ADOPTION OF MODERN BEEKEEPING HIVE TECHNOLOGY IN HARU WOREDA, WEST WOLLEGA ZONE, OROMIA REGIONAL STATE OF ETHIOPIA.

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ABSTRACT

Beekeeping is a common farming activity and income generating activity in Haru Woreda and, promotional efforts were made to progress it, no systematic study assessed to evaluate the promotional efforts and people's response to it. This study was conducted to identify factors that determine adoption and profitability of modern hive beekeeping. In this study, multistage sampling technique was used to select 138 target respondents. The primary data were collected using an interview schedule and Various documents were reviewed to collect the secondary data. To analyze the data logit model was employed to identify the determinants of adoption of modern hive beekeeping and the result showed that education, beekeeping training, availability of accessories, extension contact, access to credit and land holding were positively significant affect adoption of modern hive technology. Therefore, these significant factors in adoption of modern hive technology should be considered by policy-makers and planners of governmental and NGOs in setting their policies and strategies to promote the adoption of modern hive beekeeping technology for higher production and profit.
Key: Bee Keeping, Logit, Profit

INTRODUCTION

Ethiopia has a potential about which accounted about 27% and 3% of African and World honey production respectively and makes the country the major producers in Africa and the tenth in the world (Faostat , 2015). Ethiopia has huge potential of the apiculture sub sector, which holds a key position for poverty reduction and natural resource conservation in the country . Owing to is varied ecological and climatic conditions, the country is among the major producer of honey both in Africa and in the world. Ethiopia is recognized as one of the poorest and most food insecure countries in the world. It is principally a net exporter of agricultural products, with 85 percent of its population employed in agriculture. In general agriculture Ethiopia contributes more than 45 percent to the nation's gross domestic product (GDP) and significantly affects the

country's export trade (USAID, AGP- AMD, 2012) and (CSA, 2015) resent reported point out that agriculture share in Ethiopian economy: 40.9% of the GDP is generated by agriculture and society 72.7% of the population depends on it for its livelihood. In presentation to 5th Apin Expo Africa, the country's economy dependent on agriculture which accounts 90% of export commodity (Demisew, 2016).

Oromia has the largest number of beehives followed by Amhara and SNNP. Jimma, Illubabor, and West Wellega were the areas of Oromia region with the highest number of hives (CSA, 2012). Despite the fact that the area of country has a experienced in practice of beekeeping and is highly suitable for sustaining a large number of bee colonies, the bees and the plants they depend on, like all renewable natural resources, are constantly under threat from lack of knowledge and appreciation of these endowments. Besides, several million bee colonies are managed with the old traditional beekeeping methods in all parts of the country.

Beekeeping can help economically vulnerable communities to increase economic stability. Honey production, pollination services, agriculture, and forestry are a few of the economic benefit of beekeeping. Bee products such as propolis, royal jelly, beeswax, and bee venom are also high value but low volume green products. In addition to the direct income from bee products, beekeeping generates off farm employment opportunities in many fields including hive carpentry, honey trading, renting and hiring of bee colonies for pollination, and bee based micro enterprises. Despite of its contribution for smallholder households' income in particular and nation's economy in general, honey production system is very traditional which results in low productivity and poor quality. For example, the 96% of the hives are reported to be traditional and 91% of the total honey produced come from traditional hives in the country (CSA, 2015).

The traditional beehives are simple cylindrical containers for housing the bees and their combs. They are hives with fixed honeycombs, usually in hollow logs or in clay or wicker containers. Traditional beekeeping does not make use of the better equipments and modern techniques. As a result, harvesting the produces kills or severely weakens the colony by using fire . Besides, the product obtained from the traditional hives is relatively low quality due to the presence of debris in the honey (Workeneh, 2008). This low productivity of honey per hive was due to the type of hive beekeeping farmers' use. To improve the low yield of honey per hive different packages was implemented and among them was the introduction of modern hive.

Promoting of modern hive technology in the region to increase the quantity and quality of honey production and build the capacity of beekeepers for better management of bees and hives for honey and beeswax production (Gidey Y, Mekonen T, 2010). Ethiopian government tried to introduce different beekeeping technologies to beekeepers. For productive of bee production, it is necessary to apply modern technologies and production methods of beekeeping. In addition, it is necessary to have modern and appropriate equipment to increase the chances of success.

