Impact of Sociocultural factors on adoption of modern technologies in beekeeping projects among women groups in Kajiado County- Kenya

Muya, B.Irungu , Ph.D. Candidate CEES, University of Nairobi, P.O. Box 30197, Nairobi , Kenya.

***Keiyoro P. Njenga, Ph.D. Senior Lecturer**, CEES, University of Nairobi, P.O. BOX 30197, Nairobi, Kenya.*Coreesponding author , pkeiyoro@yahoo.com , +254736493903

Gakuo C.Mwangi, Ph.D. Prof of Distance education, CEES, University of Nairobi P.O. BOX 30197, Nairobi Kenya.

Mugo K., Ph.D candidate, CEES, University of Nairobi, P.O. Box, 30197, Nairobi ,Kenya.,

Abstract

Sociocultural factors can have various impacts in projects during different project phases. These impacts can be either negative or positive. It is important for project implementers who target adoption of technology among people who hold onto certain cultures to understand what their clients believe and consider effective as well as acceptable. This research focused on sociocultural factors influencing adoption of modern technologies in beekeeping projects with particular focus to women beekeeping groups in Kajiado County in Kenya. The objective of the study was to establish the sociocultural factors that influence adoption of modern beekeeping technologies. The target population for this research was the beekeeping women groups in Kajiado County where a sample size of 116 respondents were drawn. The study employed the use of personal interviews, questionnaires, observation guides and key informant interview guides to collect data from the targeted respondents. The collected data was coded and entered into SPSS (version 21) for analysis. The findings of the study revealed that sociocultural factors have a positive and negative influence on adoption of beekeeping technologies. The factors identified were sex of the household head, marital status, size of the house hold, size of land and cultural beliefs. This conclusion confirmed the study carried out by the Kenya Beekeepers Association (K.B.A., 2005) which suggested that some of the sociocultural factors affecting adoption of new technologies could be sex of household, marital status and size of the household among others.

Key words: Adoption, Beekeeping, Influence, Sociocultural factors, Technology,

Introduction

Sociocultural factors are patterns of collective behaviour that influence projects but which are impossible to control in project management. They are more or less preconditions for various tasks that can be shaped to execute projects. From this cultural perspective, the art of management lies within the ability of the project organization to be inventive in its adjustments to the local modes of working.

Cultural differences can have various impacts on project implementation. They vary during different project phases and in project types. Such impacts can be negative or positive. Evidence from case studieshave shown that sometimes no change is observed even after project implementation. The big

question is, whether cultural factors have any influence on project outcome which could be either negative or positive. It is important for project implementers targeting different cultures to understand what their clients believe and consider effective as well as acceptable by the society. Understanding a culture's perception is useful in discovering major aspects of the client's world view (Feder *et.al*.,1985). Cultural perceptions and responses to technological interventions may vary from community to community and in some cases from clan to clan in Kenya. In addition to cultural beliefs values, practices and cultural communication patterns also affect people's related behaviour and beliefs.

The Maasai people of Kenya live in areas with hostile environmental conditions and extended drought periods. They are pastoralists who are forced by the prevailing ecological circumstances to move with their livestock in search of water and grazing resources (Mbae, 2012). Their heritage is in cattle and their resistance to change has led other communities in Kenya to regard them as people living with nature. This community has a profound knowledge in livestock, wildlife, trees, herbs, roots and grasses that are part of their environs. The Maasai people are often firmly founded in their culture and at times opposed to modern technological changes being imposed on them. Currently, due to influence from other cultures the traditional Maasai people way of life is increasingly changing. The community is caught between a desire to maintain their culture and the need to adapt to changing social, political and economic conditions. Over the years, donor and government agencies have initiated many projects to help the Maasai community find ways to fulfil their social, economic and education needs. However, the process has been slow. Low population densities, poor communications network and the poor road infrastructure hamper the provision of services to the nomadic Maasai people (District Development Report, 2005) Hence, the pastoral lifestyle, inadequate access to modern community services, hostile environment, poor infrastructure, have made the Maasai people remain stuck to their cultural values. This has resulted in poor utilization of available resources and adoption of modern technologies in their lifestyle.

