

# FACTORS AFFECTING ADOPTION OF MODERN BOX BEEHIVE IN MANICALAND PROVINCE, ZIMBABWE

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## ABSTRACT

*Beekeeping in Zimbabwe is a common farming enterprise and income generating activity in rural areas of Manicaland province, thus Chipinge, Chimanimani, Mutasa, Buhera, Mutare, Nyanga and Makoni districts. Promotional efforts were made by non-governmental organizations, such as Worldvision, Plan International, Care International, Red Barner, just to mention a few. This was to improve beekeeping in Manicaland province of Zimbabwe, in order to uplift the standard of living of rural people in Manicaland province. There is no systematic study undertaken to evaluate the promotional efforts by these non-governmental organization and people's response to the efforts. The objectives of the study were to identify determinants of modern box beehive adoption by the rural beekeepers and to analyze the benefits of adopting modern box beehive technology in Manicaland province of Zimbabwe, thus, Chipinge, Chimanimani, Mutasa, Buhera, Mutare, Nyanga and Makoni districts. The stratified sampling technique was used to identify the respondents. The sample respondents were grouped into adopters and non-adopters of modern box beehive. The results show that 182 were adopters and 219 were non-adopters, identified out of 401 total sampled respondents of beekeepers.*

*Structured interview schedule, key informant discussion, group discussion and observation were used to collect data and were analyzed using descriptive statistics and logit model. The logit model shows that education level of household head, credit, Knowledge of beekeeper, perception of beekeeper and extension services were positively influencing adoption of modern box beehive.*

*It was found out that family size, age, extension services, market availability and beekeeping training were not much influencing adoption of modern box beehive. Ranking of major problems in beekeeping in Manicaland province, revealed that drought; honeybee pests and disease; lack of beekeeping equipment; death of colony; lack of extension services; marketing problem; shortage of bee forage; lack of beekeeping skill and reduction of honeybee colonies were found to be the major problems in Manicaland province in the beekeeping industry in their order of importance. Cost of modern box beehive was also found to be one of the prohibiting factor for the technology adoption.*

**Keywords:** Modern Box Beehive, Manicaland Province, Adopters, Benefits, Beekeeping, Honeybee, Adoption.

## INTRODUCTION

The researcher, (Feder, 2020) classified adoption into individual and aggregate adoption as per its coverage. Individual adoption is the farmer's decisions to take up a new technology

into the production process to improve production. Aggregate adoption is the diffusion of a new technology within a population or the region. The adoption to a technological change in any sub sector of agriculture is not uniform. It is governed by several socio-economic factors, such as awareness and attitude of farmers towards improved agricultural technologies, the land holding size and labor availability, farmers' resources, degree of readiness and exposure to improved practices and ideas (Salim, 2019). Adoption is a variable representing behavioral changes that farmers get into, in accepting new ideas and innovations in agriculture in order to improve production. Behavioral change is desirable in knowledge, technological information, attitudes, aspirations, values and skills (Ray, 2021).

## Background

Before human beings directly husbanded bees, collecting honey from the forest was the most favoured method for getting wild honey. Long back humans began to attempt to keep wild bees in man-made hives, made from hollow logs, tree barks, wooden boxes, clay vessels and reed baskets (Bello, 2020). In Europe in the Middle Ages, beekeeping started as a clergy and the aristocracy were searching for honey and wax for their church service (Castellanos Potenciano, 2020). The time when beekeeping started in Europe is not known. The Europeans used to nurture and protect the tree they find with a nest of bees. They used to cut a small entrance into the tree for the bees to get into the tree and getting out of the tree. This was the type of the hive used in Europe during that time. As time went on, beekeeping in Europe developed due to the demands for honey and beeswax for making candles for the church service (Blanc et al., 2018). Some of the regions in Europe were having different types of beehives different from the other such as traditional form of housing for bees made of pottery, wood or cork. Some had hinged doors which were opened when removing honey. In the north, they were using layers of straw and bark to keep the bees warm and alive during the winter. In East Germany and Poland, swarms were kept in hollow logs (Castellanos Potenciano, 2020). In Medieval Polish beekeepers had a tradition of making hollow logs into decorative shapes, like women with big skirts. This helped to the conservation of forests in Europe since the beekeepers were aware of the importance of forests. Beekeepers were charged tax by the owners of the fields or gardens where the bees were found collecting nectar and pollen from their fields. The crop farmers thought that the bee keepers were benefiting from their crops without knowing that both were benefiting (Crane, 2018).