The modern beehive has a production potential of 20-30kg per colony per year of honey while the traditional beehive produces 5-10kg per colony of honey (Holeta Bee Research Center, 2004). The modern hives allow honeybee colony management and use of a higher level technology, with larger colonies, and can give higher yield and quality honey.

The large number of modern beehive technologies have been introduced and promoted by the Regional Bureau over the past 10 years.

However, there was no study on its adoption status and profitability among farmers of Haru District, Why farmers are resisting or adopting about modern hive technologies and used still traditional hive even there is a potential. This is a big question so it is not answered with considerable evidence for the study area. Thus, this study is proposed with the Title Adoption and Profitability of Modern Hive Beekeeping in Haru Woreda West Wollega Zone of Oromia Regional State.

The potential for honey production and success in beekeeping development is depends on quality and quantity of bees and bee flora available and on the technology used in the available of local resources and economic considerations. This used which hive has favorable condition for beekeeping in the developing world goes beyond beekeeping for honey production. Choice of hive technology should be based on the cost and hive production based on quality and quantity of honey and availability in relation to local honey potential and cash return, which vary according to geographical location and temperament of both bees and beekeeper (Melaku, 2006) the result showed that Kenyan top bar hive is profitable than traditional hive and adoption of Kenyan top bar is influenced by institutional and psychological factor. Modern hive give high quality and quantity of honey (Holeta Bee Research Center, 2004).

Haru is one of the woreda of West Wollega zone of the Oromia regional state with high potential of honey production and where modern beehives didn't disseminate as traditional. The Woreda Office of Livestock and Fishery departments demonstrate and disseminate improved beekeeping technologies solely and in collaboration with projects like AGP (Agricultural Growth Program), Through organizations strive to demonstrate modern beehives in study the both adopters and non adopter.

Modern hive technology adoption is affected by socio economic, personal attributes ,institutional factors and concluded that the rate of adoption and dissemination of the technology is found to be very small (Tamirat, 2015). Problem associated with those factors are not enough like technology related factor , physiological factor and environmental factor and needs to know by compare the advantage of the new and existing technology based on their profitability is applicable. In the study of the Woreda there is no information available on the determinants of the technology adoption status and profitability of the modern hive technology. Beekeeping practiced using the traditional hive and the modern hive technology are both under the same traditional management system means no modern management system . However, information in terms of the character that contribute to their adoption and productivity on farm conditions is not

good. Therefore, the study will be very helpful to generate information new beekeepers and particularly to extension agents who are responsible to offer technological alternatives appropriate to the target and resources of the beekeepers in the study area as well as introducing beekeeping where it is not in practice (Melaku, 2006). But rapid and expansion of modern honey production technology is constrained by the shortage of better quality equipment, high price of improved equipment, lack of knowledge and training about the management of modern frame hives and others factors were using which is a problem to undertake internal inspection and feeding. Hence, Adoption and profitability of modern hive beekeeping is not studied in the study area. Therefore this study is important in disseminating and give better information.

RESULTS AND DISCUSION

This chapter presents the results and discussion of the study. It is divided into three subsections; the first sub section summarizes results by using descriptive statistics such as means, percentages and frequencies to describe the characteristics of sampled households by using explanatory variables. The second sub- section focuses on profitability of comparing modern hive and traditional hive. The third sub section presents the results from econometric analysis that identifies the determinants factors adoption of modern hive bee keeping.

Education Level: The mean years of education of the total households in the study area was 3.04in terms of years of schooling, where as the non-user and user had a mean education level of 2 and 4.32years of schooling, respectively. There was significant difference in the education level between user and non-user modern hive bee keeping household heads at 1% level of significance. The result indicates that, the education level of the non user was lower as compared to user.

Land Holding Size: This was also used in the analysis of the characteristics of the farm household in the study area. The result of the descriptive analysis shows that the mean cultivable land size calculated for the total sample households in the study area was 1.51 ha, with minimum and maximum land size of 0.015and 5 ha, respectively. On the other hand, the mean land size of the household for non-user was found to be 1.18 ha, with the minimum and maximum cultivable land size of 0.25 ha and 5 ha, respectively, where as that of the participants is 1.91 ha, with minimum and maximum of 0.025 ha and 5 ha, respectively. The descriptive analysis revealed that there was significant difference in the cultivable land size of households between user and non-user modern hive bee keeping at 1% level of significance. This implies that the users have higher cultivable land size on average when compared to that of non users.

