



RESEARCH ARTICLE

ECONOMIC FACTORS INFLUENCING ADOPTION OF MODERN BEEKEEPING TECHNOLOGIES AMONG WOMEN BEEKEEPING PROJECTS IN KAJIADO COUNTY- KENYA

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INTRODUCTION

The main economic activity among the Maasai people in Kajiado County is traditional livestock farming which include cattle, goats, sheep and donkeys. However, beekeeping activity has recently become important to this community known for the importance they attach to their cattle for many generations. The recurrent droughts have forced the Maasai people to diversify their economic activities through time. Mbae (2012), Muya, Gakuu and Keiyoro (2016) noted that in the past honey harvesters braved the sting by bees without any protective devices. In the recent times due to availability of modern beekeeping equipment, many bee keeping communities in Kenya have adopted new technologies in harvesting honey. However, although among the Maasai people traditions, men are dominant over women, beekeeping activities are today a main activity in economically empowering women (Mbae, 2012). Hence, the modern hives have by nature of their management, been beneficial to the Maasai women by enhancing conservation of the environment since this provides alternative income generating activities. Patterson (2006) found that modern technologies in beekeeping allow higher honeybee colony

ABSTRACT

Modern technologies in beekeeping have advanced over the years. However, satisfying the basic needs of the rural people by improving their standards of living through adoption of modern technologies in beekeeping is still a challenge despite advances in the technologies. This is due to the relative slow adoption rates of the new technologies. This study was designed to find out how the economic factors influence the adoption of modern beekeeping technologies using the case of the women groups in Kajiado County in Kenya. The specific objectives of the study were to determine how product market prices, substitute commodity prices, consumer incomes, beekeeper's income, and Government policies, influence adoption of the beekeeping technologies. The target population for this study was 720 beekeepers and six key informants selected through simple random sampling procedures from 72 women groups in Kajiado County. A sample size of 116 respondents was drawn. The researchers used personal interviews, questionnaires, observation guides and key informant interview guides to collect data from the targeted respondents. The collected data was cleaned, coded and entered into SPSS (version 21) software for analysis. The researchers found that economic factors influenced the adoption of beekeeping technologies. Among the economic factors identified were product prices, substitute product prices, consumer income, beekeeper's income and Government policies. It was therefore recommended that these economic factors had vital influence on adoption of modern technologies. Hence the implementers of new technologies need to consider and take into account these factors whenever new technologies are being introduced to similar communities.

management and give higher yield and quality honey. The improved box hive has components like brood chamber, super or honey chambers, inner and outer cover. It has advantages over the traditional hive in that it gives high yields of honey in terms of quality and quantity. The other advantages of improved box hive are its ease in swarming control. By increasing supers, it has the ability to allow bees to be moved from place to place in search of flowers and pollination services (Crane, 1990; Muya et al., 2016). The purpose of this study was therefore to determine the economic factors influencing adoption of modern technologies in beekeeping projects; taking the case of women beekeeping groups in Kajiado county in Kenya. The specific objectives of the study were therefore to determine how prices of honey, prices of related commodities, consumer incomes, beekeeper's incomes and Government policies; influence adoption of modern beekeeping technologies.

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 (Muya, *et.al.*, 2016). Improved management practices are also part of the improved beekeeping technology that include seasonal management routine, colony inspection, colony division, artificial feeding and pest control. The ancient Greek beekeepers used basket hives in which a series of bars were used to form the top of the hive (Mann, 1976). These types of hives were designed to allow the combs to be removed, inspected and returned back to the hive. The Kenya Top Bar Hive (KTBH) was designed in the 1970s. It is a modification of the Greek basket hive with movable, interchangeable top bars (Patterson, 2006). The hive is basically a one chamber wooden box with the sides sloping inward at an angle of 120 degrees to the horizontal. The KTBH has a number of advantages over the traditional log hive in that combs can be easily removed for inspection and returned to the hive. The honeycombs can be removed without interfering with the brood nest. Honey quality is improved since pollen and brood combs are separated from the harvested honey. There is improved pest control and the low hanging height makes it easier and faster for various management operations (Kigatiira, 2006). Adoption can be classified into individual and aggregate adoption according to its coverage. Individual adoption includes the farmer's decisions to incorporate a new technology into the production process while aggregate adoption is the process of diffusion of a new technology within a region or population (Feder, 2005). The adoption pattern to a technological change in agriculture is not uniform at the farm level but a complex process, which is governed by many socio-economic factors (Salim, 2006). The farmers' socio-psychological system and their degree of readiness and exposure to improved practices towards improved agricultural technologies act as incentives or disincentives to the practices (Salim, 2006).