According to Kukonza *et.al*.(2009), improving the living standards of rural people through modern beekeeping is still a challenge despite technological advances. The beekeeping enterprise had not received sufficient attention in the past (Matami, 2008). However, beekeeping has been promoted widely in many countries as a major rural development engine (Bees for development ,2000). Not only does the practice of beekeeping has intrinsic health benefits through providing a source of great nutritional value; but it also requires relatively few inputs and capitalizes on a readily supply of pollen and nectar from crops the bees pollinate. Beekeeping therefore is emerging as a very successful agricultural practice for rural areas in developing countries mainly due to its economic benefits from its products (Kukonza, 2009). In Uganda for example, honey, beeswax, propolis, royal jelly and bee venom are major financial products (Karealem, et al, 2007), with pollination as the major biodiversity benefit (Delaplane *et.al.,* 2008).

The main economic activity among the Maasai people in Kajiado County, is pastoralism that is keeping cattle, goats, sheep and donkeys (District Development Report, 2005). However, beekeeping is a subsidiary activity that has become a lifeline to this community which is known for the importance they attach to their cattle for many generations. The recurrent droughts have left the Maasai with little alternative but to diversify their economic activities. Mbae, (2012) notes that when modern hives were initially introduced, the honey harvesters had to brave the angry bees without any protective clothing. The use of modern equipment have enabled many beekeepers to harvest honey more conveniently than before and obtain higher quality honey. Among the Maasai community, men dominate women in social life but in beekeeping enterprises women have been empowered (Mbae, 2012). The modern hives have also, by nature of their ease of management, have been beneficial to the Maasai people by conserving the environment around them and convenient for use by the women.

The Kenya Government have realized the potential of Beekeeping sub- sector, hence has recognised the beekeeping enterprise as a source of livelihood for rural Kenyans.The main objective of this approach was to introduce improved beekeeping technologies such as modern hives, honey extractor, honey presses, smoker, veil and gloves which were initially imported from abroad. Beekeeping training programmes have been launched in order to assist farmers and extension Technicians. Before then beekeepers in Kenya were only using traditional beehives, which were inconvenient to undertake internal inspection and feeding. Traditional bee hives had no facilities to accommodate supers (honey chambers) to separate brood and honey.

In order to improve honey yields in quantity and quality, Agricultural and Rural Development Officers and various Non-Governmental Organizations have introduced improved technology in the form of improved box hives. Ehui *et.al.* (2004) in their study on adopting social science technology revealed the difficulties of developing a universal model of technology adoption with defined determinants and hypothesis. This is because of sociocultural and ecological distinctiveness of different sites and dynamic nature of most of the determinants. Further, Kerealem (2007) stated that the adoption rate of an improved technology is often low in the country. His study suggested the importance of further investigation of factors influencing the adoption of improved hives and the new technology. He recommended repeated studies of factors influencing adoption of new technologies under different conditions. It should be noted that so far there has not been sufficient information on sociocultural, socioeconomic and socio-psychological factors influencing adoption of beekeeping technologies and the financial benefits of adopting new technologies in Kenya. This information is vital and lacking and therefore this research was necessary (Crane, 1990) hence the importance of this study. Based on this information, this research was relevant in order to find appropriate answers on sociocultural factors influencing adoption of modern technologies in beekeeping.

The purpose of this research was to assess the sociocultural factors influencing adoption of modern technologies in beekeeping projects, taking the case of women beekeeping groups in Kajiado county of Kenya.The specific **objectives of the research were therefore to** establish how the level of education, sex of household head, size of household , land size and cultural beliefs influenced adoption of modern technologies in beekeeping projects.