Age of the Household Head: The average age of the household heads in the study area was 48.78years with a minimum of 21 and maximum of 68 years. The age of the household head influences whether the household benefits from the experience of an older person, or has to base its decisions on the risk-taking attitude of a younger farmer, there is no a significant difference in

the distribution of household head age between modern hive users and non users households.

Livestock Ownership of Respondent Households

Livestock production plays an important role in the study area. Farmers rear livestock for various purposes such as for food (source of egg, milk and meat), means of transport, animal dung for fuel wood and organic fertilizer, and means of transport and source of cash for urgent needs Livestock is also considered as a measure of wealth in the rural area. Farm households having a number of livestock are considered as wealthy farmer in the farm community. Livestock holding widely varied among the sampled households . The average size of livestock holding in tropical livestock unit (TLU) for the total sampled households was found to be 3.09 with standard deviation 1.14. Average holdings for user and non user modern hive bee keeping households were 1.91 and 1.18 TLU with standard deviation of 2.20 and 0.95 respectively. The survey result shows that user households possessed relatively higher number of livestock than non user modern hive bee keeping households even though the t-value shows that there is no significant mean difference between two groups.

Family size: The mean family size of the total sample households in the study area was about 7, with minimum and maximum family size of 2 and 12 respectively. The descriptive analysis revealed that there was no significant difference in the family size of households between users and non-users modern hive bee keeping.

Income of the household from honey: This was analyzed as characterizing the farm households in the study area related with the beekeeper. The mean annual income of the sample households in the study area was Birr 5971.6, with minimum and maximum annual income of Birr 3300 and 5175, respectively. But the mean annual income of the non-user of modern hive was Birr 4067.16 with minimum and maximum annual income of Birr 616 and 12870 respectively, where as that of the user of modern hive is Birr 8306.10, with minimum and maximum annual income of Birr 3375 and 19260 respectively. The descriptive analysis revealed that there was significant difference in the annual income of households between user of modern hive and traditional hive . The mean difference between the non-user and user was significant at 1% significance level. This implies that the income of the user of modern hive was higher as compared to traditional hive user. This suggests that modern hive strikingly increases income, if other factors affecting income may remain constant.

Table 1: Mean difference of users and non- user

For the Total Observation =138					User of modern hive=62				Non User of modern hive=76 Mean diff				Mean diff. test (t - value)
Variable	Mean	Std.Dv	Min	Max	Mean	Std.Dv	Min	Max	Mean	Std.Dv	Min	Max	
Age	48.7	12.7	21	68	48.06	13.1	21	68	49.3	12.5	25	68	0.59
Education	3.98	2.81	0	9	5.77	2.44	2	9	2.51	2.18	0	8	-8.25**
Lholding	1.51	1.14	0.00	5	1.91	1.23	0.012	4	1.18	0.95	0.5	5	-3.986**
Livestock	3.09	2.57	0	15	2.81	2.67	0	8	3.32	2.48	0	15	1.17
Famsize	7.06	3.48	2	12	7.41	3.99	1	15	6.78	2.99	2	12	-1.26
Income from beekeeping	6130	3717	3300	5175	8306	3728	3375	1	4356	27614	61	12	-7.29***
Experience	2.6	0.22	1	18	0.22	2.49	3	13	6.4	0.31	1	1	0.87

Source: Own survey data Computation, 2020

SOURCE OF INCOME

Household gross income is derived from agricultural (crop, livestock and honey) sales and value of crops , honey and livestock products retained for household consumption. In the case of beekeeper, individual household cropping income and cash crop income like coffee. The no non-farm incomes were also computed as part of gross household income.

Table 2: Total Income of users and non-users

Group	Obs	Mean	Std.Err.	Std.Dev.	[95% Conf. Interval]	
Non user	76	2294.89	1416.6.6	12349.68	20072.86	25716.91
User	62	26087.64	1884.17	14935.97	22320.01	29855.27
Combined	138	24329.31	1154.818	13566.04	-22045.74	26612.88
t = -1.3798						

Source: Own survey data Computation, 2020

Table 3: Income From Selling Livestock

Group	Obs	Mean	Std.Err.	Std.Dev.	[95% Conf. Interval]	
Non user	76	7405.362	602.3911	5251.524	6205.337	8605.386
User	62	11631.52	596.9651	4700.508	10427.82	12825.23
Combined	138	9304.072	461.4639	5420.974	-8391.559	-10216.59
t = -4.9273***				***Significant at 1%		

