Smallholder apiculture development in Bure, Ethiopia: Experiences from IPMS project interventions

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Acknowledgements

This paper documents interventions, results and lessons learned for apiculture commodity development in Bure Woreda, based on a participatory market oriented value chain approach. The approach was introduced by the IPMS project/staff, who not only facilitated the introduction of the approach (technically and financially), but also played an important role as partner in the development process. The credit for the development results obtained go, however, to all the partners involved in this endeavor especially farmers, staff of the Bure OoARD, ACSI, Andassa ARC and private sector input suppliers and traders.

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Abstract

Beekeeping has a long history in Bure district as in other parts of Ethiopia. On average, it is estimated that 110 tons of honey are produced annually by smallholder farmers, and approximately 5000 households (hhs) are engaged in beekeeping as a sideline income generating activity, including landless farmers. Most beekeepers use local hives and beekeeping practices. Consequently, the quantity and quality of honey produced in the district was very low. The Office of Agriculture and Rural Development (OoARD) in Bure and the Regional BoARD started addressing these problems in 2004 through a campaign style distribution of modern hives and processing equipments.

In 2007, the Improving Productivity and Market Success (IPMS) of Ethiopian Farmers project in collaboration with the district OoARD introduced a participatory market oriented value chain development approach in which stakeholders identified problems/potentials and possible interventions in production, input supply/credit, marketing and extension approaches/activities. Major problems were the low occupancy rate (23%) of the newly introduced modern hives, partly as a result of lack of knowledge and skills; lack of market price information and linkages for honey produced from modern hives as well as lack of price incentive for quality honey. Furthermore, private sector involvement in the supply of inputs was minimal. Stakeholders started addressing these problems and the objective of this case study is to review and document results and lessons generated from these interventions.

Beekeepers multiplied 198 bee colonies, planted improved bee forages in the backyards, purchased smokers and protective clothing from input suppliers and collectively sold over 15 tons honey to honey traders and consumers in Addis Ababa. Beekeepers who adopted/benefited from the various interventions, earned on average Birr 2374/annum, as compared to Birr 201 for beekeepers who did not adopt/benefit. Statistics from the OoARD also suggest that the occupancy rate of modern hives doubled over the past two years because of improved management. In addition, the beekeeping knowledge and skill of farmers have been improving. Still the average yield from modern hives is still well below its potential and requires further attention. While the overall honey production in the district increases and has attracted the interest of commercial investors, linkages with the clean honey market need to be strengthened to reap the full benefits. The commercial processing (honey extraction) also requires further attention by either cooperatives and/or private processors.

Key words: Extension, honey, impact, bee colony, innovation systems

1. Introduction

The IPMS project, funded by the Canadian International Development Agency, was established to assist the Ministry of Agriculture and Rural Development in the transformation of smallholder farmers from a predominantly subsistence oriented agriculture to a more market oriented (commercial) agriculture.

The project adopted a "participatory market oriented commodity value chain development" approach which is based on the concepts of innovation systems and value chains. Crucial elements in the approach are the focus on all the value chain components instead of only a production technology focus; the linking and capacitating of value chain partners and the assessment, and synthesis and sharing of knowledge among the partners.

The project introduced this approach in 10 Pilot Learning Woredas (PLW) in Ethiopia with the objective of testing/adopting the approach so that it can be promoted nationwide. An integral part of the approach is the identification of marketable commodities and the value chain constraints and interventions. This was accomplished through a participatory process in all PLWs

This case study focuses on the development of apiculture development in Bure district, with the objective of documenting diagnostic results and value chain interventions, and providing evidence of concepts, challenges and lessons learned to be considered for scaling out.

Following the introductory section, the resulting sections are included. Section two deals with methods and approaches used in the study, while section three presents background information, including description of the PLW and the history and diagnosis of apiculture development. In section four, value chain interventions - extension, production, input supply, marketing and credit issues are presented. Section five dwells on results and discussion on production/income, input supply/marketing, gender/environment/labor use, organizational and institutional aspects, while sections six and seven deal with challenges and lessons learned, respectively.

2. Methods and approaches

To start the development of a commodity, IPMS used a district level participatory market oriented value chain planning approach, aimed at identifying i) main farming systems, ii) potential marketable crop and livestock commodities at farming system level, iii) constraints, potentials and interventions for each value chain component iv) value chain stakeholder assessment with potential (new) roles and linkages. Different value chain stakeholders were involved and consulted in this planning exercise. Secondary biophysical and socio economic data were collected, followed by open ended interviews with focus groups and key stakeholders. The results were presented in a stakeholder workshop in which priority marketable

commodities were decided upon together with key intervention areas and partners. In Bure this participatory planning took place in June 2007.

This initial rapid assessment was followed by some more detailed studies on selected commodities. Such studies were conducted by partner institutions and/or students and or IPMS staff using formal surveys, interviews and observations.

To implement the program at Woreda, Peasant Association (PA) and community levels, the project facilitated different knowledge management and capacity development approaches and methods to stimulate the introduction of the value chain interventions by the actors concerned. The various value chain interventions are documented by the project staff in the six monthly progress reports and the annual M& E reports.

To quantify the results from individual and/or combination of interventions, the project established a baseline and measured/documented changes. Several data sources were used to establish the baseline and to document changes and results.

2.1. Baseline information

To establish a baseline, data from a formal baseline study and data from some special diagnostic studies were used. The initial PRA study also contributed to the quantitative and qualitative baseline information.

Amongst others, the formal baseline study used PA level interviews and records to collect information on the number of beehives and the number of households involved in beekeeping. This information was used to compile district level information on apiculture development and households.

2.2. Documenting change processes and results

Several sources were used for regular documentation of change processes and results, including six monthly progress reports, annual M&E reports, MSc thesis research, records kept by the OoARD, personal observations and diaries. Bure PLW staffs also monitored changes in production/productivity for a few selected farmers on a regular basis.

In 2009, the project also developed a set of guidelines for the PLW staff to systematically collect relevant information for the case studies including history, changes in extension services, value chain interventions (production, input supply, marketing and credit), results, challenges and lessons learned. Part of the information was obtained from the previously mentioned baseline and other sources and specially arranged i) key informant interviews, ii) a commodity stakeholder workshop and iii) a household level survey.

