of (50%) the 78 households surveyed have received training related to *Apis cerana* beekeeping management. Out of the respondents who received training, 73% received training in beekeeping management, 19% in honeybee disease management and 8% in honey harvesting, processing and value addition (Figure 5.9).

These trainings provided them information on bee safety, honey harvesting, honey processing, and bee colony management. Literature on honey production in Chitral district suggests that beekeepers are more skillful and trained in the northern part of Chitral where *Apis mellifera* beekeeping is mostly practiced. NGOs and other government organizations have mostly focused on northern Chitral for commercial honey production with *Apis mellifera*.

Apis cerana honey value chain governance

The findings of the study also suggest that *Apis cerana* beekeepers of the Kalash valley in southern Chitral are not organized and there are no beekeepers' associations in the area. The beekeepers work on an individual basis and have received very little support from government and non-government organizations for the development of beekeeping with *Apis cerana*. However, beekeepers in northern Chitral are more organized and have developed various beekeepers' associations that serve as an umbrella for small beekeepers of the area for trading their honey.

Figure 5.8: Net profit per household from selling *Apis cerana* honey in Kalash valley, Chitral



Number of colonies and honey production in the Kalash valley, Chitral

The average number of *Apis cerana* bee colonies per surveyed household in the Kalash valley is 3.4, which makes the total number of *Apis cerana* colonies in the region 265. In addition there are empty *katores* that are kept to attract bee swarms. Although some organizations, such as Hashoo Foundation, have tried to introduce *Apis mellifera* in the area and trained farmers, no colonies of *Apis mellifera* bees were found. Local people said that *Apis mellifera* beekeeping does not see much success in the region though they have tried their hand at it. This could be due to the cold weather of the Kalash valley and the low level of bee management skills among the beekeepers. Table 5.3 shows the number of beehives, empty hives and total honey production in the Kalash valley including Birir, Bumburet and Rumbur.

Further details of beekeeping in the Kalash valley including the average number of hives with bees per household, average number of empty hives per household, total number of hives with bees in the Kalash valley, total number of empty hives, average honey collected per *katore* and average honey production per household are provided in Table 5.4.

Regarding the availability of bee colonies, three quarters (66.7%) of the respondents said that *Apis cerana* bees are found in abundance in the forests but only 20–25% of the people collect honey from the forests. Forests in the Kalash valley contain a wide variety of bee flora that supports beekeeping and wild bee colonies. However, the number of wild bee colonies collected by the households from the forest has declined over the past decade. Similarly there has been a decline in the quantity of honey production in the valley. About one-fourth of the respondents mentioned different diseases and insects (pests/enemies) attacking honeybees as one of the reasons for the decrease in honey production while 19% of the respondents mentioned climate change induced changes in local weather conditions, particularly higher temperature and low precipitation, as an important reason for declining production of honey in the Kalash valley. These respondents mentioned that low frequency of rainfall decreases bee flora, resulting in a decrease in honey production. Deforestation in the Kalash valley has also resulted in a decline in bee flora.

Figure 5.9: Participation of Kalash beekeepers in different trainings

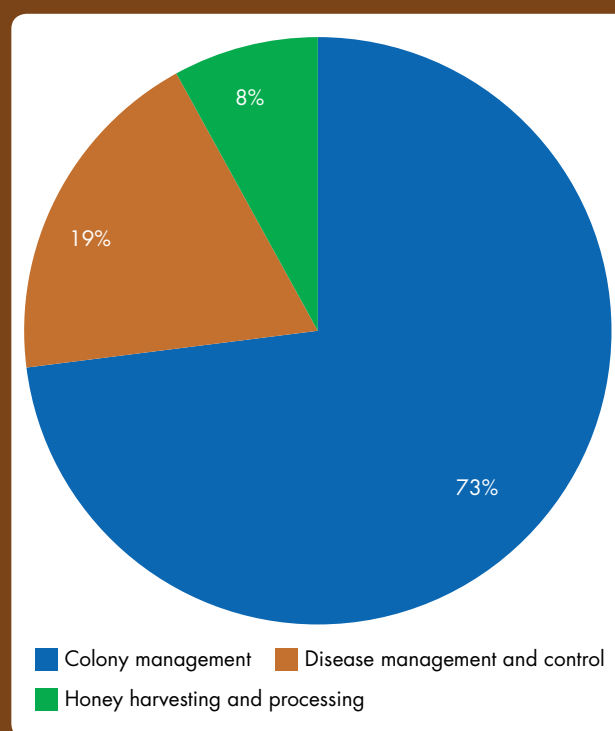


Table 5.3: Number of bee colonies and average honey production in the different sub-valleys of Kalash valley, Chitral

Valley	Hives (<i>katores</i>) with bees	Empty <i>katores</i>	Honey production per year (kg)
Birir	65	181	520
Bumburet	105	352	835
Rumbur	95	316	755
Total	265	849	2,110

Source: FGDs & Households Survey 2014

Table 5.4: Beekeeping statistics from 2013 in Kalash Valley

Types of bees	Average number of colonies (<i>katores</i> with bees)	Average number of empty <i>katores</i>	Total number of hives with bees	Total number of empty hives	Average quantity of honey produced/colony/year (kg)	Average quantity of honey produced/HH (kg)
<i>Apis cerana</i>	3.4	11	265	849	8	27.1
<i>Apis mellifera</i>	0	0	0		0	0

Rules and regulations related to bees and beekeeping in Kalash valley

Rules and regulations for beekeeping in the Kalash valley are very flexible. People do not need anyone's permission to collect honey or honeybees from the forests. There are no customary rules for harvesting honey, no state regulations for collecting and producing honey, and no rules for migration of bee colonies within the region and anywhere in Chitral district. But as *Apis cerana* beekeeping is done in traditional fixed-comb hives, farmers cannot migrate their colonies.

Marketing mechanism

In the Kalash valley 79% of the beekeepers sell honey directly to consumers and only 21% of the beekeepers sell it to middlemen (Figure 5.10). Beekeepers do not usually transport honey to the retail store. Consumers and retailers visit the beekeepers to purchase honey. According to the beekeepers, they prefer not to sell their honey to retailers as they offer a lower price; they prefer selling it directly to consumers.

In the Kalash valley there is a system of credit loaning. In winter when beekeepers lack money to meet their basic needs, retailers provide them credit loans. To pay back the loans, the beekeepers sell the honey to the retailers during the honey production season.