Literature review

Modern beekeeping emerged about the 18th century when European understanding of bee colonies and their biology made it possible for them to construct movable comb hives so that honey could be harvested without destroying the entire colony, Crane (1990). According to Crane (1990) these methods were perfected in Northern America where the European honeybee was being reared by immigrants from Europe. In Africa, traditional beekeeping methods have persisted for a long time and has the longest history. Honey hunting and use of traditional beehives still thrives in many countries in Africa.

Paterson (2006), noted that beekeeping in Kenya is as old as its history and has always been a predominantly male occupation. This can be explained by several factors. Culturally, beekeeping has been generally considered to be an exclusively male domain and male beekeepers sometimes even objected to women becoming beekeepers. There are also a number of practical constraints that hitherto hindered women from participating in this economic activity. First, handling traditional log hives required physical strength. Two, it was often necessary to climb trees where hives are hung to harvest honey. Beekeeping had, therefore, not been considered suitable for women for these modesty reasons. Harvesting honey from

traditional beehives also required long absence from home, which conflicted with women's domestic traditional chores in the society.

In a study report by Gok,(2004) on the honey value chain to identify how beekeeping farmers could position themselves in the development of the agricultural sector, it was revealed that limited value addition was being realised due to minimal investment in technological and market development initiatives. The same report indicated that the low priority given to the sector had also affected the scale of production and productivity of beekeeping. It was therefore necessary to explore ways to encourage technological innovation in the honey sector as a means of alleviating rural poverty. It is within this context that an opportunity for women to participate in the honey value chain was recommended. This was achieved by introducing modern top bar hives as an appropriate beekeeping technology for women as the hives required less physical activity and could be installed closer to their homes (Kigatiira,1979)

According to the same report Gok (2004), the third element of the intervention focused on the empowerment of women with appropriate beekeeping equipment and supporting the creation of women groups within communities . The reason for encouraging women to work in groups was because modern beehives required intensive monitoring and management. This is appropriate in organised groups. Moreover, the cost of the technology would be unaffordable for groups than individual members.

The relationships established between women's producer groups and processors' associations have strengthened the value chain as a whole. The provision of input technology service to women's groups through a revolving fund combined with embedded management skill training provided by the beekeepers' associations has been the key driver of success of this model (Kimanji ,2002). It has provided women with the opportunity to access technology in a more affordable manner hence contributing to the development of the beekeeping sector. The use of the top-bar beehive has also been appreciated by male beekeepers since it contributes to household requirements such as health and education, enabling men to spend a larger proportion of their income on other needs. Still, the key challenge is to ensure that the technology continues to stay affordable for women beekeepers and that adequate capacity development is provided for good management of modern beehives. These challenges are partly responsible for the marginal adoption of this technology in the country in comparison to traditional beehives. It is important to note that, the market trends indicate that demand for modern hives is growing, driven by rising need from processors for more and better quality honey. Consequently, the market is driving the possibility of up scaling this model (Nafula, 2008).

Majority of beekeepers in Kenya still use traditional production systems which mainly comprise of hollow log hives (Cramb, 2003). These hives constitute the single largest number of hive types in the country estimated at 1,273,000 with 73% of the hives concentrated in the eastern part of the country (Mwabu, *et.al.*,2002). Other traditional hives include the bark hives made of bark that has been peeled from the trunk of a tree. Honey harvesting is normally done at night and it sometimes involves stripping naked before climbing the trees on which the hives are hanging (Porter, 2002).

Modern beekeeping practices involve the use of improved technologies which are easy to manipulate and manage. The main types of hives used are the movable comb hives and the movable frame hives. Other accessories that go together with modern beekeeping include the catcher box, protective clothing, smoker, hive tool, bee brush, the honey extracting and refining equipment. Improved management practices are also part of the improved beekeeping technology and include seasonal management of routine colony inspection, colony division, artificial feeding and pest control.