The stakeholder meeting was organized to establish the evolution of the roles and linkages of the value chain actors.

The formal household survey conducted in 2009 obtained data from selected sample households in 9 PAs (Arbisi Menfesawite, Wundegi, Shakwa, Wangedam, Wadera Gendeba, Zalema, Zeyew Shewen, Fetam Sentom and Beko Tabo). The survey data consist of relevant production and marketing information on apiculture including number of hives, production costs and inputs use, level of production, and marketed surplus. In selecting the sample households, with the aim of getting some idea about the effect of the different interventions, a distinction was made between households who had adopted/benefited from the various interventions and households who did not. Adopters are farmers who own modern or transitional hives and non-adopters own only traditional hives. In both sample groups, both wealth and gender criteria were considered to get a representative distribution of sample households.

Following the collection of all relevant information, a write shop was organized to present information in a systematic manner. Drafts of the PLW specific commodity case studies were then reviewed by experts at IPMS Head Quarter.

3. Background to apiculture development in Bure

3.1 Description of the district

Bure is one of the consistently surplus grain producer districts in Amhara National Regional State (ANRS). Human population of the district is 169,609 of which 143,854 (85%) live in rural areas (IPMS, 2007). The number of agricultural households, 21,793, is about eight times higher than the households in the urban areas. The total area of the district is 72,739 ha of which 46.6% is cultivated and average household land holding is about 1.6 ha. At present the district is divided into 22 rural peasant associations (PAs) and two town associations (IPMS, 2007)

Agro-ecologically, Bure is classified into moist and wet lowland (10%), wet Woina-Dega (82%) and wet Dega (8%). Altitude of the district ranges from 713 to 2832 metres above sea level (masl). The altitude drops from 2832 to 713 masl as one travels from north to south part (Nile gorge) of the district, while the opposite holds true for temperature. Long term annual mean temperature of Bure ranges from 13 to 24 C^{o}, while it receives relatively high amount of rainfall with a balanced distribution ranging from 1103 to 1336 mm. It has mono-modal rainfall distribution extending from May to September. Shortage of rainfall is not a constraint for crop and livestock production. Farmers practice irrigation to grow crops in the district. The soils in the area are Humic Nitosols (63%), Eutric Cambisols (20%) and Eutric Vertisols (17%) (IPMS, 2007). Most of the district is flat but some areas exhibit soil erosion problems because of undulating topography. On the other hand, soil acidity and water logging are also problems in some parts of the district.

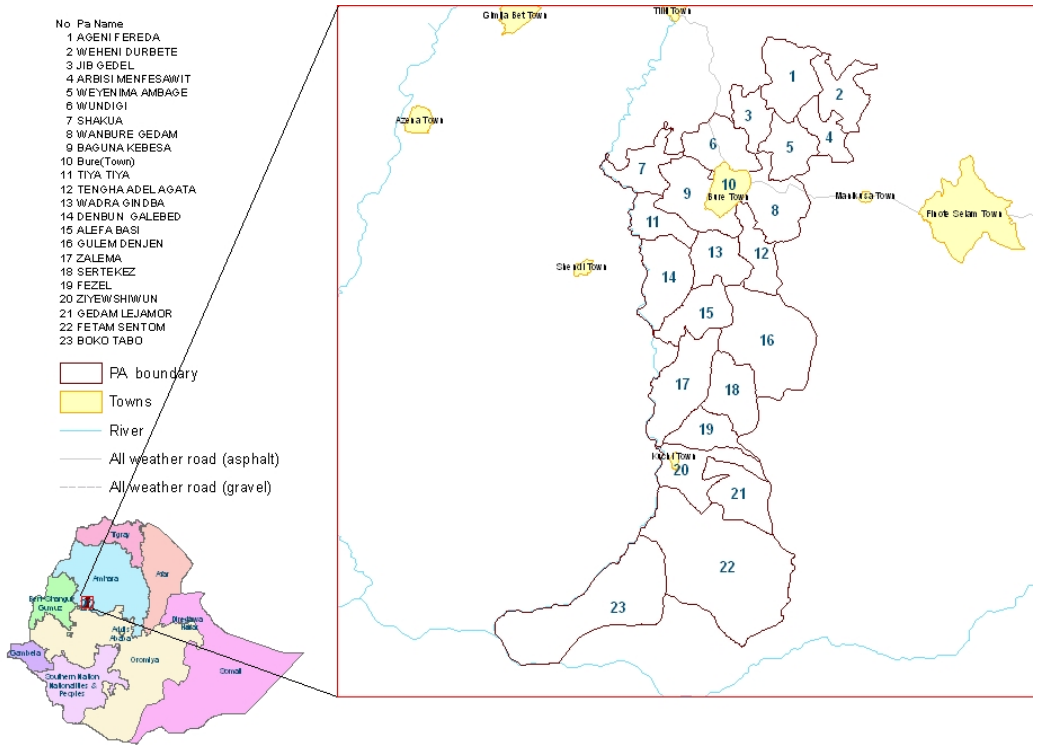

Figure 1. Map of Bure district

3.2. History and diagnosis of beekeeping in Bure

Beekeeping is not a new livelihood activity in Bure district. It has been practiced by farmers for centuries like in other parts of the country (Tessega, 2009). However, farmers rear honeybees mainly using traditional hives either made at home or purchased from local markets. In addition, beekeepers use traditional knowledge and skill in their honey bee management. Consequently, honey produced in the district is low in quantity and poor in quality and mainly targeted for the “Tej” market.

Apiculture is important especially to generate income from marginal lands, small plot of land, initial capital and labor; therefore suitable for poor and landless people. It is also considered important for the sustainable utilization of natural resources, since it enforces beekeepers to keep good vegetation cover in the area and facilitates pollination of different plant species. The government is furthermore targeting honey and wax for export to contribute to foreign currency earnings. Moreover, beekeeping products can be processed into different by-products. Therefore, beekeeping contributes for the establishment of different honeybee products processing factories. Considering the multifaceted benefits of beekeeping, the Amhara National Regional State (ANRS) government gave due attention to beekeeping. As a result, Bure district was selected to specialize in beekeeping in 2005 by the Bureau of Agriculture and Rural Development (BoARD) of ANRS. Since then modern beehives were readily available. Subsequently, the district OoARD

started training of farmers and Development Agents (DAs) on improved beekeeping technologies and distributing modern hives to farmers (Table 1).