Packaging of honey

After harvesting honey, the people of the Kalash valley put honey in a local container called chidin in the local language. The honey is later packed in small bottles to be sold to the middleman and the end users. The findings of the study show that 27% of the beekeepers in the Kalash valley use 1 kg bottles for packing honey while 19% of them use 2 kg bottles. The other bottle sizes used for packing honey are 250 gm, 3 kg, 4 kg and 5 kg (Figure 5.11). These packing bottles are made of different materials such as plastic, glass and stainless steel, and are of varied quality.

The findings of the survey suggest that 75% and 23% of the beekeepers were using plastic bottles and glass bottles respectively for packing honey, while only 2% of the beekeepers were using food grade plastic bottles (Figure 5.12).

After the honey harvested, it is not processed and is packed along with wax combs, without filtering. In the Kalash valley, people generally believe that *Apis cerana* honey has medicinal value, which will be destroyed if the honey is heated or filtered. Therefore the only kind of value addition done in *Apis cerana* honey after collection is bottling.

In northern Chitral beekeepers use different containers, including big ones, for packing honey for sale. Honey sold in big containers is usually in crude form; the purchasing agent processes it before packing it in small bottles. Beekeepers also use

Figure 5.10: Mechanism for selling honey in Kalash valley, Chitral

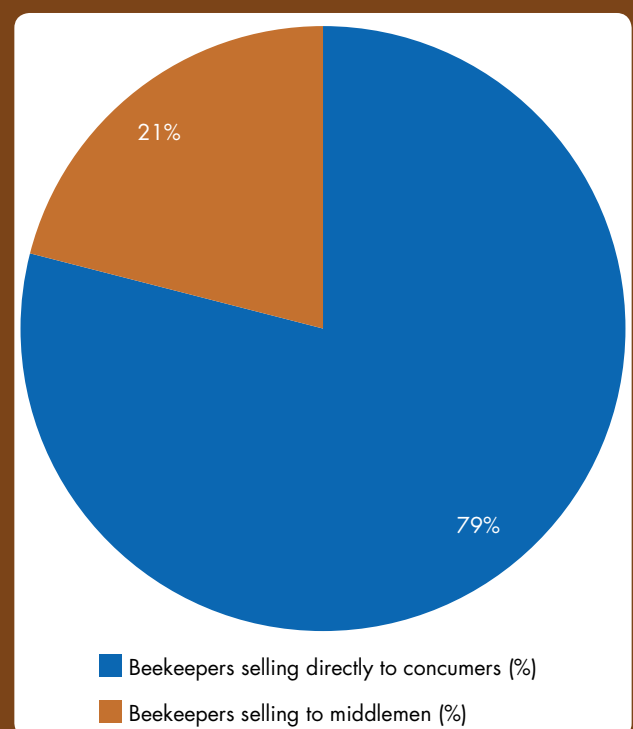
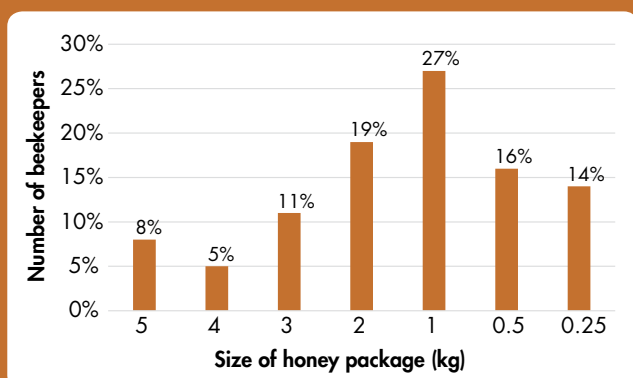


Figure 5.11: Packaging of honey by beekeepers in Kalash valley, Chitral



different type of small bottles ranging from the size of 5 kg to 250 gm.

Beekeepers' response regarding the importance of honey vis-a-vis agricultural crops

Table 5.5 shows the beekeepers' response regarding the importance of honey compared to that of agricultural crops in terms of food security, profitability, low risk and safety net for income in the region. Majority (43.2%) of the respondents said that food security provided by honey is lower as compared to the crops; a large majority (89.2%) said that honey is more profitable than crops; over half (51.4%) said there is low risk in honey production as compared to crops; and 40% said that both honey production and crops have equal importance in terms of providing a safety net for income.

Knowledge and information flow

Beekeepers of the Kalash valley obtain information through different sources, but the majority of them rely on word-of-mouth communication among themselves. The findings suggest that 65% of the beekeepers obtain information through word-of-mouth communication, while 35% are get information through extension workers i.e., group meetings, development work, NGOs, extension offices, etc.

Beekeepers' response on climate change and its impact on honey production

Beekeepers' response on climate change and its impact on beekeeping and honey production in the Kalash valley during the last five years is presented in Table 5.6. An overwhelming majority (over 90%) of beekeeper respondents said that there has been a slight increase in the temperature, frequency of rains and incidence of floods in the last five years. Over half of the respondents reported an increase in the incidence of drought. Regarding the impact of these changes on honey production, over half of the respondents said that increase in temperature has little impact on honey production; one-quarter of them felt a major impact; and about one-tenth said it had no impact on honey production. Over three-quarters of the respondents said that increased frequency of rains has had major impact on honey production. Nearly one-third of the respondents said that increase in floods had major impact on honey production while over half of them said it had little impact. A little less than half of the respondents said incidences of drought have had little impact on honey production.

Figure 5.12: Types of bottles used by beekeepers for packing honey in Kalash valley, Chitral

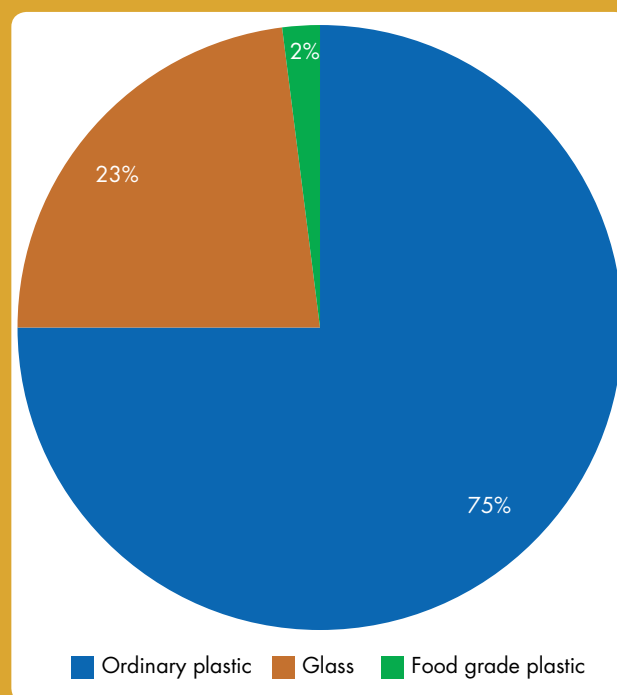


Table 5.5: Farmers' response regarding the importance of honey vis-a-vis agricultural crops

