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Assessment of honeybee enemies (pests and predators) in Bale zone, southeastern Ethiopia

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Among all constraints of beekeeping, natural bee enemies are known to cause great damage to the life and product of honeybees by causing disappearance and migration. A study was conducted in Bale from July, 2010 to June, 2012 in six districts with the objective of assessing the effect of natural bee enemies on the life of honeybees and their products. From each districts, 3 rural kebeles (RKs) and 10 beekeepers from each RKs were purposively selected and a total of 180 beekeeper participated. The selected beekeepers were interviewed using pre-tested structured questioners and single-visit-multiple formal survey method to collect the data. The collected data were analyzed using SPSS version 20 software and descriptive analysis method. Majority (96.86%) of the respondents in the study area followed traditional production system but only few beekeepers started transitional (0.88) and modern (2.26) beekeeping production system. In the study area, honeybees' enemies, agro-chemicals, lack of knowledge to manage bees and bee products, lack of bee colonies and bees poisoning from plants were identified as major beekeeping constraints. Respondents were asked to identify major honeybee pests and predators. Based on the result of this study, the existence of pests and predators were a major challenge to the honeybees and beekeepers in the study area. In all surveyed areas, the beekeepers reported the presence of Honey badger, spider, bee-eating birds, bee lice, beetles, wasps, Death Head hawks moth Mice and lizards in order of their decreasing importance. Traditionally, the beekeepers used their own control mechanisms of protecting these pests and predators like application of ash under the stand of the hive, hanging hives by rope on long trees, cleaning around the apiary site, using dog for large predators like honey badger, fencing their apiary site and mechanical like killing of the predators and pests, etc. About 72.6% of the respondents reported that honey production trend in the area decreased and 25.1 and 2.2% reported increasing and unchanged trend of production system, respectively. Despite the challenges of beekeeping, it is realized that there is potential of beekeeping in Bale, though the production system is traditional and there is an opportunity of improving the situation since there is plenty of beekeeping resources.

Key words: Enemies, honeybee, pests and predators, Bale zone.

INTRODUCTION

Ethiopia has a longstanding beekeeping practice and endowed with huge apicultural resources and it has been an integral part of other agricultural activity, where about one million households keep honeybees. More than 5.15 million hived honeybee populations are found in the country (Adgaba et al., 2014). Beekeeping is regarded to

be an agricultural venture with little or no land except a space to stand or hang hive; very little labor, almost no capital and most of the other inputs are considered to be locally available (Rubio, 2001). However, the success of apicultural activity depends on the biotic and environmental factors proffered by the ecosystem. Honeybee pests have been identified as one of the major biotic factors affecting the successful beekeeping practice (Oyerinde and Ande, 2009).

Like other living organisms, the life and products of honeybees are affected by harmful diseases, pests and toxic materials. Successful beekeeping requires regular and on time monitoring of any factor that endangers honeybee life and threaten their products (Desalegn, 2015). Honeybee colonies existing in the wild away from man's control produce small surplus honey above their requirements, signifying beekeeping is much more productive and profitable if they are only managed properly (Moeller, 1982). To this reality, protecting them from disease and pests have been recognized many centuries back and now a days became a key activity of beekeepers is to make the beekeeping more profitable (Crane, 1990).

Among all constraints of beekeeping; natural bee enemies (pests and predators) are known to cause great damage to the life and the products of honeybees by causing disappearance and migration, especially in Bale. In many parts of the world, research is under way to develop means to combat or prevent honeybee pests and predators. However, bee research in Bale is at its infancy and no investigation has been made on type of honey predators' distribution in Bale. These enemies includes: bees eating birds (*Merops species*), honey badgers (*Mellivora capensis*), wasps, ants which are the major problems hindering beekeeping activity in the zone. Even after small disturbances, thousands of bees will leave the nest to attack everything moving. If the bees do not succeed in driving away potential predators, they would immediately leave the nest and try to settle elsewhere in convenient surroundings/place. Beside their aggressiveness, a considerable high reproductive rate is another strategy of survival. Apart from these realities, there is no research information in Bale regarding honeybee pests and predators, production potential, beekeeping constraints and the existing opportunities for future. In order to address this problem, it is very important to identify the potential development which is bottleneck of beekeeping in Bale. Therefore, the objectives of this study were to identify beekeeping constraints and opportunities of beekeeping, to assess effect of natural bee enemies (pest and predators) and to assess farmer's awareness of the natural enemies and their control method.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Bale Zone of Oromia Regional State which is located in southeastern part of Ethiopia. Bale is located at 7°, 00'N and 39° 45'E and 7°, 30'N and 39°, 30'E of latitude and longitude, respectively (Ethiopian Mapping Authority, 1988). The study area rages from lowland to high lands which represent different agro-ecologies of Bale with altitude range of 500 to 4377 m above sea level. The annual minimum and maximum temperature of the area extends from 2 to 20°C for high land (Williams, 2002) and 26 to 40°C for lowlands (RLDHMO, 2009). In the area, there are two rainy seasons, the first and the main season extends from August to December with rain fall of 270 to 560 mm and the second and the short rainy season goes from April to July with rain fall of 250 to 560 mm. The dry season covers from December to March (SARC, 2001). Floral diversity extends from lowland to high land and has good potential that provides the most appropriate environment for regulating and providing year-round foraging to honeybee populations except the most extreme high lands and lowland of the area.