Table 1. Modern hive distribution by OoARD in Bure district

Year	Number of distributed modern hives	Number of modern hives filled with bee colony	% filled
2004-06	1152	766	66.5
2007	2137	772	23.5

Source: OoARD annual reports

Modern hives were constructed by different private wood workshops through contractual agreements signed between BoARD and wood workshop owners. Modern hives were distributed to farmers on credit basis and the price of each modern hive was Birr 265 until 2008. However in 2009, it increased to Birr 600. In addition, the OoARD distributed 65 honey extractors as demonstration material in different PAs free of charge. These honey extractors and wax printers rotate among beekeepers to provide service free of charge. Through these arrangements, each beekeeper took from 3 to 60 modern hives. Similarly, poor and landless youth groups, organized in two PAs (Alefa & Denbun) also took a large number of modern hives on credit from the district OoARD. Some beekeepers transferred bee colonies from traditional to modern hives and started beekeeping using modern hives. However, as can be seen from Table 1, occupancy rate of the modern hives was very low in 2007 (23.5%).

Beekeeping using modern hives requires protective clothing, smokers and other accessories. However, these inputs were not readily available in the local market. In addition, beekeepers lacked knowledge and skill to construct these accessories from locally available resources.

Bee colony is one of the important inputs of bee keeping activity. Beekeepers obtained bee colonies either by catching absconding bee colonies or by buying them from the local market. Bee colony marketing is an old practice and there are two bee colony markets (Kutch and Bure towns) in Bure**.** Bee colony traders sell colonies by hunting absconding swarms or wild bees residing in the forest areas around the Nile gorge. Farmers in the highlands of the district construct and sell traditional hives to lowland farmers. Farmers in the lowlands hang the beehives on trees in the forest areas for catching absconding swarms and wild bees. On the other hand, highlanders buy honeybee colonies from the lowlanders. Farmers involved in honeybee colony marketing are few in number (Tessega, 2009). Similarly, Adebabay et al (2008) reported that 53.1% and 35.9% of the total beekeepers in the Amhara Region obtained their foundation bee colonies by hanging bait hives on trees and by purchasing from local markets, respectively.

The price of a bee colony escalated from Birr 50-90 to 150 in 2007. This is attributed to the decrease in honeybee colonies due to environmental

degradation, intensification of agriculture and poisoning of honeybees by pesticides and increased demand of bee colonies due to the introduction of large number of modern hives into the area (Table 1). In addition, modern hives contributed to the reduction of bee colonies because of deprivation of natural multiplication. Moreover, farmers, DAs and experts in the district lacked knowledge and skills to multiply bee colonies. Therefore, shortage of bee colony is one of the main constraints for the beekeeping activity.

Beekeepers sell honey produced from traditional and transitional hives in the local market. There are about 10 and 6 honey traders in Bure and Mankusa towns, respectively *(personal observation)*. Local traders prefer honey harvested from traditional hive since their major customers are *Tej* (local beverage) makers and it has wax which bring additional income. On the other hand, honey harvested from modern hive is mainly sold to few urban dwellers for household consumption. Therefore, there was inadequate market access and information for the honey produced from modern hives. Consequently, local traders regulate the price of honey in the local market. These situations contributed to the slow expansion of beekeeping activity.

Generally, the initial diagnosis by stakeholders identified inadequate beekeeping skill, low occupancy rate of modern hives, shortage of bee colony, seasonal shortage of bee forage, lack of beekeeping input supply system, lack of market information and inadequate local market for the improved honey as important bottlenecks for apiculture development in Bure district.

Finally, it was also observed that despite the emphasis on apiculture development, the Bure OoARD was not well equipped to deal with apiculture development since at the start of the project there was only one apiculture technician to support the commodity development. Adebabay et al (2008) reported that only 33.2% of the total beekeepers in Amhara Region had access to the extension service. This reflects the effect of shortage of extension service in the sub-sector.

4. Value chain development interventions

Honey value chain development comprises input supply (beehive, bee colony, smoker, gloves, overall, boots, honey extractor, wax printer, etc), honey production, honey processing and honeybee products marketing. Interventions in honey commodity development value chain are discussed in the next sub-sections.

4.1. Extension service interventions

Knowledge and skills on apiculture are very important to establish and run a profitable beekeeping activity. In the previous years, the sources of knowledge for beekeeping were mainly parents, relatives and friends. Consequently, beekeepers followed traditional beekeeping activity and beekeeping was not the business of all farmers; only 21% of the rural households were engaged in beekeeping (OoARD, 2009). IPMS in collaboration with OoARD organized targeted and practical trainings to DAs

and beekeepers on honeybee management, bee forage development, colony splitting and honeybee products processing. This contributed for the introduction, adoption and expansion of colony splitting knowledge and skill (new technology to the area) and introduction and dissemination of improved bee forages in the area. An overview of the IPMS facilitated capacity development and knowledge management activities is shown in Table 2.

Table 2. Overview of apiculture capacity development and knowledge management events in Bure

		Public		Farmers/Private		Total	Total	Total
Date	**Event**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**partic**
Sept. 25-27, 2007	Training	7	0	18	0	25	0	25
Dec. 6, 2007	Meeting	15	4	73	0	88	4	92
Feb24- March 4, 2008	Tour	11	2	1	1	12	3	15
July 18-20, 2008	Training	12	1	24	0	36	1	37
Sept 13, 2009	Training	3	0	22	0	25	0	25
Sept 17, 2009	Training	3	0	16	0	19	0	19
Total		51	7	154	1	205	8	213

Source: IPMS progress reports

IPMS also organized study tours for farmers, DAs and agricultural extension experts to gain knowledge on the integration of natural resources conservation and beekeeping in Tigray and to show different levels of honey processing activities in Adigrat (Dimma) and Bahir Dar (Amar). The project also organized field days for farmers, DAs, extension experts and public servants of the district to share knowledge and scale-up/scale-out experiences. Moreover, it organized a scaling-up workshop to share lessons to participants from 12 districts of West Gojam Zone. In addition, the project prepared leaflet and VCD on colony splitting techniques to disseminate the technology for a wider audience even outside the district. Furthermore, the achievements of bee colony splitting intervention at Bure district were aired on radio and TV programs by the Amhara Region Mass Media Agency as an important lesson.