	Better	Same	Lower	Don't know
Food security	18.9%	16.2%	43.2%	21.7%
Profitability	89.2%	5.4%	2.7%	2.7%
Low risk	18.9%	27.0%	51.4%	2.7%
Safety net for income	18.9%	40.0%	8.1%	27.0%

Table 5.6: Beekeepers' response on climatic variations in the area and its impact on beekeeping

Climatic variations	Magnitude of the change in last 5 years (%)		Impact of climate change on beekeeping (%)		Scale of impact of climate change on beekeeping (%)			
	Slight	Substantial	Yes	No	Major impact	Little impact	No impact	Can't say
Increase in temperature	91.8	8.2	83.7	16.3	27.1	58.3	10.4	4.2
Frequency of rains	95.9	4.1	98.0	2.0	75.5	22.5	2.04	0
Incidence of floods	100	0	16.7	83.3	30.6	53.1	16.3	0
Incidence of drought	53.9	46.1	46.9	53.1	9.4	46.9	34.4	9.4

5.5.2 Forward linkages

Honey production, prices, and variations at different stages

Table 5.7 shows the price and quantity of *Apis cerana* honey produced in the Kalash valley and the price and quantity of *Apis mellifera* honey produced in northern Chitral. The average quantity of *Apis cerana* honey collected by the traders per household as well as the total quantity is showing a decreasing trend, while the price per kg of honey charged by the traders is showing an increasing trend. Similarly, the total quantity of honey collected and sold by the traders has also been showing a decreasing trend since 2009. As in the Kalash valley most of the beekeepers are selling their products directly to end users.

Data on *Apis mellifera* honey presented in Table 5.7 is collected from the reports of Hashoo Foundation. The data show that the average quantity of honey collected and sold by each trader is showing an increasing trend. Similarly, the price of *Apis mellifera* honey is also showing an increasing trend.

Table 5.7: Price and quantity structure of *Apis cerana* and *Apis mellifera* honey collected by traders in Chitral

	Year 2009	Year 2010	Year 2011	Year 2012	Year 2013
Average quantity of <i>Apis cerana</i> collected per trader (kg)	26.2	22.3	20.8	15.6	10.8
Price of <i>Apis cerana</i> honey per kg (PKR)	800	1,000	1,180	1,500	1,842.8
Total quantity of <i>Apis cerana</i> honey collected by traders (kg)	655	557.5	520	390	270
Average quantity <i>Apis mellifera</i> honey collected by a trader (kg)	186.6	168	211.7	215	230.7
Price of <i>Apis mellifera</i> honey per kg (PKR)	400	600	733.3	800	966.6
Total quantity of <i>Apis mellifera</i> honey	3,200	3,500	2,500	3,547	9,000

Figure 5.13 shows the price comparison of *Apis cerana* and *Apis mellifera* honey. Prices charged by *Apis cerana* traders are much higher than those charged by *Apis mellifera* honey traders. People generally believe that *Apis cerana* honey has medicinal properties and can be used to treat many diseases, while honey produced by *Apis mellifera* bees is only used commercially. Therefore health conscious consumers are usually willing to pay a high price for *Apis cerana* honey. This indicates the scope for enhancing production of *Apis cerana* honey.

Problems faced by traders while marketing honey

Table 5.8 shows the responses of the traders on problems faced during marketing of honey. A quarter (25.5%) of the respondent traders gave highest rank to technological problems, because in the district there is no such modern technology available for processing of honey and to ensure its quality. One-fifth of the respondents gave highest rank to finance and market for *Apis cerana* honey. However, problems regarding completion, quality standards and policy are of least concern for the traders.

Figure 5.13: Price comparison of *Apis cerana* and *Apis mellifera* honey in Chitral

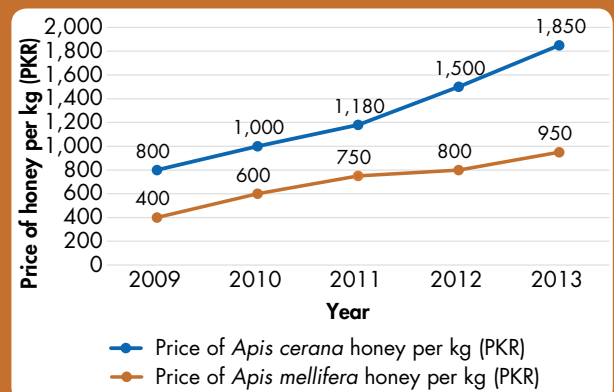


Table 5.8: Problems faced by traders in marketing of Honey

Nature of problem	Rank 1= Lowest and 7=highest	Highest percentage of responses (5)
Technology	7	25.5
Market	7	20.2
Finance	7	21.6
Competition	2	19.0
Quality standards	1	13.1
Policy	1	11.6

Procurement arrangements

Table 5.9 shows the responses of traders on procurement arrangements for both *Apis cerana* and *Apis mellifera* honey. A large majority of the traders are not satisfied with the quantity of *Apis cerana* honey because the production is low and the traders are not able to fulfill the market demand. Further, the beekeepers do not package honey properly. Still, this means that there is demand for *Apis cerana* honey and hence a potential for increasing honey production. To meet this demand, production of honey needs to be increased by building beekeepers' capacity through training in improved methods of bee management, and by providing technical and equipment support.

Table 5.9: Honey traders' response regarding their satisfaction with procurement arrangements

	Honey traders' satisfaction with procurement arrangements			
	Response for <i>Apis cerana</i> honey (%)		Response for <i>Apis mellifera</i> honey (%)	
	Yes	No	Yes	No
Quantity	18.2	81.8	78	22
Quality	100	0.00	87	13
Packaging	54.5	45.4	68	32
Cost	54.5	45.4	59	41
Timeliness of supply	60	40	69	31

On the other hand the majority of traders of *Apis mellifera* honey have no issues with the quantity and quality of honey, cost involved and timing of supply. The production of *Apis mellifera* honey meets the market demand. *Apis mellifera* beekeepers are well trained in packing, packaging and labelling the honey products.

After purchasing honey, traders do some value addition by packing, packaging and labelling the honey. According to traders, the cost involved in packing the honey is around 20 PKR/kg and the cost of labelling is 3 PKR/bottle. After value addition, the average price charged by the traders for *Apis cerana* honey is 2,250 PKR/kg, while the average price for *Apis mellifera* honey is 950 PKR/kg. If the honey is not sold in the market, traders store it for up to a year. As honey is not a perishable product, storing it is not a problem.