Sampling methods and sample size

For the study, purposive sampling was employed to identify district(s) and the rural kebele (sites) in which the study was conducted. Six (6) districts (Sinana, Dinsho, Goro, Gindhir, Rayitu and Dellomenna) were selected, considering the different agro-ecologies, accessibility and potentiality of beekeeping. A total of 180 farmers, male and female participated who possess at least three to five bee colonies participated in the study. Secondary information was also gathered from Zonal and Districts Bureau of Livestock Development and Marketing Offices and livestock related sector before conducting the actual survey.

Data collection

The core points of the questionnaires focused on identification of pest and predators of honeybees and the management system practiced by beekeepers in the study area. Focus points included number of honeybee colonies owned, type of hives used, amount of honey harvested per colony, marketing system of honey, pre and post honey harvest management. Semi-structured questionnaires was developed and pre-tested with few farmers and re-framed in such a way that it was used to collect reliable data/information. Single-visit-multiple-subject formal survey method (ILCA, 1992) was employed to collect data on various aspects of beekeeping production, management practices and pests and predators identification.

Statistical analysis

All data were entered into MS-Excel spread sheets after the completion of data collection work from the study areas. Then, the data was analyzed using SPSS version 20 Software and summarized using descriptive statistics (means, standard errors and percentages).

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Table 1. Socio-economic characteristics of the respondents.

Variables	Sample size (n = 180)	
	Frequency	Percentages (%)
Ages		
20 - 30	35	19.4
31 – 40	46	25.6
41 - 50	40	22.2
51 - 60	29	16.1
> 60	30	16.7
House hold size		
< 6	63	36
6 – 10	80	45.71
10 – 15	24	13.71
> 15	8	4.44
Farm land hold size		
None	5	2.8
0.5 - 2	97	56.7
2 - 5	54	30
Above 5 heck	24	13.3

RESULTS AND DISCUSSION

Socio-economic characteristics of the households

Table 1 shows that the household surveyed respondents age ranges from 20 to 90 years with mean age of 45.25 ± 14.83 (mean ± SD) out of which more than 67% age was less than 50 years old. This result was agreement with Tessega Belie, 2009 and Chala Kinati et al., 2010. The result indicated that young people in most productive ages are engaged in beekeeping and most of the respondent about 38.33% had an experience of 11 to 20 years old and only 17.78% had less than 10 years' experience. The rest had 17.78 (21 to 30 years), 12.4 (31 to 40 years), 8.89% (41 to 50 years) and 5% (more than 50 years) experience of beekeeping. From this, one could assumed that in Bale Zone, people are actively engaged in beekeeping starting from their early age in helping older beekeepers to undertake basic beekeeping tasks. Gichora (2003) stated that young people gradually move on to become independent beekeepers as soon as they can obtain their own hives. They continue accumulating experience by seeking technical advice from fellow beekeepers, development agents (DAs) and experts as necessary.

Concerning religion, in the surveyed area, about 71.1% of the people were Muslim and 28.9% were Christians and it indicated that Muslim religion was the dominant religion in the area. The family size of the respondents showed that maximum was 19 and minimum was 1 with mean averages of 7.16 ±4.02. This high family size is most probably because of high practice of polygamy in the area.

About 53.9% of the respondents had 0.5 to 2 ha of farmland, 30.0% had 2 to 5 hectares, 13.3% had more than 5 hectares and 2.8% of the respondents did not possess farmland. Tessega (2009) and Chala et al. (2012) reported similar subjects. In general, the result indicated that most of beekeepers benefited from less land and need not large land.