OoARD/IPMS started providing extension services in input supply (linking with input suppliers in Bahir Dar and introduction of improved bee forage), marketing of outputs (providing market information, established honeybee products marketing cooperative and linking with honey traders, processors (Bezza & Dimma) and consumers), processing of honeybee products into different products (preparation of candle and other products from beeswax) and credit services. It provided different beekeeping equipments as demonstration material for Farmer Training Centers (FTCs) of 13 PAs. It also established apiculture development platform at district level.

4.2. Input supply interventions

4.2.1. Beehive and other beekeeping equipments

As mentioned in section 3.2., modern beehives were constructed by private companies contracted by the BoARD and supplied on credit to farmers by staff of the OoARD. This led to the emergence of modern hive constructing workshops in Bure town. It is expected that these private wood workshops will takeover modern hive supply from the OoARD through time and will contribute for the sustainable supply of modern hive in the area. Some farmers have also started constructing transitional hives. Honey extractors given by OoARD for demonstration purposes are inadequate in number. In addition, beekeepers lack adequate skill and experience to repair honey extractors when they become out of operation. Therefore, honey harvesting from modern hives becomes very difficult and some farmers reported that they have tried to harvest using spoon. To solve this problem, IPMS linked the beekeepers with Tana beekeeping equipment supplier in Bahir Dar.

4.2.2. Bee colony supply

Currently, the demand for bee colony increased as a result of introduction of large number of modern hives and improved awareness of the community about the importance of beekeeping. In addition, the number of bee colonies reduced as a result of extensive deforestation and extensive use of herbicides (2,4-D) and pesticides in the area. The expansion of wheat production contributed for the expanded use of 2,4-D in the area. IPMS introduced and demonstrated wheat production using conservation tillage to minimize the effect of 2,4-D on honeybees.

Bee colony splitting technology was unknown before IPMS intervention in Bure. Therefore, IPMS trained model beekeepers and DAs from 14 PAs in 2007 and 2008 to provide colony splitting service (Table 10). Bee colony splitting is done only for a very short period of the year (August to October). Colony splitting requires assistance from other people and is done only in the evenings. A colony splitting team can split two colonies per day. Hence, colony splitting activity of the district can not be satisfied by few colony splitting service providers. Therefore, IPMS project organized a number of field days and experience sharing visits to disseminate the technology to as many beekeepers as possible and to scale-out or scale-up this technology within and outside the district.

4.2.3. Bee forage and water

Honey bee, like any other living organism, requires feed and water for survival and honey production. In the previous years, bee keepers did not recognize the importance of bee forage development in their backyard since bees collect pollen and satisfy their need from natural vegetation. Now vegetation cover on most of the farmlands and grazing areas are poor due to repeated cultivation, application of herbicides and overgrazing. In addition, natural forest areas are shrinking due to expansion of croplands. Consequently, shortage of bee forage becomes one of the important problems for beekeeping activity in the area. To solve this problem, IPMS organized awareness creation training on the importance of bee forage and bee forage development techniques to beekeepers, DAs and extension experts. In addition, trainees identified important bee forages growing in their area and the flowering calendar of these bee forage species (Annex 1). Eight important bee forage species *(Trifolium* Spp.*.)* were identified from protected natural pasture lands in Bure, (IPMS, 2009).

IPMS in collaboration with the district OoARD is striving to bring an end free grazing system in the district and to adopt the management of communal grazing lands through cut and carry system. This intervention is not only useful to maximize the amount of animal feed produced from the grazing land but also for the amount of nectar that can be harvested by honeybees from natural pasture land since it gives flowering opportunity for different naturally growing bee forage species.

Different bee forages vary on the amount of nectar they secret and the concentration of sugar in the nectar (Crane, 1975). Therefore, selection and introduction of bee forages with high amount of nectar and sugar seems important to improve beehive productivity. IPMS introduced improved bee forage which flowers during the dry season from Andassa Livestock Research Center. The seed of this bee forage is being disseminated among beekeepers through farmer to farmer exchange system in Wangedam, Arbisi, Alefa and Adelagata PAs. In addition, OoARD/IPMS advised beekeepers to grow multipurpose bee forages, namely fruit and spice crops, in their backyard.

Honeybees collect water from rivers, springs, ponds, water tanks, water pipes and other available sources. Bees require large quantity of water to dilute their brood food and to cool the hive by evaporating especially during the dry season. If hives are placed far from sources of water, it is advisable to provide water particularly during the dry season. Therefore, OoARD/IPMS trained beekeepers to supply water for their honeybees during the dry season. Consequently, beekeepers started providing water in the apiary.

4.3. Production interventions

To improve productivity of modern and transitional hives, various managements were introduced including:

- transfer of colonies from traditional to modern hives

- shade construction for the hives
- regular inspection and cleaning of hives and the compound
- bee forage development
- colony splitting

4.4. Credit service interventions

Credit is important to start apiculture with necessary facilities especially for poor farmers and landless youth and for collectively marketing honey. Beekeepers obtained credit to buy modern hives and bee colonies from OoARD through multipurpose cooperatives. In addition, IPMS advised the OoARD to provide credit for Kokob beekeepers cooperative to establish collective honeybee products marketing system in the district.

4.5. Marketing interventions

Beekeepers were complaining about low price of honey offered by traders and less demand for honey harvested from modern hives. To overcome this problem, OoARD/IPMS facilitated necessary conditions for beekeepers to establish honeybee products marketing cooperative (Kokob) at a district level. Kokob honeybee products marketing cooperative was established in December 2007 with 282 members from different PAs in the district and with 11,000 birr initial capital. The district OoARD provided 140,000 birr credit to the cooperative to become involved in honey marketing. In addition, IPMS project linked the cooperative with honey traders in Bahir Dar, Addis Ababa, Nazareth and Adigrat. The project in collaboration with OoARD and BoARD also provided honey market price information every week and the cooperative used this information during buying and selling honey.