Grading of honey by traders

Table 5.10 shows the grading of honey by the traders. The findings of the study suggest that the traders are not aware of international quality standards for honey; however, they have their own criteria for grading honey. In terms of quality, a large majority of the traders (85%) gave the highest grade to honey collected from beekeepers of the Kalash valley, but in terms of reliability of supply, a large majority (81.8%) of them gave it average grade. Given the low production, the traders cannot collect enough honey to meet the market demand. A little over one-third of the respondents rated the price, packaging and time of delivery as good.

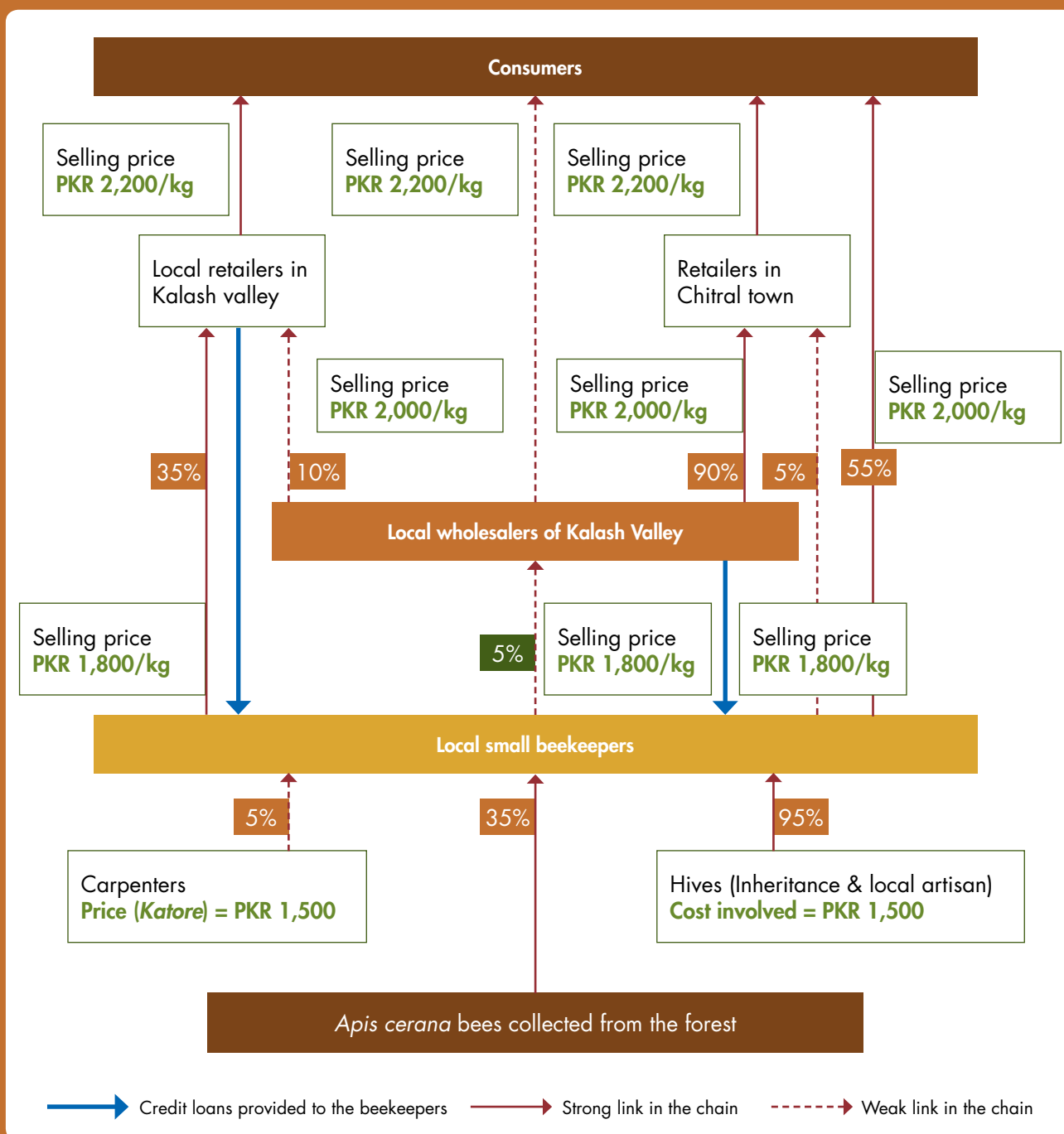
Table 5.10: Grading of honey by the traders/sellers

	Grade 1= Very bad, 2=Bad, 3=Average, 4=Good, 5=Very good	Response (%)
Quality	5	85.0
Reliability of supply	3	81.8
Price	4	30.0
Packaging	4	36.4
Delivery time	4	40.0

Quantitative analysis of *Apis cerana* honey value chain

Figure 5.14 shows the quantitative analysis of value chain map of *Apis cerana* honey produced in the Kalash valley of Chitral. The analysis involved the price charged in each chain and volume produced or sold in each chain. The percentages show the volume of input and honey sold in each chain out of the total volume produced or collected.

Figure 5.14: Quantitative analysis of value chain map of *Apis cerana* honey produced in Kalash valley, Chitral



5.5.3 Value chain function integration analysis

The *Apis cerana* honey value chain of the Kalash valley has strongly integrated functions. The functions of input supply and beekeeping are integrated and carried out by the beekeepers themselves. Similarly the collection, processing and marketing of honey are also integrated and done by the local retailers. In most cases in the Kalash valley, all these four functions of the *Apis cerana* honey value chain – input supply, production, collection, and marketing – are integrated and carried out by the beekeepers themselves. The integration map is provided in Figure 5.15.

In general the value chain functions of *Apis cerana* honey produced in the Kalash valley are weak and inefficient. On the whole, input supply systems are underdeveloped, production method is rudimentary and based on indigenous inherited knowledge, and marketing is underdeveloped. The processing function of *Apis cerana* honey is missing because the honey is sold in crude form, as crude honey is believed to have medicinal value.

5.5.4 SWOT analysis

Figure 5.16 shows the SWOT analysis of *Apis cerana* honey produced in Kalash valley of Chitral district.