World demand for hive products is in excess of marketed production by few beekeepers. The reason is hive products have several uses and applications but only a drop are exploited (Rush, 2020). Beekeeping is a global activity which is rich in existing local knowledge and skills. The additional technical information can lead to more improved honey and beeswax harvests. Beekeepers can be helped in several ways to build on their resources to increase income by harvesting and processing honey using improved methods and this will help them to get better prices by coming up with secondary products, saving and selling beeswax (Ceyhan, 2019). Beekeepers and trainers generally lack the necessary training materials. Most of the written books of beekeeping discuss European bees which are found in temperate conditions. Most of the trainings carried out are theoretical, emphasizing modern beehives without providing the practical aspect. New bee farmers require training on how to work with bees, how to maintain honey quality, how to get better yield, how to separate honey from beeswax, how to produce

secondary honey products, how to make bee equipment, and how to find market for their bee products (FAO, 2019).

Beekeeping is a promising off-farm business which directly and indirectly contributes to smallholder's income (Jemal., 2019). Agricultural activities together with beekeeping activities can be operated side by side and does not compete for scarce land resources, and provide off-farm employment and income generating opportunity. To support rural economy, smallholder agricultural production system should be supported by other income generating activities such as bee farming. The beekeeping business is also creating job opportunities in both rural and urban areas for urban and landless rural youth and women by involving them in bee equipment production and beekeeping activities (Chagwiza, 2020). According to Chitesa et al. (2018), about 75% of the honey produced 2012/13 in Zimbabwe was consumed by beekeeping households. Beekeeping in Zimbabwe has huge availability bee forage and potential for honey production (Gemechis, 2019).

The major honey production system in the region is traditional beehives. Traditional beehives results in low productivity, which in turn result in the low contribution of the sector to agricultural GDP of the country. Manicaland province of Zimbabwe has diversified types of forest vegetation suitable for beekeeping, as a result large volume of honey is supposed to be produced annually. Due to poor infrastructural facility, poor market information and long market chain there is no well-developed market structure for bee products. Profitability of honey production and the performance of honey markets in Zimbabwe is not defined. Honey market performance results are not available (Kifle, 2019) According to knowledge on how marketing routes and systems could contribute to the household income and the implications of these for national and international trade in apiculture is the way to design any policy or institutional innovation to improve marketing for the benefit of the poor. Very few beekeepers in Zimbabwe keep records of their beekeeping business and information of profit and loss is not available. The national government and non-governmental organizations (NGOs) have been investing in the honey value chain, so far with unclear outcomes (Gemechis, 2019).

## **Beekeeping in Zimbabwe**

In Zimbabwe, the systems of beekeeping are a mixture of traditional and low technology beekeeping, which use movable top bars. The two systems have their advantages and disadvantages over each other although traditional beekeeping is very unpopular and being discouraged due to its negative effects on the environment. The definition of a 'commercial beekeeper' is used in Zimbabwe to mean beekeepers using frame hives, a system that was used by majority of white Zimbabwean commercial beekeepers which is the Langstroth bee hive. As at now very few black beekeepers have successfully commercialized (Akessa, 2018). Beekeeping is a profitable income generating business for rural farmers because of the high demand for hive products on the market. There is a very high shortage of pure natural honey and other hive related products such as beeswax in the market. Demand on the local market is always outstripping supply resulting in nothing left for export, as a result of the importance given to it as food, and its various applications in traditional and modern medicines (Smith, 2019).