Source: Own survey data Computation, 2020

Table 4: Income From on farm

Group	Obs	Mean	Std.Err.	Std.Dev.	[95% Conf. Interval]	
Non user	76	13302.68	1136.915	9911.392	11037.83	15567.53
User	62	11244.71	1360.183	10710.09	8524.855	13964.56
Combined	138	12378.08	876.0408	10291.15	-10645.78	14110.4
t = 1.1701						

Source: Own survey data Computation, 2020

Household total Income: The total mean annual household income in the study area was 24329.31 ETB. From the total mean annual income of a household, cropping contributes share (38%) and livestock and honey production (61.76%). The minimum and maximum gross income of sample household was ranges from 6016 and 68350 ETB respectively. The total income difference between adopter and non adopter household is statistically insignificant. But I26087.64 ETB and 22894.89 ETB mean total income of adopter was greater than non adopter of modern hive beekeeping respectively.

Total on farm income: Total cropping income is the amount of mean annual income of a household obtained from types of cropping systems. The mean annual income of sample households from cropping income in the study area was 12378.09 ETB per year. The total mean annual 13302.68 ETB and 11244.71 ETB cropping income of non adopter households was substantially higher than that adopter for of modern hive households respectively. The t-test shows that there is insignificant difference between two groups.

Livestock income: Sale of live animals and their products are the main livestock-related income sources in the study area. The livestock income category includes income from the sale of livestock, livestock products (i.e. butter, eggs, honey etc.) . The mean livestock income for adopter and non adopter household was 11631.52 ETB and 7405.36 ETB respectively. Adopter of households had larger livestock income than non adopter households Based on the results of t-test statistically there is a significant difference between two groups.

Major constraints of beekeeping sub sector in the study area
In order to utilize the beekeeping sub sector, identifying the existing constraints and searching for solutions are of paramount importance. The participants identified seven major constraints. All problems cannot be solved at once because of time and capital shortage. As a result, prioritization of the problems was made to identify the most important constraints that hinder the development of beekeeping sub sector in the study area. The constraints can also hinder adoption of modern hives.

Table 5. Ranking of beekeeping constraints in the study area

S/no	Constraints	Frequency	Rank
1	Disease and pest	54	1
2	Pesticides and herbicides	52	2
3	Death of colony	36	3
4	Marketing problem	23	4
5	Lack of beekeeping skill	12	5
6	Swarming	6	6
7	Absconding of Honeybees	3	7

Source: Own survey data, 2020

Determinant Factors that Affect the adoption of modern hive bee keeping
The logit model was employed to estimate the effects of the hypostasized independent variables on adoption of modern hive beekeeping status of households. The model estimated groups of adoption of modern hive and non adoption of modern hive accurately. six significant variables were identified out of the eleven variables by estimating a logit model. Among the factors considered in the model, education of household, landholding, Beekeeping training, access to credit , Availability of accessory and Extension contact significantly affected adoption of modern hive bee keeping .

Results of multicollinearity diagnosis
Before running the two econometric models (logit and selection), the variables were checked for the existence of multicollinearity problem. As it is indicated on Appendix Table 6 (for dummy variables) and Appendix Table 7 (for continuous variables), the values of CC and VIF were very low compared to their respective critical values (< 0.75 for CC and <10 for VIF), which revealed the absence of a sever multicollinearity problem among these potential explanatory variables.

Educational level of the respondent : As the result , the educational level of the respondent was positively and significantly to influence the adoption of modern hive beekeeping. This is due to the fact that as the educational level of farmers is increased, farmers' ability to get, process and use information for their investment decisions is also increased. For example, as the educational level of farmers is increased by one grade level, the probability of deciding and adoption of modern hive will be increased by 36%, being other variables constant. This implies that as the farmers' grade level is increased, the ability of deciding to adopt modern hive will also be increased.

Landholding : positively affected adoption of modern hive households at significant level of 10%. The land size of households increased by 1 hectare, probability of adoption of modern hive was increased by factor 42%, other variables in the model kept constant. Own farm land can

facilitate experimentation with new agricultural technologies like used for shading of hive in homestead, planting flora. This implies that farmers having a large area for their apiary site encourage and motivate practicing the modern hive beekeeping technology.