Figure 5.15: Degree of chain integration in the value chain of *Apis cerana* honey, Kalash Valley, Chitral

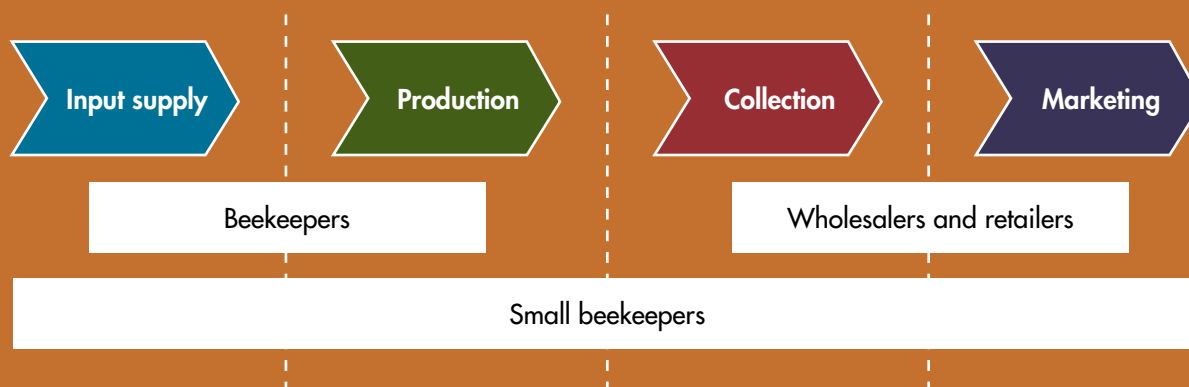


Figure 5.16: SWOT analysis of *Apis cerana* honey produced in Kalash valley

Input supply	Production	Processing	Trading
Strengths			
<ul style="list-style-type: none"> Abundance of forests in the region creates a favourable environment for honeybees Abundance of natural bees in the forests of the Kalash valley 	<ul style="list-style-type: none"> A large number of the households of Kalash valley are involved in beekeeping Farmers recognize beekeeping as a viable economic activity 	<ul style="list-style-type: none"> Traditional knowledge on honey harvesting and processing 	<ul style="list-style-type: none"> Unique taste because of the climatic conditions and flora Market is available at local level as well as downstream
Opportunities			
<ul style="list-style-type: none"> Availability of bees and floral resources offer good potential for niche market 	<ul style="list-style-type: none"> Indigenous knowledge of bee management Government and non-government programmes are available to promote the sector and provide technical assistance. 	<ul style="list-style-type: none"> Many processors and entrepreneurs are involved in the sector. 	<ul style="list-style-type: none"> Possible to tap into the huge national and international market if some necessary preparatory steps are taken Growing local demand for wild honey because of its medicinal properties A big and growing tourist market
Weaknesses			
<ul style="list-style-type: none"> Absence of proper equipment and laboratory facilities for quality assurance/ certification mechanism/ infrastructure at local level 	<ul style="list-style-type: none"> Traditional hives (<i>katore</i>) used for <i>Apis cerana</i> beekeeping are less productive than modern hives. Migration beekeeping is not practiced in the region One-time harvest in a year due to climatic conditions, traditional beekeeping, and lack of opportunity/ skills for migratory beekeeping. 	<ul style="list-style-type: none"> Complete destruction of the combs at harvesting time Absence of improved bee management and honey processing technology 	<ul style="list-style-type: none"> Domestic market is more or less saturated; entrepreneurs have not been able to find new markets.
Threats			
<ul style="list-style-type: none"> Short floral season 	<ul style="list-style-type: none"> Only one harvesting season Volatile climatic conditions of the region 	<ul style="list-style-type: none"> High cost of processing facility 	<ul style="list-style-type: none"> Cheap honey produced by <i>Apis mellifera</i> bees available in the region

5.6 Relevance of the Findings to Value Chain Development

5.6.1 Relevance to upstream actors (backward linkages)

Beekeeping – an important source of income for the Kalash community

The population of the Kalash valley is largely illiterate. Agriculture and beekeeping are the major income generating activities in the region. Despite the low production of honey, beekeeping contributes significantly to people's income. In the Kalash valley honey traders provide credit loans to the local people. In winter people buy daily necessities from the traders on credit. The beekeepers pay off the loan in summer by selling their honey to the traders. Thus the people of the Kalash valley get some relief in winter because of the honey production.

Suitable climate for beekeeping

The Kalash valley of Chitral district including Birir, Bumburet and Rumbur sub-valleys is located in the hub of forests. Around 85% of these regions are covered with natural forest and there is an abundance of bee flora. As a result there are plenty of wild natural bees in the forests.

Demand for *Apis cerana* honey at local and national level

Honey produced by *Apis cerana* in the Kalash valley is believed to have medicinal value. It has high demand in local and national market and is sold at a very high price compared to *Apis mellifera* honey.

Low production and inferior quality owing to traditional bee management methods

Despite good opportunities and suitable climate for *Apis cerana* beekeeping, beekeepers of the Kalash valley have not achieved the optimum level of honey production. One of the reasons for low production is that they use traditional beekeeping methods. They use traditional hives called *katores*, as they think *Apis cerana* bees do not like modern beehives. The beekeepers did try to use modern hives but due to their lack of knowledge and skills for using movable hives, the bees absconded.

The other drawback of using traditional hives is that it is not possible to manage swarming of honeybees. Moreover, it is difficult to ensure the quality of honey collected from *katores*. The *katores* are usually fixed in the wall, and it is difficult to transport bee colonies to other places to provide pollination service and exploit the nectar flow.

Findings of the survey also suggest that beekeepers of the Kalash valley are not aware of modern and scientific techniques of beekeeping and have very low skills. Women of the Kalash valley are strictly prohibited from taking part in beekeeping. SRSP's efforts to mobilize women in the valley and train them in beekeeping were hence unsuccessful.

Use of agricultural chemicals and pesticides

Honeybee colonies in the Kalash valley are attacked by different diseases. Chemicals and pesticides used by farmers have also led to the killing of bees. The colonies become weak and vulnerable to pests and diseases. If these issues are properly addressed, honey production in the region would grow both in quantity and quality.

5.6.2 Relevance to downstream actors (forward linkages)

Low supply of honey to traders

The value chain functions of *Apis cerana* honey produced in the Kalash valley are integrated. Majority of the functions of the value chain including input supply, production and marketing are performed by the beekeepers themselves. Most of the honey produced in the Kalash valley is sold in the local market. There is no mechanism for bulk trading of wild honey in downstream market. This is because production is very low and traders do not visit the Kalash valley to collect honey.

Quality concerns of the traders

One of the concerns of honey traders is that beekeepers usually sell *Apis cerana* honey in crude form, which reduces the market demand for honey. Only customers who need honey for medicinal purposes or are health conscious purchase it. No mechanisms have been developed in the region for processing *Apis cerana* honey. In order to create a market demand for *Apis cerana* honey, beekeepers need to be trained on proper packaging and packing of wild honey. In addition, proper marketing of honey is required in downstream market to increase demand.