The main service industries in Zimbabwe involved in honey uses are manufacturers of confectioneries such as manufacturers of cosmetics, Willards Foods and Crystals Sweets, manufacturers of floor polish like shoe polish and furniture polishes using beeswax, pharmaceutical manufacturers, for example the Zimbabwe Pharmaceuticals, manufacturers of

antiseptics, baking industries and manufacturers of beeswax foundations and strips (Rosario, 2021). This business in Zimbabwe has the potential to improve the income of small scale honey producers and at the same time increase the benefits to crop yield and conservation of trees and health of the bee farmers. It is dominant in Matabeleland North, Matabeleland South, Midlands, Mashonaland Central, Mashonaland East, Mashonaland West and Manicaland where it is mostly integrated with agro-forest, crop production, and livestock (Mazorodze, 2019). Beekeeping farming has been increasing from 2005 up to date with a rise in the number of beehives and beekeepers (ILO, 2019). The Agritex report of 2018 shows that the number of beekeepers in Zimbabwe is 15967 with 85794 beehives. Zimbabwe has two beekeeping production models which are the traditional which uses beehives made of tree bark, buckets, log, and clay. The other model is the improved that use the Langstroth hive and the Kenya Top Bar (KTB) hive. The cost of the Langstroth reduces the number of beekeepers that use it (Nyatsande, 2018). The highest percentage of honey produced in Zimbabwe is from small scale bee farmers with an average rate of 42700 tons per annum against 69730 tons per year expected yield. The low production levels are mainly due to the predominant use of traditional low yielding hives and the quality is generally poor. The proportion of modern hives, especially the Kenyan Top Bar Hives (KTBH) is being widely adopted in Zimbabwe, with Mutasa, Lupane and Mudzi districts currently having the highest population (ILO 2019). Beekeeping has support from government, the Forestry Commission, Environmental Africa, Reduced Emissions from Deforestation and Forest Degradation (REDD), Sustainable Agriculture Trust (SAT), World Wide Fund (WWF), non-governmental organizations, the International Labor Organization, Carbon Green Africa, Southern Alliance for Indigenous Resources (SAFIRE), the International Rescue Committee (IRC), Food and Agriculture Organization FAO and other private players (Nyatsande et al., 2018; Mazorodze, 2019; ILO 2021). Start-up costs of beekeeping are low, with protective clothing and tools, such as smokers, at around US\$20 and, given the timber availability, Kenya Top Bar Hive is costing US\$12-15 or even just \$5 if purchasing the wood, plastic and nails separately and building it oneself. The Langstroth hive, is at around \$200 (without start-up kit) and this explains why its adoption in the country has remained very low. At the moment most of the beekeepers are using indigenous methods to smoke the hives during harvesting, some of which are harmful to the bees. Smallholder producers of honey are mainly using traditional beehives. This is taken as inferior as compared to the Kenya Top Bar Hive as the design of the latter permits for beekeepers to inspect on honey maturation without breaking the hives and disturbing the colony. The Kenya Top Bar Hive is the model being introduced to almost all beekeepers through NGO and public sector extension institutions (Crane, 2018).

Beekeeping in Zimbabwe is carried out by both men and women including youth without excluding a particular sex. A study carried out by Environmental Africa in six rural districts of Zimbabwe (2019) shows that the ages of people in beekeeping in Zimbabwe ranges from 18 years to 93 years. The majority are between 40 to 49 years range (ILO, 2021). It also shows that 87% of them are women who are involved in the apiary management. The adoption of Kenya Top Bar hives has helped to increase the number of women since it does not involve the climbing of trees to hang the beehives and it is easy to inspect the Kenya Top Bars whilst standing on the ground. Women also do the fire protection by making fire guards around the apiaries and do the monitoring of dates of hive colonization. Traditional beehives are mostly hanged by men since they are able to climb trees to hang the hives (Environment Africa, 2019).