Adoption is viewed as a variable representing behavioural changes that farmers undergo in accepting new ideas and innovations in agriculture. The term behavioural change refers to desirable change in knowledge, understanding and ability to apply technological information, changes in feeling behaviour such as changes in interest, attitudes, aspirations, values and changes in overt abilities and skills (Rogers, 2003; Feder *et. al* ., 1985,Dasgupta, 2009 ;Leeuwis, 1993; Demeke, 2003)

According to the psychological field theory of Kurt Lewin (1986), the interaction of situational forces with the perceived environment can be described as a field of forces towards modernization. Hence a farmer or woman beekeeper in his subjectively perceived environment feels something is worth striving for targets. He/she then mobilizes his/her personal powers to achieve this goal. When something negative or undesirable occurs, he/she activates his personal powers in the same way to avoid the negative situation. Ways of reaching targets and avoiding negative situations can be blocked or impeded by barriers or inhibiting forces. This includes lack of knowledge, uncertainty about outcome, insufficient capital, cultural practices, lack of opportunities for scaling up of innovation which are the key determinants to adoption of modern technologies.

According to Kenya Beekeepers Association (KBA, 2005; Spielman (2005;) conference proceedings report, socio cultural factors that influence adoption of modern technology are many and may include: sex of household head, marital status, and size of the household among other factors. Adoption of modern technology will therefore have to take into consideration such factors. This indicates that farmers with large family size, for example, may opt more for technology adoption. This in turn implies that technology adoption will increase hive products which contribute to satisfy the needs of their families. Farm experience may help the farmer to get more understanding of management practices of the farm activities. Similarly, education level of adopters such as women of improved technology could be higher than non-adopters of the technology. This implies that, cultural practices and education level of the beekeepers can positively be associated with adoption of improved modern technology of beekeeping (KBA, 2005; Endrias Geta ,2003; World Bank ,2007; European Commission manual ,1997)

Methodology

This research was carried out through descriptive research design (Cooper and Schindler,2003. This method dealt with the intensive investigation of the problem relevant to the research. This entailed selecting several targeted cases where intensive analysis of the possible alternatives for solving the research problem was carried out.

The target population comprised of one county livestock production officer (C.L.P.O), one member from each key stakeholders Dupoto e maa, Neighbours Initiative Alliance, German Agro Action, Maasai Community Development, ASAL Management and 10 women beekeepers selected through simple random sampling from each of the 72 registered women beekeeping groups in Kajiado County.

Table 1. Target population

Category	Target population
County Livestock Production Officer	1
Neighbour Initiative Alliance	1
German Agro Action	1
Maasai Community Development	1
ASAL Management	1
Dupeto-e maa	1
Women Beekeepers	720
Total	**726**

The researchers used purposive sampling to select one County Livestock Production Officer and one member each from other key informants from the key stakeholders. The researchers collected primary data from women beekeeping groups using semi-structured questionnaires, consisting of close and open-ended questions (Kombo and Tromp, 2006). The semi-structured questionnaires addressed both quantitative and qualitative aspects of the information in the research.

Secondary data was collected from journals and reports filed with the Ministry of Agriculture Livestock and Fisheries during the desk top review process. This complemented the findings obtained from the primary data sources. The researchers used key informants interview guides where respondents were asked questions and gave immediate feedback. Key informant interviews were held with six stakeholders in Kajiado County which involved purposively picking one individual representative from Dudoto, Neighbours Initiative Alliance, German Agro Action, Maasai Community Development, ASAL Lands Management and the Ministry of Agriculture, Livestock and Fisheries representatives.

Results and Data analysis

The researchers sought to find out level education among the women. Table 1.

Table 1. Education levels of Respondents

Education levels	Frequency	Percentage
none	30	42.25
Primary	30	42.25
Secondary	8	11.27
University/College	3	4.23
Total	**71**	**100**

From the data collected it was revealed that majority 42.25%, of the respondents did not have any formal education, an equivalent number 42.25% had primary level education, 11.27% of the respondents had secondary education while 4.23% of the respondents possessed University/college qualifications indicating that most beekeepers (85%) were either illiterate or had primary level of education.