Producers are not informed about market requirements for honey

Beekeepers of the Kalash valley, especially those who rear *Apis cerana*, have no idea about the honey market, market requirements or price of honey. Even in the case of *Apis mellifera* honey, there is a lack of transparency and trust among beekeepers, traders and processors. The traders blame the beekeepers for providing honey of inconsistent quality whereas the beekeepers blame the traders for offering a low price and capturing a higher value.

Price difference between *Apis cerana* and *Apis mellifera* honey

According to the traders, the price difference between *Apis cerana* and *Apis mellifera* honey is very high. The average price charged for *Apis cerana* honey is PKR 1,800–2,200 (USD 17.2–21.1)/kg, while the average price charged for *Apis mellifera* honey is PKR 800–1,000 (USD 7.6–9.6)/kg. Majority of the customers prefer to purchase *Apis mellifera* honey because of its low price.

The price of *Apis cerana* honey varies widely depending on which sub-valley it has been produced. One of the reasons for such differential pricing in the region is the absence of beekeeping organizations that could provide information to beekeepers.

Lack of institutional mechanism for processing and branding honey

Honey testing and certification is an important component of the value chain that is missing altogether. There is no institutional mechanism for branding and certifying honey in Chitral. The quality of honey could be controlled by establishing a honey-testing centre in the district.

5.7 Recommendations for the Development of *Apis cerana* Honey Sub-sector in the Kalash Valley of Chitral, Pakistan

The Kalash valley of Chitral district has excellent potential for honey production due to its honeybee friendly atmosphere, especially for *Apis cerana*. The region has plenty of bee flora to support beekeeping. *Apis cerana* colonies are found in the forests. There is market for *Apis cerana* honey produced in these valleys. Honey produced by *Apis cerana* bees sells at a very high price. *Apis cerana* honey production can be enhanced if it receives some attention from the government and non-government organizations in the area. In the Kalash valley, beekeeping is the only low-investment activity that could reduce the poverty of the landless and underprivileged people. The majority of the people are already practicing beekeeping using traditional methods; their skills can be sharpened by training them on modern beekeeping techniques. Based on the value chain analyses the following recommendations are made for upgrading the *Apis cerana* honey sub-sector in the Kalash valley of Chitral.

- Beekeepers in the Kalash valley are using traditional beekeeping and honey production methods. Thus, honey production is low and the quality of honey is poor. Improving the production and quality of honey is necessary to enhance the income of beekeepers. Thus, the study strongly recommends introducing modern beekeeping management technology and training local beekeepers on modern techniques of beekeeping. There is need to enhance the skills and capacities of at least 100 beekeepers of the three sub-valleys/villages of the Kalash valley in bee management, honey harvesting/collection and honey processing through training, technical and material support, and exposure visits. *Apis cerana* beekeeping is also practiced in other regions of Pakistan, like Kashmir; and other districts of Khyber Pakhtunkhwa (KP) therefore the skills of Kalasha beekeepers can be enhanced through exposure visits to these areas and other regions.

- Honey from the Kalash valley is of very good quality in terms of taste, viscosity and flavour. However, due to the lack of processing and packaging, many consumers still prefer *Apis mellifera* honey due to its longer shelf life and user-friendly packaging. The demand for *Apis cerana* honey can be created through proper packing, packaging and labelling.
- *Apis cerana* beekeepers in the Kalash valley do not use any chemicals and medicines to control pests and diseases, and do not feed sugar to honeybees. Moreover, the valley has a unique climate and unique flora/floristic compositions. Thus, honey produced in the Kalash valley has a distinctive aroma and taste. Therefore *Apis cerana* honey should be promoted as a special niche product.
- The Kalash beekeepers are not organized. Beekeepers' groups/associations are completely absent in the Kalash valley. If the beekeepers are organized they can make their voice heard by the government and non-government organizations and get support for beekeeping development; they can also collectively sell their honey to buyers. Therefore, the study recommends developing three honeybee associations –one in each of the three sub-valleys/villages of the Kalash valley, building their capacities and strengthening the links between beekeepers, associations, traders and processors.
- There are no centres that facilitate beekeeping in the region. Establishing such a centre in the region can help the beekeepers to purchase beekeeping kits/tools and medicines for controlling diseases that attack honeybees.
- Many government and non-government organizations are working in the beekeeping sector in different parts of Chitral district. These organizations should be encouraged to support the marginalized and poor communities to promote beekeeping in the Kalash valley. For this, a strong platform should be created where all stakeholders of beekeeping can interact in a productive manner.
- There is no honey certification and testing centre for honey in the district. Honey produced in the district is usually sent to Honeybee Research Institute (HBRI), Islamabad for certification and testing. Therefore, the study recommends developing a certification and testing centre for honey in the district to ensure the quality of honey.
- Honey produced in the Kalash valley is confined to the local market of Chitral only. There are no arrangements for bulk trading of *Apis cerana* honey in downstream market. On the other hand *Apis mellifera* honey produced in northern Chitral is linked to the downstream market by Hashoo Foundation. Unfortunately the beekeepers of the Kalash valley are not connected with Hashoo Foundation for marketing their wild honey. Therefore, the study recommends connecting the beekeepers with Hashoo Foundation so that they can brand and sell the honey produced in the Kalash valley in the downstream market. However, for Hashoo Foundation to provide this marketing support, Kalash beekeepers need to increase the quantity and quality of honey.



6. Conclusion and Way Forward for the Development of *Apis cerana* Honey Sub-Sector in the Mountain Areas of the HKH

More recently, various development organizations have started using the value chain (VC) approach to improve the competitiveness of specific sub-sectors and market development for achieving pro-poor development objectives. The value chain development framework encompasses a Value Chain Analysis (VCA), which helps us understand the current situation of a particular value chain, constraints and potential through a systematic chain mapping and analysis process.

6.1 Key Findings Emerging out of the Value Chain Analysis Studies

A value chain generally includes three or more of the following actors (operators): producers, processors, distributors, brokers, wholesalers, retailers and consumers. However, the findings of the present study revealed that the value chain of *Apis cerana* honey produced by smallholder beekeepers in the hill/mountain areas of Bangladesh (CHT), Bhutan (southern districts) and Pakistan (Kalash valley, Chitral) is very primitive, involving mostly two actors – the beekeepers and the consumers. In traditional *Apis cerana* honey value chain, beekeepers themselves are doing most of the work – inputs, production and marketing of honey. In these areas most *Apis cerana* beekeepers keep bees in the walls of their houses or in hollowed out logs, or pitchers that they make themselves. They use traditional bee management methods and squeeze the combs to harvest honey, put it in used bottles and sell it informally to known customers in or outside the village. Only a very few farmers sell honey, and that too, to local retail shops.