Sources of honeybee colonies to start beekeeping

The indigenous knowledge on beekeeping differs from beekeepers to beekeepers and also from place to place, depending on beekeeping experiences and exposure to beekeeping activities. When beekeepers were asked to explain how they started beekeeping, about 98.3% reported that they started beekeeping by catching swarms and only 1.7% started through inheritance from their family. Chala et al. (2012) reported that about 87.8% of beekeepers started beekeeping by catching swarm in Gomma district. The result showed that catching swarm was the dominant source in the study area and the beekeeping production system was mostly traditional and this is also most probably because of poor extension services system, poor adoption of improved beekeeping technologies, high costs of beekeeping equipment (but stated above possible to start beekeeping with no cost), lack of government and non-government organization dealing with beekeeping in the study area.

Table 2. Arrangement of beehives.

Placement of hives	Total sample sizes (N = 180)	
	Frequency	Percentage
Backyard	90	50
Under the roof of the house	75	41.7
Hanging on trees in forest	14	7.8
Both at backyard & hanging on trees in forest	1	0.6

Figure 1. Forest beekeeping at left lowland area and at right high land area.

Beekeepers replied that as 50% of them place at backyard and the remaining 41.7%, 7.8% and 0.6% were hanging on tree in forest, under the roof of house and both at backyard and hanging in forest respectively (Table 2).

Trends of beekeeping in Bale

Beekeeping is not new idea in Bale; it is an ancient farming activity which is practiced as a sideline with other farm activities. Yet in Bale, there are three types of beekeeping which include: traditional, transitional and modern based on the types of beehives used. The data showed that the majorities (96.86%) of the respondents in Bale followed traditional production system but only few beekeepers stated transitional (0.88%) and modern (2.26%) beekeeping production system. Shunkute et al. (2012) reported that in Kaffa, Sheka and Bench-Maji zones of Ethiopia, traditional beekeeping practice is the dominant system accounting for more than 99% of the total, while intermediate and modern hives are less used (<1%) (Keffa, Sheka and Bench Maji is forest areas where beekeepers practiced more traditional method by hanging). In Bale, still traditional production practiced two forms, traditional forest beekeeping which is practiced in forest by hanging beehives on long trees and with no management care given for bees and it is the dominant way of traditional production system in Bale up to now (Figure 1) and the second form is traditional back yard beekeeping which is practiced around homestead and little management was given to this type of beekeeping production system.

Data showed that beekeeping production system in the study slightly showed improvement. Traditional production system gradually shifted to transitional and modern beekeeping system (Figure 2) which means that improved beekeeping technologies is practiced to harvest good quality and quantity of honey and other hive products in the area.

Table 3 indicates that about 72.6% of the respondent reported that beekeeping production decreased with regards to the yields of hives and the number of honeybees populations, this is because of climatic change from time to time as they said flowering plants found in the area previously diminished and only 25.1 and 2.2% increased and had stable production system respectively in the area. As their responses, the main

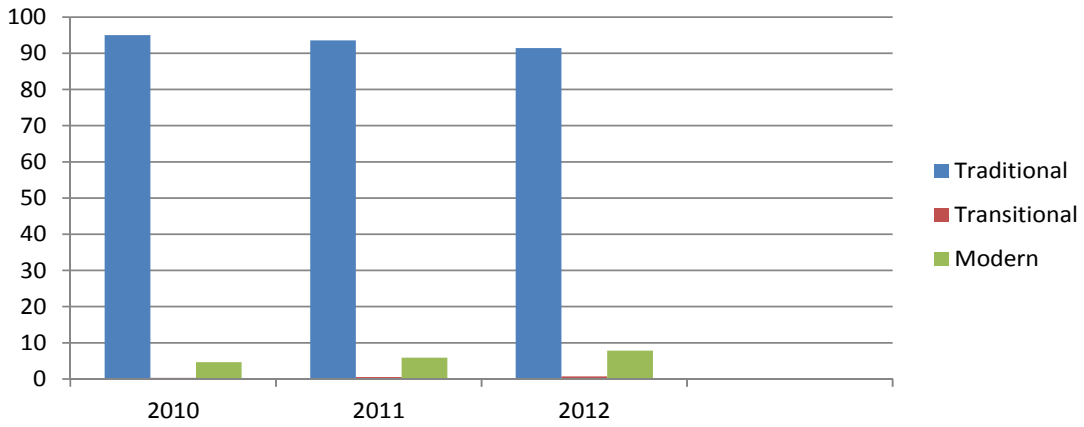

Figure 2. Status of beekeeping production system in Bale (2010 to 2012).