Beekeeping training:- The marginal effect favor adoption of modern hive technologies increases by a factor 92% of for households who participated in beekeeping training programs. The positive relationship between trained farmers and adoption of the technology is that farmers who have clear information about the use and the method of implementing the technologies had the highest opportunity to adopt the technology. Adoption on modern beekeeping technologies training and demonstration of modern beekeeping both has positive significant effect on adoption probability at 1% a probability chance. The change from adoption to non adoption on training and demonstration will change probability of adoption . This implies that developing the ability of beekeeper through beekeeping training enhanced adoption of modern hive.

Access to credit :- Access to credit was positive and significant influence on adoption of modern hive at 10% significance level. The marginal effect in favor of adopting modern beehives technology; farmers who had access to credit , keeping other things constant, had 88% higher probability of adopting modern beehive unlike non-adopter farmers. The reason behind this is that those farmers who had access to credit sources will be able to buy modern beekeeping equipments and hives better than others that who didn't have access to credit. Credit received from primary saving and credit cooperative.

Availability of accessory: - availability of accessories significantly affect at 1%. Accessory enhanced the adoption of modern hive those accessories like smoker, veil , gloves, overall, boots, water sprayer, bee brush.etc used for this technology. Based on the result adopting modern beehives technology increases by factor 64.8% of house hold who had accessories of modern hives beekeeping This implies that the higher access of the agricultural equipment the respondent owned, the higher is the farmer willingness to adopt in technology

Access to extension service : has positive influence on the probability of modern hive adoption at 5% significance level. From this result it is possible to state that those household who have access to extension service like training and demonstration are more likely to adopt modern hive than those who have not. The marginal effect result also shows that the estimated increase in the probability of adoption of modern hive technologies due to access to extension service was 43% . In addition to offering information and creating awareness, extension service also includes advices, training during harvesting and catch queen, demonstrations and timely distribution of inputs. Farmers who are frequently visited by extension agents tend to be more progressive and more likely to experiment with modern hive technology.

Table: The Logistic Regression Result

Variables	Odds Ratio	Std. Err.	p>│z│	Marginal effect (dy/dx)
Sex	0.1163809	0.1802202	0.165	-0.4714066
Age	0.9727908	0.0378158	0.478	-0.0067167
Education	4.395242	2.130834	0.002*	0.3604763
Land holding	5.643553	3.570828	0.006*	0.0.421344
Livestock holding	0.9415481	0.2118245	0.789	-0.0146647
Beekeeping training	2338.775	5451.325	0.001*	0.9245949
Access to credit	577.3506	1642.964	0.025**	0.8833778
Availability of accessory	55.07548	89.12224	0.013**	0.6486591
Extension contact	5.893751	4.620904	0.024**	0.4319058
Family size	1.244752	0.2542637	0.284	0.033063
Experience	0.8522803	0.1675136	0.416	-0.0389177
Cons	7.23e-10	1.58e-08	0.004	
LR chi2(11) = 157.64 **Prop > chi2 = 0.0000** **Pseudo R2 = 0.8373**	*** , **, ***Significant at 1% , 5%, 10%**			

Source: Own survey data Computation, 2020

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS SUMMARY AND CONCLUSIONS

Logit model is used to examine the factors determining adoption of modern hive beekeeping technology and T-test was used for descriptive statics .Based on Econometric model results out of 11explanatory variables, six of them were found to be significant adoption of modern hive beekeeping technology. These variables were beekeeping training, Access to credit, Availability of accessory, Extension contact, Education and land holding significant

Bee keeping training participation had significant and positive influenced on the adoption modern hive bee keeping technologies. Training participation can improve farmers' skill, knowledge and perception about this technologies. As a result, policies and strategies should place more emphasis on strengthening the existing agricultural extensions service provision through providing rigorous training and upgrading farmers' awareness about technologies in the study area.

The credit system and utilization means need to be facilitated more in the study area to enable the farmers to use the credit in using of modern hive because this variable was affecting technology adoption. To enable farmers have modern hive with accessories the mechanisms such

as credit facilities from saving and credit cooperative is not only enough. Therefore, the government should be encourage cooperatives services and micro financial institutions strengthen and attract them in terms of number and capacity to reach the rural households need.