### **Improved Beekeeping Practices**

Improved beekeeping practices covers all frame hives. The most common frame hives are the Zandar and Langstroth beehives in Zimbabwe. Modern box beehive, Dadant beehive, Modified Zandar beehive, and foam beehive are found in small numbers. The most commonly used hive type in Zimbabwe is the traditional beehive, which covers the bark beehive and log beehive. Modern box beehive has advantages over the traditional beehives in that it gives high honey yield in quality and in quantity. It has a possibility of swarming control by transferring the bees from one location to another in search of honeybee forage and pollination services. Its disadvantages are that the equipment is relatively expensive, requires skilled manpower and the equipment needs very specific precaution in handling it.

### **Statement of the Problem**

In 2000, the Zimbabwean government, realized the potential of beekeeping sub sector of the Zimbabwean agriculture, and established beekeeping demonstration Centre at Domboshawa Training Centre. The main objectives of the beekeeping demonstration Centre was to introduce improved beekeeping technologies imported from developed countries to the beekeepers in Zimbabwe and to provide beekeeping training for farmers and extension officers in Zimbabwe. About 80% of the beekeepers of Zimbabwe were using traditional beehives, which are difficult to carry out beehives internal inspection and bee feeding. The annual honey yield per traditional beehive is around 5-8kg, which is very low in quantity and quality as compared to modern box beehive, which is 20- 30kg. Modern box beehives can give higher yield and good quality honey. In order to improve honey quantity and quality, Ministry of Lands, Agriculture, Water, Fisheries and Rural Development and Non-Governmental Organizations introduced modern box beehives. Beekeeping technology and the financial benefit of adoption of modern box beehive technology information is not available. Adoption rate of modern box beehives is very low in Zimbabwe and this study suggested the importance of investigating the factors that influence the adoption of modern box beehives. However, revealed the problems of developing a universal model which can be used in technology adoption with defined determinants and hypothesis which can suit every situation, due to socio- economic and ecological differences of different locations and different nature of the determinants. Due to these facts, the researchers recommended replicated study on determinants of adoption on different conditions. This study was carried out to find feedback on adoption of modern box beehives and financial benefit of modern box beehive together with practices related to beekeeping such as feeding, honey post-harvest handling of hive products, preparing shading, planting bee forage, ant protection etc. to find information on their appropriate utilization.

### **Significance of the Study**

Improved beekeeping has been introduced in Zimbabwe since 1950`s. Domboshawa Beekeeping Training Centre was constructed in 200, which train farmers on good beekeeping practices and carry out researches in beekeeping. It is the first centre in Zimbabwe for the development of beekeeping sub sector of agriculture in Zimbabwe. The Zimbabwe government and Non-Governmental Organizations have been playing a big role in disseminating modern box beehives. Although these organizations are playing a big role in the dissemination of the technology, there is no enough study on improved beekeeping adoption of the technology. Financial benefit of modern box beehive was not adequately studied so far. There are various

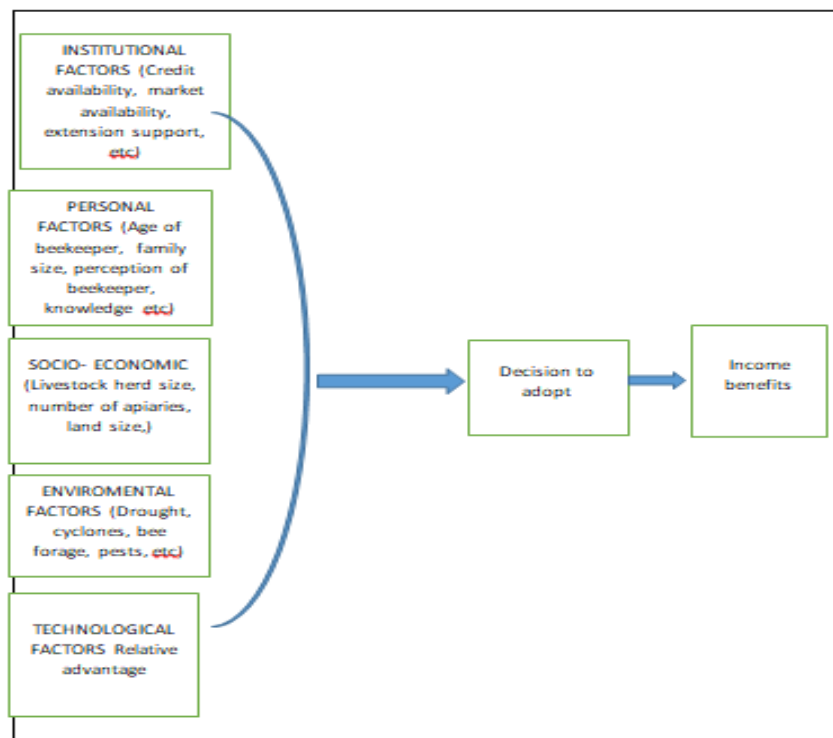
factors that positively or negatively contribute towards adoption of the modern technology. Identification of the factors are important for policy makers, beekeeping researchers and organizations in beekeeping development programs to get enough information on the adoption status of modern box beehive, this will help them to suitably modify the strategies in passing the information to beekeepers in beekeeping. This study would contribute in giving information on factors of adoption of modern box beehive technology.