Table 3. Trends of beekeeping production system in the study area.

Trends of beekeeping	Frequency	Percentages
Increasing	45	25.1
Decreasing	130	72.6
Stable	4	2.2

reasons for decrease in production were: deforestation, un-wise use of pesticides and herbicides, presence of pests and predators in the area, absconding and migrations problem, lack of honeybee's forages, and bee colonies death were mentioned as the utmost problems for the deteriorations of product and productivity of honeybees and this result is similar to report of Tessega (2009) and Haftu and Gezu (2014).

Honey harvesting periods, production and management practices

In Bale, there were two honey harvesting period; the first was from November to January (peak periods) the second harvesting time was from May to August (the second peak time). Besides these major harvesting periods, there are many small harvesting periods which depend on the type of flowering plants and rainfall patterns in the study area. Among the total 180 respondents, 82.8% of them harvest honey twice within this period of the year, whereas only 7.2, 5.6 and 4.4% of the sample farmers responded that they harvest once, more than three, three times, respectively in a year. It was reported by the beekeepers that any production obtained in the remaining periods of the year would be left as a source of food for the colony to strengthen it for the next harvesting season. As indicated in Table 4, the annual mean average honey production obtained by sample respondents from traditional hives range from 7.40 to 8.52kg per hives from 2010 to 2012 but transitional and modern hives showed more improvement and there is no significant difference ($P < 0.05$) between transitional and modern bee hives (Table 4) this is because of poor management given to modern bee hives.

For the question, "Do you visit and inspect your beehives and colonies?" 97.2% of the respondents said "YES" and only 2.8% said "NO" and it indicated that most of beekeepers visit and inspect their beehives both externally and internally. About 42% of the respondents visit their bees when necessary, while 36.1% of them visit their bees every day (always) and the rest visit their bees to check if the hive was occupied with bees and at least during honey harvesting seasons. Only few farmers started internal hive inspection and most interviewed farmers practiced external hive inspections (Table 5). About 73.7% of the farmers responded that they clean around their apiary sites, while the rest (26.3%) do not. Only about 36.3% of the interviewed farmers gave additional food during dearth period and the remaining 63.7% did not give any additional feed; this is because of year round availability of flowering plants, except the extreme low areas.

Beekeeping constraints

Based on the results of the present study, the major constraints of beekeeping is the environmental condition

Table 4. Honey harvested in kilogram on different types of bee hives from 2010 to 2012.

Types of hives used	2010		2011		2012	
	Average	SD	Average	SD	Average	SD
Traditional	7.40	5.52	7.42	5.72	8.51	7.47
Transitional	12.00	9.27	11.80	7.08	11.17	8.35
Modern	12.93	7.84	13.84	9.58	15.02	9.69

Table 5. Frequency inspections/visiting of apiary site.

Time of visit	Frequency	Percentages
Always (every days)	61	36.1
Every three days	8	4.7
Every week	17	10.1
Every two week	12	7.1
When necessary	71	42

Table 6. The major constraints of beekeeping in the study area.

Beekeeping constraints	Rank
Un-wise use of pesticides and herbicides	1st
Honeybees enemies	2nd
Lack of knowledge to manages honeybees and bees products	3rd
Lack of bee colonies	4th
Bee poisoning from plants	5th

which includes: honeybees' enemies, bee poisoning due to agro-chemicals, lack of knowledge to manage bees and bee products, lack of bee colonies and bees poisoning from plants (Table 6). All of the beekeepers that participated in the study were requested rank their importance. Accordingly, un-wise use of pesticides and herbicides stand out which challenged beekeeping in the area and followed by honeybees' enemies (pests and predators), the detailed result is shown in Table 6. As mentioned, these constraints directly affected honeybees and hive products and had great impact on the economy of the beekeeping. Shunkute et al. (2012) reported in Kaffa, Sheka and Bench-Maji zones of Ethiopia, the same result.