Beekeeping development with *Apis cerana* in CHT is a recent phenomenon and is being promoted by some development organizations, while in southern Bhutan and the Kalash valley of Chitral, Pakistan, beekeeping is an age-old tradition and farmers have long been keeping bees in fixed comb logs or wall hives. Farmers also collect honey from wild colonies in each area. The findings of the present study revealed that *Apis cerana* honey is an important source of cash income for the households in all the sites.

The study sites in each country were found to have a great diversity of bee floral resources and traditional bee management knowledge to support beekeeping development. The findings revealed huge scope and potential for the development of *Apis cerana* beekeeping and for enhancing honey production to improve the livelihoods of poor mountain communities and build their resilience to the impacts of climatic and socio economic changes. Honey market is growing in each country and consumers prefer *Apis cerana* honey produced by hill/mountain beekeepers, as it is believed to be pure and have medicinal properties.

The findings further revealed that developing the *Apis cerana* honey sub-sector in all the study areas would entail strengthening the chain in all its nodes right from input supplies, production, processing, packaging and branding to marketing. The current production of honey in all the study sites is very low though there are a number of beekeeping households and a huge availability of bee flora in all these areas. SWOT analysis revealed great opportunities and strengths for enhancing honey production, and also identified weaknesses and threats that should be addressed in order to achieve the potential in each site.

At the marketing end, findings revealed that there is demand for *Apis cerana* honey. Currently over ninety percent of the honey produced is sold locally through informal channels. Demand for high-quality honey is increasing in the high-end markets in cities where people are becoming more and more health conscious. This indicates the

potential for beekeeping development and honey production. However, the beekeepers lack knowledge of market requirements and the skills for meeting such requirements. Furthermore, lack of information flow in the value chain prevents them from entering new markets, and reduces the benefits they could obtain from entry. Thus, there is need to enhance beekeepers' knowledge of market requirements and their skills for meeting such requirements.

6.2 Key Interventions for Development of *Apis cerana* Honey Sub-sector

As explained above, development of *Apis cerana* beekeeping and honey value chain has great potential to increase farmers' income through enhancing the production and quality of honey and promoting *Apis cerana* mountain honey as a special product from mountain areas. It has the potential to become a viable alternative income generating option for the rural poor, a potential enterprise for school leaving youth; it could provide rural women an opportunity for self-employment and provide job opportunities to others through the development of related enterprises (construction of beehives and other beekeeping equipment, colony production, etc.), thus increasing the resilience of mountain people. However, interventions are required to increase the production and quality of honey, strengthen the supply of inputs. There is need to improve the packaging and branding of honey, and to promote mountain honey as a niche product in high-end markets to harness its full potential. Based on the recommendations of these area-based studies, following key interventions have been suggested for the development of the *Apis cerana* honey sector.

6.2.1 Developing farmers' organizations – development of farmers' groups/associations/cooperatives

Currently, most beekeepers in the mountain areas of the HKH produce small quantities of honey, which they sell individually. Thus, there is no substantial amount to be sold in the formal market. The study therefore recommends facilitating the development of local institutions by organizing target beneficiary beekeepers into groups, associations or cooperatives, ensuring participation of the poor, women and disadvantaged groups in the areas selected for value chain development. This is important to attain the volume, scale and quality required for efficient enterprise development, and also to link farmers to various government programmes/schemes. Cooperative formation and capacity building is also important for ensuring long-term sustainability.

6.2.2 Capacity building of individuals and institutions

Improving the production of honey

The core problem for the development of honey sector, particularly with *Apis cerana* honey in mountain areas, is the low production and poor quality of honey. This is because farmers regard beekeeping merely as a subsidiary activity. There is a huge demand in both the local and national market for *Apis cerana* honey but beekeepers still pursue beekeeping as a side activity supplementing other farming activities rather than as an enterprise/business. Furthermore, there is very little support from various government and non-government development organizations for the development of the *Apis cerana* honey sub-sector. To develop this sector, farmers need to change their perspective and look at beekeeping as an enterprise.

Capacity building of individuals and organizations has been identified as crucial for enhancing the production and quality of honey and other bee products, and pollination service through pre-harvest and post-harvest technologies. Enhancing the production and quality of *Apis cerana* honey would require introduction and promotion of improved technologies and building beekeepers' capacity for using these technologies through training and other means. Most *Apis cerana* beekeepers in the study areas still use traditional methods of beekeeping, which yield small quantities of honey and of inferior quality. They either do not have access to improved technologies or lack resources to buy the expensive equipment. In some areas where non-government development organizations have introduced improved technology, beekeepers lack the skills for using the improved technology. Thus the study recommends building the capacity of interested beekeepers and their organizations for using pre-harvest and post-harvest technologies through trainings, equipment support, exposure visits to successful *Apis cerana* beekeeping-based enterprises, and improving their access to input supplies and financial services. This is necessary to help them expand their enterprises and build their confidence to become commercial beekeepers from backyard beekeepers.

It is necessary to sensitize and strengthen concerned extension and development institutions in government and non-government sectors (currently supporting *Apis mellifera* beekeeping) to support the development of *Apis cerana*. Training of trainers and lead farmers and other capacity building programmes for key members of farmers' organizations should be implemented by engaging line departments and experts, enabling them to efficiently process and market honey and other products. These trained members/farmers can be used as resource persons for training other farmers within the villages to scale out the efforts.

Improving value addition skills

Along with efforts to increase honey production, there is also need to improve the quality and presentation of honey through proper filtration, packing and labelling. Currently, most *Apis cerana* beekeepers in the mountain areas are packaging honey in re-used glass/plastic bottles without even removing the original labels. This lowers the value of the product, making it difficult to sell it in formal markets. Rigorous efforts are required to create awareness; beekeepers should be provided training and information on the importance of product presentation so that their product can fetch a fair price; they should also be provided packing bottles with proper labels for the first batch of honey and the cost of the bottles may be recovered from the honey sale proceeds.

6.2.3 Strengthening input supply

Lack of input supply like improved movable frame beehives, bee veil, and so on is a major constraint to enhancing the quantity, quality and presentation (packing and branding) of honey in mountain areas. Basic beekeeping equipment such as bee veil, queen gate and swarm bag are not available in the local markets, which prevents beekeepers from expanding their beekeeping enterprise. Bringing these equipment from the other areas would involve additional time and transportation cost. Therefore, the study recommends establishing local beehive and equipment facilities. For this, the supporting institutions need to identify potential entrepreneurs and build their capacity to produce/source and supply beekeeping materials and equipment through training, financial and policy support.