### Scope and Limitations of the Study

The study dealt with modern box beehive adoption by taking the sample from one province. It cannot represent the whole modern box beehive population of Zimbabwe. However, this research recommendation can be used in other areas having similar socio-economic characteristics.

### Conceptual Framework for the Study

Adoption of a new technology in beekeeping business is influenced by personal attributes such as (age of the beekeeper, family size of the beekeeper, perception of the individual, experience of the individual etc), environmental factors such as (bee forage, bee disease, bee pest), institutional support such as (bank credit, market availability, extension support, etc) and socio- economic (income from bee products, total number of honeybee colonies the beekeeper has, backyard size of beekeeper etc.) factors. Factors encouraging adoption are neither economic nor purely non-economic. Both economic and non-economic reasons are important motives for driving the farmers' attitude towards the new technology and its adoption.

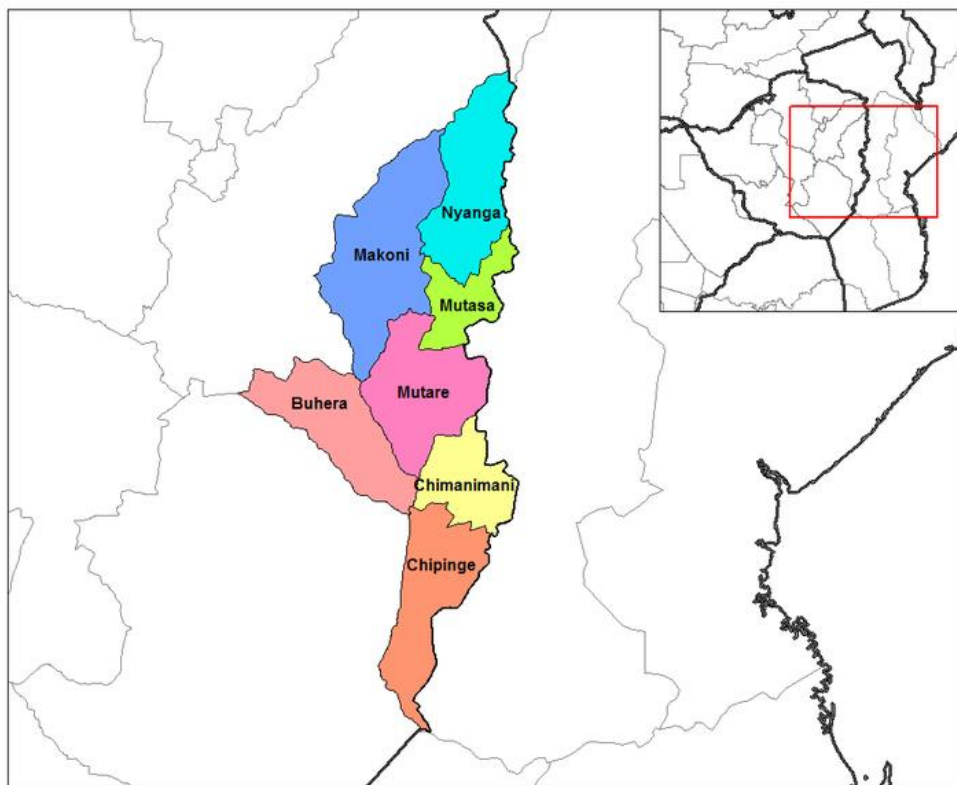


## FIGURE 1 FACTORS AFFECTING MODERN BOX BEEHIVE ADOPTION

### RESEARCH METHODOLOGY

#### Description of the Study Area

Manicaland province of Zimbabwe is in the eastern side of the country. It borders with Mashonaland province in the North, Masvingo province in the West up to the South and finally borders with Mozambique in the East. Manicaland province has seven districts, which are Makoni, Mutasa, Nyanga, Buhera, Mutare, Chimanimani and Chipinge.



**FIGURE 2  
MAP OF MANICALAND PROVINCE**

The province has a population of 2.037 million, as of the 2022 census. The major activities in Manicaland province in agriculture is dairy farming, beekeeping, horticulture, beef production, tobacco, tea, coffee production, small livestock production (poultry, piggery, sheep and goat) and macadamia production. All the seven districts of Manicaland were included in the study, which are Chipinge, Chimanimani, Mutasa, Nyanga, Mutare, Makoni and Buhera districts.

#### Population Size

The number of beekeepers selected for the study varied according to the intensity of beekeeping in the district. Chipinge 45, Chimanimani 52, Mutasa 72, Nyanga 84, Mutare 38, Makoni 57 and Buhera 53 beekeepers were selected. This gave a total of 401 beekeepers selected for the study. The survey was carried out from 2 May 2022 to 2 August 2022, which means the survey took four months to be completed.