5. Results and Discussion

5.1. Production/productivity/income

The effect of the various interventions in terms of households/hives, production/ productivity and income from apiculture can be assessed at individual household and district levels.

Household level data

The household survey conducted in 2009 provided information on the number of beehives and occupancy rates by adopter and non adopters.

Table 3. Average number of hives and occupancy rate/hh by adopters and non adopters in Bure

	Number of hives owned per household				Occupation rate
Farmer type	Obs [a]	Modern	Transitional	Traditional	Modern (%)
Adopters	26	7.1	1	**4.2****	74.6
Non-adopters	11	0	0	2.0	

Source: IPMS Household survey 2009

Note: [a] Number of sample households engaged in beekeeping.

Adopter farmers on average owned 7.1 modern hives with an occupancy rate of about 75%. As indicated in Table 3, adopter farmers also had traditional hives, amongst other to provide wax for the modern hives.

Table 4. Average honey production and gross value per household

Farmer type	Average production (kg/hh)[a]								Production value (Birr/HH) [a]	
	Obs	Traditional	Obs	Transitional	Obs	Modern	Obs	Total	Obs	value
Adopters	16	**51.1****	6	41.8	20	108.5	25	**132.1*****	25	**2374.37*****
Non-adopters	9	16.1	0		0		9	16.1	9	201.39

Source IPMS Household survey 2008

Note: [a] Average production value is calculated by multiplying the individual honey production from each hive type by the hive specific average honey prices for each group (adopters and non-adopters) in each PLW. HHs with hives but zero level of production are dropped out in calculating the average productions and values.

The table above shows that the household production and household gross production value of adopters was significantly higher than for farmers with traditional hives only (non adopters). Much of this is the result of the increased number of hives (see Table 3). While hive productivity from modern hives was higher than from traditional hives, the actual yields are low as compared to what is possible under good management (see Table 5).

Table 5. Annual hive productivity Bure

Farmer type	Traditional				Transitional				Modern			
	Obs	Mean	Min	Max	Obs	Mean	Min	Max	Obs	Mean	Min	Max
Adopters	16	**12.0****	7	20	6	16.6	3.6	30	20	15.1	2.5	30
Non-adopters	9	7.4	2	14	0				0			

Source: IPMS Household survey 2009

Note: Farmer type: Adopters = Own modern or traditional hives; Non-adopters = Own only traditional hives

** significantly different from the other group average at 5% significance level.

These data compare with Adebabay et al (2008), who reported on the average 10.2kg, 16.6kg and 17.5kg honey per year/hive from traditional, transitional and modern hives in Amhara Region, respectively.

Key informants also mentioned that they normally harvest honey 1 to 2 times between October and December. Currently, a few farmers harvest honey up to three times per year in June, September/October and November/December both from traditional and modern beehives. This improvement is attributed to beekeepers' skill development in bee feeding, cleaning, proper positioning of beehives, regular supervision, constructing house or shade for bees, etc.

Based on discussions with key informants, a comparison between honey production from modern and traditional hives is shown in Table 6.

Table 6. Comparative cost benefit analysis of honey production - traditional and modern hives

No.	Items	Amount in Birr		Remarks
		Modern	Traditional	
1	Costs (*per hive)*	600	20	The price modern beehive increased from 265 to 600
1.1	Hive cost per one production season (depreciation)	30	4	Modern hive serve for 20 years while traditional hive only for 5 years
1.2	Purchase of bee colony	200	200	
1.3	Wax (sheet of wax)	75		
1.4	Harvesting & extraction labor cost	15	4	
1.5	Cost of extractor (depreciation)	70	-	Extractor can serve for 5 years with unit price of 3500 birr and for a minimum of 10 hives
2.	Honey harvested per season *(in kg per hive)*	30	15	
3.	Honey price *(Birr/kg)*	25	20	
4.	Total revenue *(Birr/hive)*	750	300	
5.	Return to labor *(Birr/hive)*	360	92	

Source: Key informants discussion

District level data

Table 7 shows apiculture production from local hives following the baseline survey conducted in 2007..

Table 7. Baseline data on honey production traditional hives in Bure

Woreda	Honey	No of hh/PA	Mean
	Local beehive		
Bure	Average yield per harvest/hive(kg)	11HH	9.27
	Number of hive producing honey/hh	12HH	2.33
	Estimated yield per household (kg)	computed	21.6
	Number of hives in the Woreda	22PA	11,861
	Estimated number of households	computed	5,090
	Estimated production in the Woreda (kg)	**computed**	**109,951**
	Average price per kg(birr)	12HH	14.38
	Total value per hive/year(birr)	computed	133
	Total value per household (birr)	computed	310.6
	Estimated value in the Woreda (birr)	**computed**	**1,581,095**

Source: IPMS baseline data 2007

Table 7 indicates that the amount of honey produced and the value from the traditional hives in 2007 amounted to approximately 110 tons and 1.58 million Birr. No reliable data could be obtained from the baseline data on the productivity of the modern and transitional hives.

Table 8 shows total number of modern, transitional and traditional hives following records produced by the Bure OoARD in 2009.

Table 8. No of beehives and household heads engaged on apiculture in Bure in 2009

Types of hives	Number of beehives	Number of household heads		
		Male	Female	Total
Traditional	12538	3991	63	4054
Transitional	161	62	1	63
Modern*	2074	495	5	500

Source: Bure district OoARD annual report
*Only hives which were occupied

Table 1 indicated that the total number of modern hives distributed by the Bure OoARD was 3,289 until the end of 2007, with an occupancy rate of only 23.5%. During 2008 and 2009 hive distribution slowed down and attention was given to improving the occupancy rate through hive/colony management and colony splitting. According to statistics by the Bure OoARD, the total number of modern hives was 3,890 in 2009 and the occupancy rate was 2,074 which is 53% (Table 9)

Table 9. Modern hive distribution attempt in Bure district

Year	Number of distributed modern hives	Number of modern hives filled with bee colony	% filled
2004 -7	3289	772	23.5
2008	535	1003	26
2009	66	2074	53
Total	3890		

Source: OoARD annual reports

5.2. Input supply and Marketing

5.2.1. Input supply

As a result of training on colony multiplication, farmers split over 198 bee colonies in 13 PAs (Table 10) in the last two years. Each bee colony was worth about 200 birr in the local market. Therefore, this intervention contributed to save over 39,600 birr from the pockets of beekeepers who expanded beekeeping activity through colony splitting technology. So far, about 85 households benefited from the bee colony splitting intervention. The technology is expanding even in non-intervention PAs through farmer to farmer experience sharing approach.