Experience in beekeeping

The researchers sought to find out the beekeeping experiences within the women groups. Table 2 shows results on the experience in beekeeping of the respondents in their respective groups.

Table 2. Experience in beekeeping

Experience in beekeeping	Frequency	Percentage
Less than One year	1	1.41
One to two years	3	4.23
Three to five years	6	8.45
Five years and above	61	85.92
Total	**71**	**100**

The findings indicated that, majority 85.92% of the respondents had five years and above of experience, 8.45% of the respondents had experiences ranging between three to five years, 4.23% of the respondents between one to two years, while 1.41% of the respondents had less than one year.

Sociocultural factors influencing adoption of new technology

The study sought to establish the socio cultural influence on adoption of new technologies. The results are shown in table 3;

Table 3. Cultural factors influencing adoption of new technologies

Cultural factors on new technology adoption	Mean	Std Dev
Sex of household held	4.01	0.792
Marital status	4.14	0.798
size of household	3.61	0.594
size of land	3.77	0.897
cultural beliefs	4.19	0.785

From the findings majority of the respondents strongly agreed that cultural beliefs influence adoption of new technologies. This was shown by a mean score of 4.19. Respondents also strongly agreed that Sex of the household head influenced the adoption of new technologies as shown by a mean score of 4.01. Marital status equally influenced the adoption of new technologies as shown by a mean score of 4.14. Other factors contributing towards the adoption of new technologies were size of land and size of the household as shown by a mean score of 3.77 and 3.61 respectively. This implies that sex of the household head, marital status, size of household, size of land and cultural beliefs strongly contribute to influence adoption of new technologies in beekeeping.

Key informant interviews and focus group discussions held with the field officers revealed that farmers who are young in age were reported to be more willing to adopt modern technologies faster. Women heading families were also fast in adopting modern technologies among women beekeepers. The interview further revealed that farmers with large family size opt for the adoption of new technologies faster as compared to those with small families. Small land size was also positively rated. This confirmed what Spielma (2005) who stated, that a beekeeping activity can be undertaken on small land size. He also observed that one of the relative advantage of beekeeping activity is that it does not require fertile land and uncultivated land could also be suitable for beekeeping and therefore, for landless farmers, having just an apiary site is sufficient for engaging in the activity

Aspects of sociocultural factors influencing technology adoption

The study had sought to find out those aspects of sociocultural factors that influenced adoption. of new technology table 4:

Table 4. Aspects of sociocultural factors influencing technology

Aspects of social cultural factors and technology	Mean	Sd Dev
Farmers having large families easily opt for new technologies	3.32	0.824
New technology adoption increases hive products (honey, beeswax, propolis, pollen, royaljelly , beesvenom) which contribute to satisfy the needs of the families	4.26	0.505
Farm experience helps farmers to get more understanding of management practices of the farm activities	4.33	0.476
Education level of beekeepers is positively associated with adoption	4.09	0.658

From the findings as shown in the table, majority of the respondents strongly agreed that farm experiences help farmers to get more understanding of management practices of the farm activities as was shown by a mean score of 4.33. Respondents also strongly agreed that new technology adoption increases hive products which contribute to satisfy the needs of the families as was shown by a mean score of 4.26. It was also revealed that education level of beekeepers is positively associated with adoption and farmers having large families easily opt for new technologies as indicated by mean scores of 4.09 and 3.32 respectively. The implication here is that farmers having large families easily opt for new technologies with hope that the new technology adoption would increase hive products which contribute to satisfy the needs of the families; while farm experiences helps farmers to get more understanding of management practices of the farm activities; and education level of beekeepers is positively associated with adoption.