### **Method of Data Collection**

Structured interview schedule was prepared and pre-tested two days before the actual data collection. Observations and personal interviews were conducted with Environmental Agency, beekeepers, extension officers, Forest Commission and bee trainers. Observation and focus group discussion were used to collect data on general view of the respondents on the technology and management practices of their apiaries. The enumerators were trained first and involved in the questionnaire pretest. They collected data under the supervision of the researcher. Farmers were explained the purpose of the survey before they were asked questions of the survey.

### **Data Analysis**

Data analysis tools used were descriptive statistics such as frequencies, percentages, mean and standard deviations, t-test and  $\chi^2$  were used to test the continuous and discrete variables, respectively. SPSS version 12 was used to analyze quantitative data collected in the study. Any item that cannot be captured through quantitative analysis was analyzed qualitatively based upon interview and group discussion with extension workers, beekeepers and traditional leaders. For identifying financial benefit of adopting modern box beehive partial budgeting was used.

## **RESULTS AND DISCUSSION**

### **Demographic Characteristics of the respondents**

The result shows that 182 beekeepers of the 401 sampled beekeepers were modern box beehive adopters and 219 beekeepers of the sampled beekeepers were non-adopters of the modern box beehive. It has significant mean difference at  $P < 0.01$ . The results show that the mean age of adopters' is smaller than non-adopters age. The result is negatively correlated at  $P = 0.010$ . This shows that beekeepers are not willing to accept new technology as they get advanced in age. This is in agreement with Shiferaw and Holden (1998) and Yohannis (1992) who also indicated that age of the household head negatively influenced adoption of a new development.

It was found out that 45.2% of the adopters were in the age group of 25-30 years. The 37.8% and 17% of the remaining adopters were in the age groups of 41-50 and 51- 60 years age group, respectively. The result shows that as the beekeeper get older, adoption of modern box beehive decreases.

The respondents mean family size for adopters is 6.1 and 4.7 for non-adopters. The family sizes of adopters are bigger than those of non-adopters. The result shows that there is a significant mean difference between adopters and non-adopters at  $P < 0.05$ . This shows that



beekeepers with bigger family size accept new technology adoption which will give them more hive products and help them to look after their families.