IPMS project bought 37 overalls, 37 boots, 37 veils and 37 hand gloves to train DAs and beekeepers and use them as demonstration materials in 13 FTCs. After observing the interest of farmers in these inputs, the project linked beekeepers with beekeeping input suppliers in Bahir Dar. Through these efforts beekeepers from five PAs purchased smokers, veils and hand gloves from Tana beekeeping input supplier, in Bahir Dar.

Table 10. Number of trainees and bee colony splits by PAs

No.	PA name	Number of bee colony training participants		Bee colony splitting	
		DAs	Beekeepers	Splits	Participant HH
1	Wangedam	3	5	58	27
2	Arbisi	2	5	24	17
3	Agenifereda	2	5	6	5
4	Shaqua	2	5	44	9
5	Woyenema	1	5	4	2
6	Denbun	1	4	1	1
7	Tiya Tiya	1	2	1	1
8	Tengeha	1	2	0	0
9	Woheni	1	2	2	2
10	Alefa	1	2	24	8
11	Wadera	1	2	0	0
12	Wundegi	1	2	4	4
13	Sertekez	1	0	3	3
14	Adelagata	0	1	0	0
15	Zalema	0	0	6	5
16	Baguna	0	0	1	1
	Total	18	42	198	85

5.2.2. Marketing

As a result of the introduction of modern and transitional hives a new honey product appeared – i.e. clean honey – which is supposed to fetch a higher price than the crude honey harvested from the traditional hives. The household survey did indeed show a price differential between farm gate honey prices harvested from the different hive types (see Table 11), with honey from modern hives fetching Birr 5/kg more than honey from traditional hives.

Table 11 Average prices of honey per kg from the different hive types (2008)

Woreda	Farmer type	Traditional		Transitional		Modern	
		Obs	Birr/kg	Obs	Birr/kg	Obs	Birr/kg
Bure	Adopters	15	14.33	6	16.83	17	19.59
	Non-adopters	8	12.50	0		0	

Source: IPMS household commercialization study 2009

The Kokob cooperative purchased and sold over 15 tons of honey in 2009. The appearance of the cooperative as a new marketing agent contributed to improving and regulating prices, thus improving the bargaining power of beekeepers while selling their produce in the local market. Therefore, all beekeepers in the district benefited directly or indirectly. Those beekeepers who are members and sold their honey to the cooperative obtained better income by selling their honey to trader and consumers in Addis Ababa at higher price (on average 28 birr/kg). Similarly, non-members of the cooperative also benefited indirectly since the price of honey (20 to 25 birr/kg) in the local market is also higher compared to the previous years. The cooperative obtained about 420,000 birr from the sale of 15 tons of honey to trader and consumers in Addis Ababa in 2009.

Through marketing interventions, potential buyers of honey increased both in number and type compared to before the project. Consumers, local traders, traders from distant areas, cooperative and *Tej* markers are involved in buying honey from the local market. This indicates the diversification of honey buyers at this moment. The quality of honey supplied is improving since beekeepers skill in honey handling and management improved now compared to the previous years. It is also attributed to the expansion of modern hives in the area. The price of honey increased from 7 to 25 birr/kg in the last four years. Similarly the price of wax increased to 50 birr/kg. The activities of the cooperative have also attracted the attention of investors, who have acquired land to establish a honey processing and beekeeping inputs manufacturing factory.

5.3. Other indirect benefits/cost

Gender

In the past, beekeeping was a male dominated activity in Bure district but in recent years women started participating in different beekeeping activities. In the male headed households, women have a role in cleaning the areas

around the hives, controlling ants and other insects, providing supplemental feed and water, prepare smoke for honey harvesting, honey extracting during harvesting and wax printing. Therefore, there is an increase in workload on women. Despite this fact, skill development opportunities (training and study tour) given to women is almost nil. Consequently, the proportion of female and male headed household engaged in apiculture is not significantly changed

Employment

It was observed that beekeeping does not require a large capital investment and land, so in principle it creates income generation opportunities to poor and landless farmers. Government has therefore encouraged youth (groups) to participate in this activity.

Beekeeping was considered as a sideline activity by farmers for the last several years. Compared to other agricultural activities, beekeeping does not demand much labor and time. Most beekeeping activities are usually done either early in the mornings or in the evenings. Therefore, beekeeping is a complementary activity to other agricultural activities in terms of its time and labor requirement.

Environment

Beekeeping contributes to increase crop productivity in an area. Segeren (2004) reported that the yield and quality of a number of fruit crops (apple, almond, apricot, avocado, cherry, citrus *Spp.*, cashew, mango, guava, pear, peach, etc) increased significantly as a result of honey bee pollination role. In some countries, fruit orchard owners rent bee colonies from beekeepers during flowering periods of their fruit crops. On the other hand, beehives produce higher honey yield by collecting pollen from the fruit trees. This indicates the presence of complementary relationship between apiculture and fruit production. Considering this importance, OoARD/IPMS supported fruit development activities in PAs where beekeeping is an important commodity. In addition, the pollination role of honey bees is vital for continued life on earth and creation of plant genetic diversity in an area. Moreover, beekeeping activity encourages good vegetation cover in the area and permits to fulfill the household livelihood from a small plot of land. Therefore, beekeeping contributes for the conservation of natural resources.

On the other hand, beekeepers complained about the effect of using herbicides (2,4-D) for crop (wheat) production on honeybees. The chemical has a direct adverse effect on bee population. Therefore, traditional wheat production with extensive or unregulated herbicide application has antagonistic effect on beekeeping. To overcome this problem IPMS is demonstrating wheat production using conservation tillage technology.

5.4. Institutional/organizational changes

As compared to the start of the project, several actors are now involved in the development of the apiculture sector in Bure as can be seen in Table 12.

