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Assessment of Hive Placement, Colony Unification and Colony Transfer of Modern Beehive Production System on Eastern Zone of Tigray Regional State, North Ethiopia

Niguse Gebru
Department of animal production and technology, Adigrat University , Tigray, Ethiopia
E.mail: niguseg41@gmail.com

Shushay Welderufael
Department of plant sciences, Adigrat University , Tigray, Ethiopia
E. mail: shushay24@gmail.com

Abstract
The study was conducted to assess the implementation of hive placement, colony unification and colony transfer of modern honey bee producers by taking four districts of Eastern Zone of Tigray. Data were collected by using semi-structured questionnaire as well as direct observation. The total number of household head respondents was 160. Beekeepers were kept their hives back yard (37.5%) with no shed, inside a simple built shed (25.6%), eaves of their house (22.5%), inside the house (11.9%) and trees found near to home (1.3%). The beekeepers were also transferred their colony to the modern hive on June to August (84.4%) which is rainy season and September to December (15.6%). In addition, about half (53.1%) of the respondents were offered supplementary feeds (different powders and sugar). Majority of the beekeepers were put their hives in uncomfortable areas and transferred their colony in high rainy season that most crops are on vegetative growth stage, nectar and pollen could be washed. In general, farmers had used weak beekeeping management practices. Therefore, in order to increase productivity and avoid absorbing, hives must be protected from disturbance and excess wind and sunlight and colony should be transfer on the season of flower abundance.
Keywords*:* hive Placement, colony unification and colony transfer.

1. Introduction

Beekeeping is a sustainable resource-based farming system without negative impact on the ecology and can be practiced without competing resources. Eastern part of Tigray Region believed to have diversified type of vegetation and cultivated crops for beekeeping activities. According to annual report of the region, BoARD (2010), most of the degraded lands rehabilitated with natural vegetation at faster rate than expected. Most of the planting vegetation are suitable for soil and water conservation and are preferred for their bee flora (Jacobs *et al.,* 2006).In some districts of the zone large proportion of inaccessible lands for other agriculture are covered with various types of trees, shrubs, bushes, and field flowers that could make the area potential for beekeeping. However, the modern beekeeping was not productive as expected and potential. Moreover, farming system and factors affecting production at farmers' level were not identified. Therefore this study was conducted to assess the hive placement, colony unification and colony transfer season.

Materials and Methods

Description of the study area

The study was conducted in four districts (woredas) of eastern zone of Tigray, called Ganta-Afeshum, Gulomekeda, Erob and Atsbiwonberta. The districts have different agro-ecological areas namely sub moist dry, sub moist cool and sub moist. The annual rain fall ranges from 400-600mm and the minimum and maximum temperature ranges from 6-21.8^{O}C with an altitude of 2000-3000 meter above sea level. In the study area the maximum rain fall occurs from mid-June up to September and between March and May but the minimum rain fall occurs from April to May.

Sampling Techniques and Sample Size

Prior to the actual survey, information was gathered from secondary data and informal survey from key informants. Based on the information obtained from secondary data and informal survey, a semi-structured questionnaire was developed. Four districts and two peasant association (Tabias) from each district were selected for the study. By the help of bureau of agriculture and rural development of the districts, samples of modern beehive owning farmer respondents were selected from each Tabia by using simple random sampling. The total sample size was determined by the following two formulas (Bill, 204).

$$SSo = \frac{(1-P)(P)\,Z^2}{C^2} \ldots\ldots \text{Eq1} \quad \text{and} \quad SS = \frac{SSo}{1+\frac{(SS-1)}{N}} \ldots\ldots \text{Eq2}$$

Where: - SS = Sample size finite population
Z = Constant Z-value (e.g., 1.96 for a 95 percent confidence level)
P = Percentage of population picking a choice, as decimal (5% b/s N may not be more than 5,000)
C = Confidence interval
SS_o= Sample size for infinite population
N= Total population the survey area

Data Sources and Methods of Collection

Both primary and secondary sources of data were used in this study. Secondary data were obtained from reports of the district offices of Agriculture and Rural Development and other published and unpublished materials. Primary data were collected using questionnaire, informal discussion with groups and key informants. In addition, a direct observation was used.

Pre-testing of the questionnaire and record sheets were made as a pilot survey and on the basis of information obtained during pre-testing, modification were made on the questionnaire. Then, the primary data were collected from sample respondents through the questionnaire and direct discussion. The collection of information was made at household level. Checklists under major topics of the study were prepared well ahead of time to ensure the completeness of the discussion and other primary data.