## Extension Services

Extension services is very important in the promotion of modern box beehive in beekeeping technologies. To provide effective extension service, the extension officers should be well equipped in practical skills in the modern beekeeping technology. The interview result with (Environmental, 2019) non-governmental organizations, Forest Commission, Agricultural extension officers and observations made, the beekeepers had directly received beekeeping training in all the seven districts of Manicaland province. The uptake of the modern box beehive technology indicates that technical assistance to the beekeepers was minimal, and failed to transform a large number of beekeepers to accept the new technology. The difference is statistically significant at  $P < 0.01$ . This shows that the small number of beekeepers who were frequently visited by extension officers managed to be transformed and accepted the new technology.

## Perception of Beekeepers on Modern Box Beehive

Questions to identify perceived relative advantage of modern box beehive and its relative disadvantage were asked to get the general perception of beekeepers on modern box beehive. High honey yield, ease for hive inspection, ease of honey harvesting, quality of honey harvested are the major relative advantages of modern box beehive, which were given by the majority of beekeepers. It was also discovered that high cost of modern box beehive, high skill to use the modern box beehive, and unavailability of this modern technology were found to be the main disadvantages of modern box beehive. The respondents were given both categories of advantages and disadvantages to rate on scale of four. The result of each category was added separately. The difference of the total relative advantage and disadvantage was found to be very positive.

No	Adopter (N=182)	Non-adopter (N=219)	T-value	rs	P
1	M=17.1 SD=2.8	M=14.3 SD=4.1	4.007***	.188**	0.024

*M=mean, SD= Standard Deviation, \*\*\*, \*\*- significant at P*

The result shows that the attributes of perception are highly correlated with adoption of modern box beehive (Table 1). The relative disadvantage and adoption of modern box beehive was not correlated. This shows that the beekeepers in the province are positively perceived modern box beehive which is an opportunity for beekeeping extension training. Statistically it is significantly different at  $P < 0.01$  with  $t$ -value=4.007 (Table 1). The result shows that beekeepers who had positive perception of the new technology, adopt the technology fast. The result is supported by Shiferaw and Holden (1998) who wrote that perception support adoption positively. This is also in support with the study of on factors influencing adoption of soil

conservation adoption in south Ethiopia that discuss perception of soil conservation problem influenced positively and adoption of soil conservation new technology.

**Group Discussion Data Gathered**

During the group discussion, beekeepers revealed that drought; honeybee pests and disease; lack of beekeeping equipment; death of colony; lack of extension services; marketing problem; shortage of bee forage; lack of beekeeping skill and reduction of honeybee colonies were found to be the major problems in Manicaland province in the beekeeping industry in their order of importance. Cost of modern box beehive was also found to be one of the prohibiting factor for the technology adoption.

**Honeybee Pest Problems**

The presents of honeybee pests create a problem for adopting modern box beehives as they kill bee colonies and hive products. The occurrence of pests in beehives in both adopters and non-adopters apiaries were found to be the same. Table 2 summarizes that among the respondents, 100% of modern box beehive adopters and 95% of non-adopters admitted that bee pests are a problem in their apiaries, therefore, bee pests are a problem in Manicaland province which affect the adaptation of modern box beehive.

Response	NAD n=219	AD n=182	Total
No	11 (5%)	0 (0%)	11 (2.7%)
Yes	208 (95%)	182 (100%)	390 (97.3%)
Total	219 (100%)	182 (100%)	401(100%)

NAD- non-adopter, AD- adopter

The major bees` pests exist in the province were ranked as they were given by respondents, based on the damage they cause on bees and beehive products (Table 3).

No	Honeybee enemies	Frequency	%	Rank
1	Ants	127	31.8	1
2	Honey beetle	119	29.7	2
3	Honey badger	62	15.5	3
4	spider	59	14.7	4
5	birds	34	8.5	5

The most serious pest was found to be the ants (31.8%). The adopters (85%) and the non-adopters (15%) were using ashes under the beehive to expel the ants.

## Knowledge on Modern Box Beehive

New beekeeping technology needs practical knowledge. It was found out that 65% of the adopters are able to harvest the modern box beehive without the help of the assistant. About 72% of the non-adopters are afraid of bee sting and they hire other beekeepers to harvest honey for them. It was also discovered that 53% of the adopters are able to repair the modern box beehive when broken and only 13% of the non-adopters could repair the broken down of the modern box beehive.