Access to extension service is also positively affect adoption of modern hive. Extension workers could play a key role in transferring knowledge to the rural people easily thereabout the technology through technical advice, training on field demonstrations giving aware of the advantage of technologies and willing to adopt new This means Farmers who have frequent extension agent contact are expected to be more familiar and more knowledgeable about the use of improved agricultural innovation . therefore Extension agent visit has the potential to enhance dissemination and management technology by aware of available information to the farmers. Moreover, this extension contact is useful to relay farmers' demand to practice and government policy makers to give more attention to new technology.

Own farm land can facilitate experimentation with new agricultural technologies like used for shading of hive in homestead, planting flora. farmers having a large area for their apiary site encourage and motivate practicing the modern hive beekeeping technology.

Availability of accessory is positively affect a chance of being adoption of modern hive because it needs accessory during harvesting and catch queen bees to keep in hives. therefore government should give attention to supply or capacitate private organization to supply accessory reach to farmer. So ,facilitating access to modern beehives and its accessories especially honey extractor ,wax stumper etc which can increase beehives which in turn c affects of adoption modern hive.

Household head's education level was found to be significant determinant of the adoption of modern hive. Therefore, the farmers should be educated by a means that fits with their living condition and also simply identify information of the technology such as adult education.

From descriptive statics education ,land holding ,income of household were significant from this results modern hive is used for income generating for livelihood of farmer . Income was a chance of adopting technology to buy hive with accessory.

Major problems of beekeeping sub sector were identified in the study area. Based upon the ranking result disease and pest, Pesticides and herbicides application, death of colony, marketing problem, lack of beekeeping skill, swarming and absconding of honeybees were found to be the major constraints in the beekeeping development of the districts. As beekeeping is not as such commercialized there is no such huge production per beekeeper in these areas, the whole bee products are sold around their own vicinity

RECOMMENDATIONS

Based on the findings of the study the following points are considered as an essential areas of intervention that need due consideration:-

1. Due to the constraint of cost of technology number of modern hive is not increasing. Institutionally and homemade modern hive give a better yield than traditional hive. Researchers

and development workers have to search other alternatives like the modifications of the technology using locally available materials to reduce the cost of the technology. In another way local artisans should be trained about the construction of modern hive using locally available material to ensure the supply of low cost modern hive.

2. Extension contact between beekeepers and extension agents should be further strengthened and by increasing frequency of contact to promote modern beekeeping technology that focuses on a practical approach and information about knowledge of the technology. Agricultural extension services have to be provided to farm households including those farmers who are far from development agent offices. Training should also be given by giving attention to wise way of using different chemicals specially herbicides to minimize the death of honey bees.

3 .Provision of credit services to beekeepers to widen the financial bases of poor beekeepers. Beekeepers can use the loan to buy modern beehives and access to modern beehives accessories like honey extractor, smokers, brush, gloves, wax stumper and others.

Bee-keeping equipment and accessories have to be supplied or made accessible to the farmers and great attention has to be given to increase productivity and to take appropriate management practices of modern beehives which can positively affect the probability of adoption of modern beehives.

Appropriate prevention and controlling methods of pests and predators, especially wax moth and birds, have to be further studied by biological researchers. Also, appropriate coping mechanisms for bee keeping during drought have to be further studied by biological researchers.

Cooperative office of the district and NGOs need to come together to strengthen the existing beekeepers cooperative as they can provide a good learning environment for similar areas. Organizing them to operate in enclosure areas has multiple advantages i.e. apiary can be established in the area and they can also protect and conserve it by planting different bee forages. Stimulate saving and credit cooperative to buy modern hive and accessories in other kebeles who didn't participate. Beekeeping cooperative should be strengthened and members are encouraged to pool their resources together to attract credit from financial institutions.

Modern hive can be more effective if it is accompanied by the promotion of hive shading, supplementary feed, bee forage, improved and protection, honeybee colony multiplication and post harvest handling practices. Extension and NGOs can assist the enterprise in demonstrating their reared honeybee colony to the surrounding beekeepers and other similar areas.

Education level of house hold head and practical knowledge of the technology were found to be positively and significantly influencing adoption decision of improved box hive. The educated beekeepers can easily understand the basic management practices of beekeeping and they also know the advantage that is obtained from improved beekeeping by comparing with traditional beekeeping. Hence, it is appropriate for research, beekeeping extension and NGOs to target them during on-farm research and modern hive beekeeping technology promotion as they can easily

understand about the technology which, in turn, helps for convincing the others to adopt the technology.

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