Table 12. Actors and roles in the development of apiculture in Bure

Actor	Role
OoARD	Supply of modern hives, facilitate/organize skills development and provide knowledge
Farmers	Change from traditional to business oriented apiculture Bee colony producers
Local traders	Purchase of honey in particular traditional
Bee colony catchers and sellers	Catching and sale of colonies
Local carpenters	Construction of hives
Private traders Bahr Dar	Supply equipment for modern apiculture
Kobob cooperative	Purchase and sell honey
ACSI	Supply credit for apiculture development
IPMS	Provide knowledge and provide TA to OoARD and other partners and facilitated scaling out to other Woredas.
Platform	A beekeeping stakeholders forum for solving different apiculture problems through discussions
Andassa Livestock Research Center	Provided beekeeping training to farmers and experts and improved bee-forage
Private traders Addis	Purchase of honey

Source: Stakeholder meeting

6. Challenges in the intervention process

6.1. Capacity building and knowledge management

As clearly demonstrated by the low occupancy rate of modern hives at the start of the project, supply of inputs without adequate knowledge and skills development does not give the desired results. While a considerable number of farmers and DAs have been trained the OoARD presently does not have an apiculture expert who can provide overall leadership for the apiculture development program. Attention should be paid to filling this gap.

6.2. Honey processing

The objective of modern hive introduction was to increase productivity and improve the quality of honey produced. The sole supplier of modern hives and honey extractors was the government through the OoARD/multipurpose cooperatives. The number of modern hives and honey extractors distributed to each PA is not proportional. Consequently, some farmers failed to harvest honey from their modern hives on-time due to lack of honey extractor. Moreover, it becomes difficult to repair honey extractor since there is no trained technician to maintain this equipment. Shortage of honey extractor and lack of skill to repair it is still a challenge for beekeeping activity in the district. This problem should be solved through provision of credit, by organizing private service providers and training beekeepers or private service providers on its repair. Possibilities of involving the cooperative in this

activity should also be explored and lessons could be learned from the East Shoa Apiculture Association.

6.3. Hive construction

Modern hives were constructed through a campaign by BoARD through outsourcing to private wood workshops and distributed in bulk to each district through the OoARD, in collaboration with multipurpose cooperatives. Farmers observed a mismatch between frames and a modern hive box. To solve this problem, beekeepers should directly buy from manufacturers to regulate the quality of the hive. In addition, OoARD/BoARD should play adequate regulatory role to check the quality of modern hives so that they comply to the specifications. Furthermore more attention should be given to locally producing modern as well as transitional hives.

6.4. Bee forage development

Seasonal shortage of bee forage is one of the challenges for the beekeeping activity in Bure district. Continued attention should be paid to matching apiculture with commodities which produce bee forage (fruit crops, spices and tree crops) with different flowering calendar.

6.5. Marketing

The unpredictability of commodity prices in Ethiopia is the crucial problem to make decision on the marketing aspects. The major challenges faced by the bee products marketing cooperative include a threat by honey traders who usually opt to buy honey with higher price in reference to the collection price with which the cooperative buys from farmers. Traders are deliberately engaged in doing so to kick the cooperative out of business and improve their bargaining power, which in turn reduces the bargaining power of honey producers. The other challenge is lack of system to determine price based on quality of honey. To solve these problems, the cooperative should be further linked to honey processors and exporters for sustainable and diversified market opportunity and identify important quality parameters. Special attention also needs to be paid to the role of the newly arrived investor, since this could change the marketing of quality honey and the supply of inputs for apiculture.

7. Lessons and recommendations

Apiculture is a profitable and an environmentally sustainable livelihood activity. Large numbers of households are engaged in beekeeping activity in Bure district. However, most of them follow traditional beekeeping practices and produce low quantity and quality honey. The OoARD strived to solve this problem by distributing modern hives. However, beekeepers had also inadequate bee colony supply, marketing and knowledge or skill in beekeeping. Therefore, effective commodity development requires interventions at all steps of commodity development value chain. Hence the following recommendations are suggested to further improve the expansion of apiculture at Bure and neighboring Woredas.

- Currently the OoARD focuses on distributing modern hives to farmers. This responsibility can be handled by private input suppliers and the cooperative. However the OoARD should give more emphasis to knowledge sharing and skills development of beekeepers.

- Although beekeeping was men dominated activity in the previous years, the responsibility or involvement of women in beekeeping is increasing nowadays. However, women lack access to trainings and experience sharing tours in beekeeping. This situation should be improved by providing training opportunities to women farmers.

- Expand colony splitting practice or experience through farmer to farmer training or study tours within the district.

- The expansion of modern hives seems indispensable to increase the production of honey both in quantity and quality. However, this expansion depends on the availability of wax to prepare foundation sheet used in modern hives. Therefore, it is important to keep some traditional or transitional hives for wax production. Transitional hive provides higher yield and better quality honey compared to the traditional hive. However, the technology is new and there is no supplier organization. Therefore, the OoARD or other development organizations should provide training to the community on constructing this type of hive using locally available materials.

- The price of honey does not sufficiently reflect the quality of honey. Consequently, beekeepers did not give much attention to quality improvement. However, this situation reduces the number and type of potential buyers. Therefore, stakeholders should discuss and come up with solutions to provide better price for quality products.

- Beekeeping contributes to improve the livelihood of farmers by generating large amount of money from a limited area, small amount of initial capital and labor. Beekeeping does not need to take up valuable land. Hives may be hanged on trees and roofs or placed on wastelands. This makes beekeeping feasible for small holders and landless youth.

8. References

Adebabay K., K. Ejigu, T. Aynalem and A. Jenberie. 2008. Beekeeping in the Amhara Region. Amhara Region Agricultural Research Institute.

Crane E. 1975. Honey: A Comprehensive Survey. International Bee Research Association, Heinemann, London, UK.

IPMS. 2007. Bure Pilot Learning Woreda Diagnosis and Program Design. Unpublished.

IPMS, 2009. Bure and Fogera Pilot Learnings Woredas, Observations on Native Pastures, Unpublished.

OoARD. 2009. Bure District Office of Agriculture and Rural Development, annual report for the period July 2008 to June 2009.

Segeren P. 2004. Beekeeping in the tropics. Fifth Edition. Agromisa Foundation, Digigrafi, Wageningen, the Netherlands.