Further, many beekeepers are unable to obtain more improved hives due to their lack of skills in hive making, and the high cost of wood in the open market. There is need to identify and train interested local carpenters (and farmers with basic carpentry skills) in hive making and support the hive carpenters to purchase wood at a subsidized rural rate. Extension staff and local government should also support beekeepers to get small loans to buy improved hives and equipment.

6.2.4 Marketing, business management and pricing

For beekeepers accustomed to subsistence farming, product marketing and business management is a new area. This is also true for extension staff across mountain areas. For this reason production often precedes market requirements. In order to reverse the process so that the product gets a market, both concerned staff and beekeepers should be trained on market development. Beekeepers should also be provided basic skills in business management and entrepreneurship, market literacy and product pricing.

6.2.5 Building up linkages and collaboration

Building up linkages within beekeepers

There is a need to ensure participation of poor smallholder beekeepers in the study areas in the commercial honey value chain through strong collaboration, coordination and integration of beekeepers/beekeeper groups. Inclusive cluster village approach to include all beekeepers interested in modern beekeeping to come together, facilitation to link them to the market by encouraging them to participate (with their products) in trade fairs/local exhibitions/festivals and periodically holding discussion forums/meetings organized by groups themselves and by the extension institutions can foster collaboration and linkages.

Building up market linkages and collaboration outside

Building vertical linkages in the chain would increase the beekeepers' confidence. Once the beekeepers are assured of the market and the demand for honey increases, they can pursue beekeeping as their main source of income. However, in *Apis cerana* beekeeping there is lack of effective value chain linkages among input providers, beekeepers, processors, traders, and service providers. There is still limited awareness of quality parameters and on how to manage colonies with a view to ensuring quality of the product; therefore, awareness raising campaign, training and institutional strengthening are necessary.

6.2.6 Facilitating development and promotion of product/brand

Product development and value addition is necessary for the product to be able to compete in the market or find a place in a specialized/niche market. This would involve processing, packaging, branding and certification. The study recommends promoting good practices in beekeeping (improved technology), processing (quality improvement), packaging, and labelling *Apis cerana* honey as per market requirements and promoting it as a special market product. In addition, there is a need to develop new approaches to fair trading and certification systems for small-scale producers.

6.2.7 Facilitating access to finance

Value chain promotion activities such as enhancing production, value addition, product development, branding, etc. require finance for developing infrastructure for collection, production, processing, packaging, etc. Thus, the study recommends identifying and facilitating linkages between farmer groups/cooperatives and relevant programmes/schemes of government, non-government and private institutions that support small farmers through loans and subsidies. Cooperatives also need to be encouraged to create a revolving fund for which the project can initially provide some seed money; the fund can be used for essential activities and reused once sufficient profits are generated. A platform should be created for organizing multi-stakeholder meetings and workshops to develop synergy and explore possibilities for resource sharing with other development projects/programmes.

6.2.8 Strengthening access to information

Access to information on the factors affecting the honey value chain (positively or negatively) such as technical aspects, weather, market, quality, price, government schemes, subsidy, etc. should be facilitated by linking beekeepers to information service providers. Platforms should also be created for organizing multi-stakeholder meetings and workshops to facilitate information sharing among various stakeholders such as government, non-government, and private sector organizations.

6.2.9 Facilitating learning and knowledge sharing

Learning and knowledge sharing is essential for the development of *Apis cerana* beekeeping. Many bee development programmes in the HKH countries now focus on promoting beekeeping with *Apis mellifera*. *Apis cerana* is considered to be a type of bee that does not produce large quantities of honey. As a result there have been no research and development efforts to promote this bee. Yet, there are several examples of successful *Apis cerana* beekeepers and bee-based enterprises. Facilitating visits of the beekeepers and supporting policy and development professionals to these successful enterprises can change their mindset in favour of *Apis cerana* and motivate farmers to manage their own *Apis cerana* based enterprises. Therefore, the study suggests organizing exposure-cum-learning visits for individual beekeepers, beekeepers' organizations and supporting institutions to successful *Apis cerana* based enterprises in different areas/countries to facilitate knowledge sharing and learning.

6.2.10 Facilitating inclusiveness: Encouraging participation of women and disadvantaged groups in honey value chain development

An intervention is most successful and sustainable when it takes into account the points of view of all members of the society, irrespective of their gender, caste, or ethnicity. Therefore, the study suggests ensuring the participation

of women and other groups in beekeeping development at all stages – design, implementation and monitoring – to achieve sustainable results. This can be ensured through organizing training, exposure visits and other capacity building activities at a time and location that is convenient to the participants.

6.2.11 Favourable policy and institutional support for the development of *Apis cerana* honey value chain

Apis mellifera honey value chain linkages are stronger than the value chain for *Apis cerana* in all countries of the HKH. This is because the *Apis mellifera* honey value chain is supported by several government, non-government and private sector organizations. *Apis mellifera* beekeeping is undertaken on a commercial scale, producing honey in marketable quantities and of acceptable quality. However, *Apis cerana* beekeeping in mountain areas has been overlooked by research and development organizations and remains a small-scale household activity in isolated pockets away from the development mainstream.

Beekeeping with *Apis cerana* is common in the HKH where hundreds of thousands of small beekeepers are managing millions of colonies using traditional equipment and methods. Yet government agencies throughout the HKH are only engaged in promoting *Apis mellifera*. There is evidence that *Apis mellifera* beekeeping is not profitable when taken up on a small scale, and there are several examples of its failure, especially in remote mountain areas. Thus there is need to reorient beekeeping development policies and programmes in regional member countries, making them favourable for *Apis cerana* beekeeping. The study suggests promoting *Apis mellifera* in the plains where it is more successful and *Apis cerana* in mountain areas. Such policy reorientation will help *Apis cerana* beekeeping get institutional support, which in turn would enhance the *Apis cerana* honey value chain in mountain areas and bring higher incomes to mountain people. An example of this is the current beekeeping development policy of the Government of Nepal (2017).

6.3 Ensuring Sustainability

Ensuring equitability and sustainability is a key challenge. It is important to come up with a concrete plan and carefully design activities so that the target communities can benefit from beekeeping products and services. Some of the activities for ensuring long-term sustainability of the *Apis cerana* honey value chain development in mountain areas include: engaging the economically active population, especially the rural unemployed youth, women and other disadvantaged groups in *Apis cerana* beekeeping; supporting the development and strengthening of community-based organizations (beekeepers' groups/associations/ cooperatives) and building their capacity; leveraging and convergence with government schemes through regular communication and sharing of impact and lessons with concerned officials; and encouraging communities to plant trees/plants that provide nectar and pollen to bees around the house and on the common village land, and convincing concerned departments (e.g., forest department) to include such plants in their plantation schemes to help strengthen beekeeping in the area.

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