Responses on Culture as an influence of adoption of Modern technologies

The results of responses collected from the respondents on whether Culture influences the adoption of modern technologies is shown in table 5.

Table 5 : Cultural influences on the adoption of modern technologies:

Response on influence of culture on technology adoption	Frequency	Percentage
Yes	69	97.18
No	2	2.82
Total	**71**	**100**

The findings revealed that majority 97.18% of the respondents agreed that culture influences technology adoption, while only 2.83% of the respondents did not agree.

Discussions

Sociocultural factors were found to have an influence on the adoption of beekeeping technologies among the women beekeeping groups in Kajiado County. The sociocultural factors that were identified included sex of the household head, marital status, size of the house hold, size of land, education level, experiences in beekeeping, social status and cultural beliefs. All these factors were found to strongly influence adoption of new technologies in beekeeping among farmers. These findings confirmed the report of the Kenya Beekeepers Association (K.B.A., 2005) which suggested that some of the sociocultural factors affecting adoption of new technologies could be sex of the household head, marital status and size of the household among others. Spielman, (2005) also stated that a beekeeping activity can be undertaken on small land size and that one of the relative advantages of beekeeping activity is that it does not require fertile land and hence, for landless farmers having just an apiary site is sufficient for engaging in beekeeping activity.

In the European commission journal (1997) it is reported that there are both positive and negative cultural characteristics that influence adoption. It is further reported that other indicators that influence adoption of new technologies are timing of the project, age of the beekeeper, education status of the beekeeper, own land holding, social status of the beekeeper, average household size and household assets which are all sociocultural factors that stand to be key determinants of adoption of technologies in beekeeping.

Conclusions

The research sought to answer four basic questions touching on the sociocultural factors that influence adoption of modern beekeeping technologies. In answering these questions, the study concluded that sociocultural factors including sex of the household head, marital status of the farmer, size of the house

hold, size of land, education levels, social status and cultural beliefs positively or negatively influence adoption of new technologies.

Recommendations

It is evident that sociocultural factors, positively or negatively influence adoption of modern beekeeping technologies. The study found out that all the identified factors influenced the adoption of modern technologies in beekeeping in one way or the other as discussed in this report. Following the findings of this study, therefore, the researchers made the following recommendations: That there is need for Training and Extension Experts in Agriculture and Livestock production to address, consult and study sociocultural factors in a particular community and/or region before and during the process of introducing new beekeeping technologies. This will help to mitigate the negative influences. Extension Experts tasked with the responsibilities of introducing new technologies should first explore the strengths, limitations or otherwise of these factors in a particular area or region before introducing the technologies.

This study was carried out in Kajiado County with women beekeeping groups. The researchers suggest similar research be carried out in different locations of different ecological zones to establish other factors that could be influencing adoption of new beekeeping technologies and for comparison purposes.

References

Bee for development, (2000). Agricultural Extension Black well Science Ltd, UK

Cooper and Schindler (2003) Research methodology and design writing in proposal and thesis writing.47:14-16.

Cramb, R.A. (2003). *Processes Affecting the Successful Adoption of New Technologies by Smallholders.In:* Hacker, B. (ed). Working with Farmers: *The Key to the Adoption of Forage Technologies,* pp.11-22. ACIAR Proceedings No. 95. Canberra: Australian Centre for International Agricultural Research.

Crane, E., (1990). *Bees and beekeeping*: Science, practice and world resources. Comstock publishing associates (Cornell university press), Ithaca, New York.

Dasgupta, S., (2009). Diffusion of Agricultural Innovations in Village India, Department of Sociology and Anthropology, University of Prince Edward Island, Canada

Delaplane, A., Kydd, J., Morrison, J. &Uray, I. (2008).A policy agenda for pro-poor agricultural growth. World Development 32(1):73-89.

Demeke, A.B. (2003). "*Factors Influencing the Adoption of Soil Conservation Practices in North western Ethiopia*." Discussion Paper 37.Institute of Rural Development, University of Goettingen.