Honeybees' pests and predators and controlling mechanisms

Honeybees' pests and predators

According to the result of the current study, the existence of pests and predators were a major challenge to the honeybees and beekeepers in the study area. The beekeepers reported the presence of the most harmful pests and predators in their area. Honey badger (*M. capensis*), spider *(Latrodectus mactan)*, bee-eater birds, bee lice (*Braula coeca),* beetles (*Aethina tumida*), wax moth *(Galleria mellonella)*, wasps *(Polistes fuscatus)*, death head hawk moth *(Acherontia atropos)*/(*Irbaataibiddaa in afanoromo*), mice, lizards, snake, praymantis, and monkey were the most dangerous pests and predators in order of importance (Table 7). Similar findings were reported in other areas of the country (Desalegn, 2001; Kebede and Lemma, 2007; Belie, 2009; Chala et al., 2012; Shunkute et al., 2012). This survey revealed that 50.3% of respondents reported honey badger in and around their apiary sites. Honey badger attack was a serious problem and stand out in the area causing disappearance of honeybee colonies. As a result of this predators attack, a considerable amount of honey and other hive products is lost and disappearance occurs. The respondents reported that spider and bee-eating birds with 31.5 and 17.8% were the second and third most serious bee enemies present in the area and Table 8 shows the top ten most frequently found pests and predators in the study area, but some rarely found pests and predators in specific area were also mentioned

Table 7. Pests and predators founds in Bale Zone in order of importance.

Pests and predators	Sample size (n = 180)		
	Frequency	Percentages	Ranks
Honey Badger	90	50.3	1st
Spider	56	31.5	2nd
Bee-Eating Birds	30	17.8	3rd
Bee Lice	18	12.4	4th
Beetles	19	18.8	5th
Wax moth	13	16.9	6th
Wasps	12	22.2	7th
Death Head Hawks Moth	12	31.6	8th
Mice	5	20.8	9th
Lizards	7	43.8	10th

Table 8. Major top ten honeybee enemies (pests and predators) in Bale as ranked by sample respondents and controlling mechanisms total sample (n=180)

Pests and predators	Traditional controlling mechanisms
Honey Badger	Use of chasing dogs, use of “wotmed” to kill, fencing the apiary site with strong fence, hanging hives by rope on long trees
Spider	Cleaning apiary site always, removing the spider webs, putting ash around hive stand
Bee-eating birds	Scaring the bee-eating birds from the area, putting like tallow, mastic, plastic on hive entrance.
Bee Lice	Smoking/fumigating the hive with materials like tobacco, dung, grass, etc, making the colonies strong, giving additional food for weaken colonies.
Small hive beetles	Strengthening the colony or keep strong colonies, remove weak colonies, cleaning apiary site
Wax moth	Making the colonies to be strong, giving additional foods, reduce hive entrance, smoking/fumigating the hive.
Wasps	Cleaning apiary site, remove nests of wasps, narrow the hive entrance
Death head hawks Moth	Cleaning apiary site, reducing hive entrance
Mice	Cleaning apiary site, killing using cats,
Lizards	Lengthening hive stand and fixing smooth iron sheet on hive stand, cleaning apiary site, coating legs of the hives with engine oil.

by few farmers, like ants (two type sugar ant (xuxi) and ants (goondaa)) snake, pray mantis, their existence were also reported by some of interviewed beekeepers.

Indigenous knowledge of beekeepers practiced on pests and predators controlling mechanisms in Bale

Traditionally, beekeepers practiced different prevention mechanisms but are not totally effective in alleviating these pests and predators which need to develop good prevention mechanisms in order to avoid them. Respondents were asked how to traditionally control pests and predators in their locality and most of the respondents reported putting ash around hive for most common pests, fixing smooth iron sheet on the trunks of a tree where hives are hanged, hanging hives on long trees which has very smooth bark which is not suitable for honey badgers to climb on and tying of thorny branches, using dog and killing badger using wotmad (Figure 3). Similar finding was reported by Dabessa and Belay (2015) as beekeepers used different mechanisms to protect their honeybees from pests and predators in Walmara District of Oromia Region. Accordingly, in the study area, the indigenous knowledge of beekeepers used are summarized in Table 8, but this result needs to be proven scientifically by researchers in order for the beekeepers to fully benefits from this apiculture sub-sector.

Beekeeping opportunities

As it was known, Bale has a bimodal rain fall type, due to

Figure 3. Bee hives hanged on trees to protect from pests and predators in Ginnir district.

this fact, there is year round availability of flowering plants. According to the respondents, the major opportunities for beekeeping in the study area include: existence and abundance of honeybee, availability of potential flowering plants, ample sources of water for bees, beekeepers' experience and practices, socio-economic value of honey and marketing situation of bee products. Different researchers had reported similar ideas (Workneh, 2006; Chala et al., 2012; Shunkute et al., 2012).