Hive protection from high temperatures, rains and strong wind is one of the practices that is recommended to protect the hives from damage. Among the users of modern box beehive 78.8% were adopting the practice through the construction of bee houses where they keep hives with bees and breed queen bees. About 81% of the adopters have built the houses and their bees are under roof, whereas 15% of non-adopters were gathering building materials to construct the bee shades.

## Absconding of Honeybees

Absconding is the total leaving of bees from the hive. Absconding can be caused by climate change, thus lack of feed, honey bee pests and drought. The lack of feed was found out to be 18% among the adopters and 29% among the non-adopters. It was also found that bee pests accounts for 9% on adopters and 26% on non-adopters. Drought was causing 31% abscondment on adopters and 35% on non-adopters. To reduce abscondment, about 52% of the adopters have planted bee forage and 13% of the non-adopters are into bee forage planting.

## Education Level of Respondent

Education level of the respondent increases the adoption of the modern box beehive. It was found out that 75.1% of the adopters have attended a high school up to tertiary level, non-adopters (38%) have ended at primary school level and 67% of non-adopters have not attended school. Education level increases information and understanding of the new technology which helps to apply the technology to increase production. Education level influences adoption of modern box beehive significantly at  $P < 0.01\%$ .

## RECOMMENDATIONS

The following recommendations are given to make use of the new technology effectively and efficiently. The beekeepers did not increase significant number of modern box beehive. They remained with the number of the modern box beehive they were given by Non-governmental organizations. The main prohibiting factor is the cost of this technology.

1. Researchers and development workers should come up with the technology which use locally available materials to cut the cost of the technology.
2. Absconding, which is mainly caused by lack of feed, honeybee pests, and indiscriminate agrochemical application, can be managed by carrying out beekeeping training through extension officers, NGOs and private players involved in beekeeping development the trainings should address honeybee protection and apiary management, covering feeding practice and growing bee forage which are drought resistant.
3. Trainers should promote cone shaped metal sheet to reduce water getting into the hive, the use of used engine oil to overcome the existing ant problems in the province.
4. The hive shading, supplementary feed, bee forage, bee protection, honeybee colony breeding and post-harvest handling practices should be promoted.

5. Beekeeping extension, NGOs and private players should be involved in beekeeping development of modern beekeeping practices to increase the honey production and its quality and market value.
6. Extension and NGOs can assist the enterprise in demonstrating their reared honeybee colony to the provincial beekeepers and other similar provinces.
7. Drought is one of the major problem in beekeeping growth in Manicaland province. Beekeepers should integrate beekeeping activities with water harvesting to keep water available to the bees.
8. The Research should help in selecting moisture stress tolerant perennial bee forage suitable to the different areas of the province and extension officers help to promote the planting of these plants.
9. Beekeepers should be given loans to buy modern box beehive accessories.
10. Research should identify and document the Indigenous Technical Knowledge of beekeepers in the province in order to integrate valuable ITK into improved beekeeping practices done in the province.

## CONCLUSION

The objectives of the study were to identify modern box beehive adoption by the beekeepers in Manicaland province of Zimbabwe. Stratified sampling technic has been used. The respondents were categorized into adopter and non-adopter beekeeper households. Quantitative and qualitative data were collected using focus group discussions, interviews, observations, key informant interviews. Data were analyzed using descriptive statistics thus, percentages, frequencies, mean, and standard deviates. It was found out that the level of education of an individual plays a big role in adopting new technology.

The research, extension services and non-governmental should give beekeepers adequate training in the form of practical. Most of the trainings given extension staff and NGOs are below standard. They do not help the beekeeper much. Institutions should give loans to beekeepers so that they can increase the number of hives on their own, without the assistance of donors. Trainers of beekeeping should have enough knowledge of the subject. They should not be handpicked to fulfill the duty. Projects should be well explained to the recipients before they are included in the project.

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