District Development Report, (2005) Kajiado. Science and Poverty: An Interdisciplinary Assessment of the Impact of Agricultural Research. *International Food Policy Research Institute,* Washington, D.C.

Ehui Jemal, (2004). Adoption of Beekeeping innovations: its income and gender implications in adamitulu district. Unpublished M.Sc. Thesis, Haramaya University, Haramaya.

Endrias Geta, (2003). Adoption of Improved Sweet Potato Varieties in Boloso Sore Woreda, Southern Ethiopia. An M. Sc. Thesis Presented to the School of Graduate Studies of Alemaya University.

European Commission (1997) The Oslo Manual: The measurement of Scientific and technological activities; Proposed guidelines for collecting and interpreting technological innovation data.

Feder, G., Just, R.E. &Zilberman, D., 1985. Adoption of agricultural innovations in developing countries: a survey. Econ. Dev. Cult. Change, 33: 255-297.

GoK, (2004). Second report on poverty in Kenya, Vol.ii.Poverty and social indicators. Nairobi: Ministry of Planning and National Development.

Karealem, T.S., Burke, W. J., Freeman, H.A. &Kristjanson, P. (2007). Factors Associated with Farm Households' Movement Into and Out of Poverty in Kenya: The Rising Importance of Livestock. A paper prepared for the international workshop *"Understanding and addressing spatial poverty traps: an international workshop*" 29 March 2007, SpierEstate, Stellenbosch, South Africa

KBA., (2005). Kenya Beekeeping Association, fourth annual conference proceedings. Nairobi. Kenya bureau of statistics, 2009 report.

Kigatiira,K.I,and R.A.Morse (1979) The construction, Dimensions and sittings of log hives near Nairobi.

Beekeeping in rural Dev, IBRA, London, 1979:p53-58

Kimanji, (2002) Predicting Household Poverty: *A Methodological Note with a Kenyan Example Social Sector Division Kenya Institute for Public Policy Research and Analysis* Discussion Paper Series No. 12 Nairobi, Kenya.

Kombo D, Tromp K (2006). Proposal & Thesis Writing. Kenya. Pauline's publications.

Kukonza, H. &Gordon, A. (2009). Agricultural Marketing in Developing Countries: The role of NGOs and CBOs, Natural Resources Institute

Kurt Lewis (1986): Stochastic Field Theory of Behaviours. Commentationes Scientiarum Socialium, 34. Societas Scientiarum Fennica, Helsinki.

Leeuwis, C. (1993) Of Computers, myths and modelling; the social construction of diversty, knowledge, information and communication Technologies in Dutch horticulture and agricultural extension.

Matami, R.M. (2008). The growth of Kenya's bee keeping industry.

Mbae, R,M (2012) Factors Influencing Implementation of ALLPRO Beekeeping Project in Kajiado and Mwingi Districts .An MBA reaserch project paper, Kenyatta University

Mwabu, G., Kimenyi, M.S., Kimalu, P., Nafula, N.&Manda, K. D. (2002) Predicting Household Poverty: A Methodological Note with a Kenyan Example Social Sector Division Kenya Institute for Public Policy Research and Analysis Discussion Paper Series No. 12 Nairobi, Kenya.

Nafula, H.T. (2008) Adoption and Diffusion of beekeeping apiculture in Kenya; An empirical study carried out in the Centre, Southwest and Northwest Provinces.

Paterson,P.D(.2006).The tropical agriculturist. Macmillan Publishers limited (2006)

Rogers, E. M. (2003) Diffusion of innovations, fifth edition. Free Press, New York, U.S.A.

Spielman, J. (2005) Innovation Systems Perspectives on Developing-Country Agriculture: A Critical Review. ISNAR Discussion Paper 2.

World Bank (2007) *Enhancing Agricultural Innovation: How to go beyond the strengthening of research systems.* Washington DC, USA: World Bank.