Data Analysis

The survey results were analyzed using Excel software. Descriptive statistics (like frequency distribution percentage and tabular presentations) were used. In addition, information obtained from group discussion was analyzed using qualitative analysis.

Result and Discussions

Majority of the beekeepers (37.5%) in the districts kept the frame bee hives at the back yard of the house with no shed to protect the sun and other factors. About 25.6% of the beekeepers kept their hives inside a simple built shed and 22.5% of the producers kept hives at the eaves of their house. The other placements were inside the house (11.9%); trees found near to home (1.3%) and protected areas (1.3%) (Table1).

Hives should be put in areas where they are protected from any animal and human disturbances. In addition, hives should be under shade to protect the direct impacts of wind sun light and other external factors. Whereas in case of the study area majority of the beekeepers placed their hives at the backyard with no shade and not protected from animal disturbances. This might be the case for the low productivity of the colony and absconding. Similar to this Nebiyu and Messele, (2013) reported that, most (57.7%) of the beekeepers kept the traditional bee hives at the back yard of the house, 21.2 % kept inside a simple shed built for hive placement, 13.5% kept under the eaves of the house, 5.1 % kept on trees in forests and 2.6% kept on trees near home stead. Moreover, Tessega (2009) reported that hive placements of about 34.2% backyard, 20% inside the house and 5% under the eaves of the house in the study conducted at Burie district Amhara.

Table 1. Hive placement of bee keeping in the districts

	Erob		Atsbi		Gulemekeda		G.afeshum		Sum total	
Items	N	%	N	%	N	%	N	%	N	%
Backyard (no shed)	9	22.5	20	50	14	35	17	42.5	60	37.5
Eaves of house	7	17.5	10	25	7	17.5	12	30	36	22.5
In simple shed	24	60	1	2.5	15	37.5	1	2.5	41	25.6
Inside the house	---	---	9	22.5	2	5	8	20	19	11.9
Trees near home	----	----	----	----	1	2.5	1	2.5	2	1.3
Protected areas	----	----	----	----	1	2.5	1	2.5	2	1.3
Total N	40		40		40		40		160	

N = Number of households

In addition, the beekeepers in the study areas were practiced colony unification (53.1%) and about half (46.9%) of the beekeeper respondents had no knowledge and experience in colony unification.

Similar to this, different scholars were reported on the supplementary practices of beekeepers. Beekeepers in Ada'a-Libenworeda Oromia (Ethiopia) were aware of this fact and they supply sugar and ground beans to their bees during the dry season (Melaku *et al*., 2008). The result of this survey also in line with the report of Solomon (2009) who indicated that during dearth period when there is shortage of honeybee forage, beekeepers provided supplementary feeds. Generally according to the respondents of this survey, all months of the year there was shortage feed for honey bee regardless of its variation in severity. The peak months in which feed shortage occurs are April (17.3%), March, and February (6.2%).

Table 2. Participation of beekeepers on colony unification of the districts

Districts		Households (N)	Percent (%)
Erob	Yes	22	55
	No	18	45
Atsbi	Yes	10	25
	No	30	75
Gulemekeda	Yes	25	62.5
	No	15	37.5
Gantaafeshum	Yes	28	70
	No	12	30
Total	Yes	85	53.1
	No	75	46.9

Majority of the beekeeper were transferred their colony to the modern hive on June to August (84.4%) and September to December (15.6%) seasons. In case of Erob district, colony transfer was only practiced in one specific season which was June to August (Table 3). Season of June to August is rainy season in the area. Therefore, there might not be high availability of nectar because of the rainy washing and water filling of flowers. Due to this problem, colonies might be faced to high stress that could lead to absconding and weakness.

Table 3. Season of colony transfer in the study area

	June to August		September to November	
Districts	Household (N)	Percent (%)	Household (N)	Percent (%)
Erob	40	100	---	---
Atsbi	35	87.5	5	12.5
Gulemekeda	31	77.5	9	22.5
Gantaafeshum	29	72.5	11	27.5
Sum total	135	84.4	25	15.6

Conclusion

Majorityof the beekeepers were put their hives in uncomfortable areas. In addition, beekeepers were transferred their colony in high rainy season that most crops are on vegetative growth stage and nectar and pollencould be washed. In general, beekeepers had used weak beekeeping management practices in the study area.

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