Tessega B. 2009. Honeybee Production and Marketing Systems, Constraints and Opportunities in Bure District of Amhara Region, Ethiopia. MSc Thesis Submitted to the Department of Animal Science and Technology, School of Graduate Studies, Bahir Dar University.

Annex 1: Honey bee floras of Bure district identified by beekeepers

No	Amharic name	Type	Scientific name	Flowering time
1	Yabesha gomen	Crop	*Brassica spp*	Aug-Sept
2	Yeferenji suf	Crop	*Helianthus annuus*	Sept-Oct
3	Noug	Crop	*Guitozia abyssinica*	Sept-Oct
4	Bekolo	Crop	*Zea mays*	Oct and June
5	Bakella	Crop	*Vicia faba*	August
6	Ater	Crop	*Pisum sativum*	August
7	Guaya	Crop	*Lathyrus sativa*	Nov-Dec
8	Sindie	Crop	*Triticum astivum*	Sept-Oct
9	Duba	Vegetable	*Cucurbita pepo*	Sept-Oct
10	Shinkurt	Vegetable	*Allium spp.*	Jan-Feb
11	Timatim	Vegetable	*Lycopersiconesculentum*	Jan-April
12	Gulo/Qachima/	oil crop	*Ricinus communis*	Sept-Oct
13	Berberie	Spices	*Capsicum annuum*	Aug-Sept
14	Zikakibe	Spices	*Ocimum basilicum*	Aug-Sept
15	Tosign	Spices	*Thymus schimperi*	Aug-Sept
16	Tenadam	Spices	*Ruta chalepensis*	December
17	Ensilal	Spices	*Anethum graveolens*	Aug-Sept
18	Kok	Fruit trees	*Prunus persica*	Aug-Sept
19	Avocado	Fruit trees	*Persea americana*	Oct-Dec
20	Mango	Fruit trees	*Mangifera indica*	Oct-Dec
21	Papaya	Fruit trees	*Carica papaya*	Aug-Sept
22	Birtukan	Fruit trees	*Citrus sinensis*	Jan-Feb
23	Lomi	Fruit trees	*Citrus aurantifolia*	Jan-Feb
24	Muz	Fruit trees	*Musa x paradisiaca*	Sept-Dec
25	Zeitun	Fruit trees	*Psidum guajava*	Feb-April
26	Qega	Fruit trees	*Rosa abyssinica*	Feb-March
27	Enjori	Fruit trees	*Unidentified*	October
28	Gesho	Stimulat	*Rhamnus prinoides*	Jan-March
29	Buna	Stimulat	*Coffea arebica*	Sept and March
30	Lenquata	Shrubs	*Grewia villosa*	December
31	Gumero	Shrubs	*Capparis micrantha*	January
32	Abita	Shrubs	*Unidentified*	November
33	Simiza	Shrubs	*Justica schimperiana*	Dec-Jan
34	Embuay	Shrubs	*Solanum indicum*	Aug-Sept
35	Kosheshila	Shrubs	*Acanthus sennii*	Oct-Nov
36	Dengorita	Shrubs	*Vernonia auriculifera*	Dec-Jan
37	Digita	Shrubs	*Calpurnia aurea*	April-June
38	Kinchib	Shrubs	*Euphorbia tirucalli*	Jan-May
39	Azo hareg	Bushes	*Clematis hirusta*	November
40	Ayit hareg	Bushes	*Ipomoea tenuirostris*	Sept-March
41	Ras kimir	Bushes	*Leucas martinicensis*	Nov-Feb
42	Kulqual	Bushes	*Opuncia ficus-indica*	Feb-March
43	Ambacho	Bushes	*Rumex nervosus*	Aug-Sept
44	Bahir zaf	Wood trees	*Eucalyptus camaldulensis*	Oct and April
45	Wulkifa	Wood trees	*Dombeya torrid*	Nov
46	Girar	Wood trees	*Acacia abyssinica*	Jan-May
47	Girawa	Wood trees	*Vernonia amygdalina*	Jan-Feb

48	Sesa	Wood trees	*Albizia gummifera*	Jan-Feb
49	Wanza	Wood trees	*Cordia africana*	Jan-Feb
50	Bisana	Wood trees	*Croton macrostachys*	April-June
51	Sholla	Wood trees	*Ficus sur*	Dec-Jan
52	Getem	Wood trees	*Schefflera abyssinica*	April-May
53	Yetebenja enchet	Wood trees	*Jacaranda mimosifolia*	Feb-April
54	Birbira	Wood trees	*Milletia ferruginea*	Nov-April
55	Shito bahirzaf	Wood trees	*Eualyptus citriodora*	Nov-Feb
56	Korch	Wood trees	*Erythrina abyssinica*	Feb-March
57	Gravilla	Wood trees	*Grevillea robusta*	Dec-Feb
58	Woira	Wood trees	*Olea europaea*	April-June
59	Wajima	Legumes	*Trifolium rueppellianum*	Aug-Sept
60	Maget	Legumes	*Trifolium decorum*	Aug-Sept
61	Muja	Grasses	*Snowdenia polystachya*	August
62	Gaja	Grasses	*Andropogon abyssinicus*	August
63	Mech	Weeds	*Gizota scabra*	Oct-Nov
64	Adiyo	Weeds	*Biden prestinaria*	Sept-Oct
65	Ashawurit	Weeds	*Unidentified*	Nov-Jan
66	Telenji	Weeds	*Achyranthus aspera*	Sept-Oct
67	Chinch	Weeds	*Unidentified*	September
68	Gorteb	Weeds	*plantago lanceolata*	June-Sept
69	Yemidir Berberie	Weeds	Acmella caulirhiza	June-Jan
70	Rench	Weeds	*Caylusia abyssinica*	Aug-Oct
71	Dabakeded	Weeds	*Verbascumsinaiticum*	Aug-May
72	Etsefaris	Weeds	*Datura stramonium*	Aug-Feb
73	Awut	Weeds	*Physalis peruviana*	Sept-Nov
74	Samma	Weeds	*Urtica simensis*	October-Dec
75	Amecalla/Yeset milas/	Weeds	*Hygrophilla auriculata*	Sept-Jan
76	Wofankur	Weeds	*Commelina benghalensis*	July-Feb