CONCLUSIONS AND RECOMMENDATIONS

It is known that Bale has adequate natural resources and a long tradition and culture of beekeeping. However, because of many beekeeping constraints, beekeepers did not fully benefit from the apiculture subsector. Among these constraints, honeybee enemies (pests and predators) were mentioned as bottle neck of beekeeping in Bale. These pests and predators includes: honey badger, spider, bee-eating birds, bee lice, beetles, wax moth, wasps, death head hawks moth, mice, lizards in order of importance. Despite this problem, there is also good opportunity to enhance the production, productivity and quality of products in Bale zone. Based on this, the following points can be forwarded and recommended. Appropriate scientifically proved means of controlling and management of pests and predators should be addressed in order to minimize the effects of these pests and predators. Since most of the beekeepers in Bale followed traditional way of production system which is highly affected by these pests and predators, emphasis should be given to training program for the community, focusing on the practical aspects of beekeeping and modern beekeeping technologies. There should be introduction of affordable and appropriate beekeeping technologies with all equipment, to enhance the beekeeping production, productivity and quality products in order to fully profit the beekeepers from this sub-sector.

Conflicts of Interests

The authors have not declared any conflict of interests.

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REFERENCES

Adgaba A, Al Ghamdi AG, Shenkute S, Ismaiel S, Al Kahtani Y, Tadess MJ, Ansari W, Abebe MQ, Abdulaziz A (2014). Socio economicanalysis of beekeeping and determinants of box hivetechnology adoption in the kingdom of SaudiArabia. J. Anim. Plant Sci. 24(6):1876-1884.

Chala K, Taye T, Kebede D, Tadele T (2012). Opportunities and

challenges of honey production in Gomma district of Jimma zone, South-west Ethiopia. J. Agric. Ext. Rural Dev. 4(4):85-91.
Crane E (1990). Bees & beekeeping, science, practice & world resource, Heineman, Newness, London.
Dabessa J, Belay A (2015). Survey on Major Honey Bee Pests and Predators in Oromia Special Zone Surrounding Finfine in Walmara District. Eur. J. Biol. Sci. 7(2):62-70.
Desalegn B (2001). Honeybee pest and predators of Ethiopia Proceedings of the third National Annual Conference of Ethiopian Beekeepers Association (EBA). September 3-4, Addis Ababa, Ethiopia. pp. 59-67.
Desalegn B (2015). Honeybee diseases and Pests research progress in Ethiopia: *A review.* Afr. J. Insect 3(1):093-096.
Gichora M (2003). Towards Realization of kenya's Full Beekeeping potential: A Case Study of Baringo district. Ecology and Development series No.6, 2003.CuvillierVerlag Gottingen, Gottingen, Germany. 157p.
Haftu K, Gezu T (2014). Survey on honeybee production system, challenges and opportunities in selected areas of Hadya zone, Ethiopia. J. Agric. Biotechnol. Sustain. Dev. 6(6):60-66.
Kebede T, Lemma T (2007). Study of honey production systems in Adami Tulu JidoKombolcha district in mid rift valley of Ethiopia. Livest. Res. Rural Dev. 19(11).
Moeller FE (1982). Managing colonies for high yields Tompkins & Griffith (Eds.). In Garden way's practical Beekeeping pp. 119-130
Oyerinde AA, Ande AT (2009). Distribution and impact of honey bee pests on colony development in Kwara State, Nigeria. J. Agric. Soc. Sci. 5:85-88.
SARC (2001). Profile of Sinana Agricultural Research Center (SARC).Oromia Agricultural Research Institute.Working Document Series 1, November 2001, Addis Ababa, Ethiopia.
Shunkute AG, Yemisrach G, Dejen A, Nuru A, Gebeyehu G, Workneh A (2012). Honey production systems (*Apis mellifera* L.) in Kaffa, Sheka and Bench-Maji zones of Ethiopia. J. Agric. Ext. Rural Dev. 4(19):528-541.
Tessega B (2009). Honeybee Production and Marketing Systems, Constraints and Opportunities in Burie District of Amahara Region, Ethiopia.
Williams S (2002). Bale Mountains: a guidebook. United Printers, Addis Ababa, Ethiopia. 52 p.
Workneh A (2006). Identification and documentation of indigenous knowledge of beekeeping practice. Proceedings of the 14th Ethiopian Society of Animal Production, ESAP. Addis Ababa.