Adoption represents behavioural changes that farmers undergo in accepting new ideas and innovations in agriculture. According to Rogers (2003) behavioural change refers to desirable change in knowledge, accepting 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. Hence adoption is the degree of use of a new technology when a farmer has full information about the technology and its potential for higher yields (Feder, *et.al.*, 1985). Therefore, adoption of a new technology may spread or diffuse within a region (Rogers, 2003; Feder, 1985; Rogers and Shoemaker, 1971). The decision of whether or not the beekeepers will adopt a new technology may hinge upon a careful evaluation of a large number of technical, economic and social factors. Further the adoption or rejection of an innovation is hence a decision to be made by an individual (Dasgupta, 2009; Hagmann, 2003). The probability of adopting a new technology will depend on the difference in profitability between the new and old technologies and the ability of the farmer to perceive the advantages and efficiently utilize the new technology (Behera, 1999). As noted by Gavaian and Gemechu (1996) high yields are not necessarily sufficient conditions to motivate farmers to adopt a technology. With technology application, farming must be basically profitable or at least more cost-effective than other alternatives (Behera and Mahapatra, 1999). Beekeeping as a source of valuable food and off-farm income in rural areas of developing countries has been more valuable than other farm products (Ambrosini *et.al.*, 2002; Kerealem, 2005). Behaviour adoption is seen as resulting from the psychological field of inhibiting and driving forces hence these forces are present in a state of equilibrium or disequilibrium in varying degrees of tension between them. Once such forces are identified in the farmer's decision making process, the chances of diffusion can be estimated and consequences for promotion programs concluded. Lack of financial assistance, information and attitude can inhibit adoption of a technology (Hoffman, 2006).

METHODOLOGY

This study used a descriptive research as explained by Cooper and Schindler (2003). The study was concerned with finding out the what, where and how economic factors influenced adoption of bee keeping

technologies. The target population in this study comprised of 720 beekeepers and six informant groups selected through simple random procedures from 72 registered women beekeeping groups and six key informant groups. The study used the Fishers (1958) formula to arrive at a sample size of 116 of which 71 farmers responded. Questionnaires were used as the main instruments of data collection. These consisted of structured and open ended items with the use of Likert scale to measure a range of opinions. These questionnaires were self-administered. Semi structured interview guide and focus group discussions guide for the key informants were also used. Pre-testing of the questionnaires was done to identify and change any ambiguous questions. This helped to improve the content validity of the data that was collected. The data was examined and edited to correct errors and omissions. The responses to every question in the filled questionnaires were coded, entered and analyzed using Statistical Package for Social Scientists (SPSS) version 21 software programme. A frequency table with varying percentages was used to present the findings.

Table 1. Target population

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

RESULTS AND DATA ANALYSIS

The data (Table 2) revealed that majority 49.3% of the respondents were aged 50 and above, 46.48% of the respondents were of the age between 36-50 years while 4.23% of the respondents were aged between 18-35 years.

Table: 2 Age of the respondents

Age	Frequency	Percentage
18-35 years	3	4.23
36-50 years	33	46.48
50 and above	35	49.30
Total	71	100

The analysis indicated that the young women are yet to fully engage in beekeeping activities in this county. It was also observed that majority 90.14% of the respondents were married, 5.63% of the respondents reported other status while 4.23% of the respondents were not married

Table 3 Marital status

Marital status	Frequency	Percentage
Single	3	4.23
Married	64	90.14
Other status	4	5.63
Total	71	100

However, there was an indication that most of the respondents keeping bees were married women.

Education levels of Respondents

Majority 42.25%, of the respondents did not have any formal education and an equivalent number 42.25% had elementary level of education. The data in Table 4 show the education level of the respondents. Also 11.27% of the respondents were of secondary education while 4.23% of the respondents had University or college level qualifications, indicating that most beekeepers (85%) were either illiterate or had primary level of education. The data in table 5 indicate 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 experience.

Table 4: Education levels of respondents

Education levels	frequency	Percentage
none	30	42.25
elementary	30	42.25
Secondary	8	11.27
University/College	3	4.23
Total	71	100

Table: 5 Experiences 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

Income generating Activities for the women

The study sought to find out whether the women were solely dependent on beekeeping as source of income.

Table: 1 Income generating activities

Response on Income generating activities	Frequency	Percentages
Non-Beekeeping activities	68	95.77
Only-Beekeeping activities	3	4.23
Total	71	100

From the findings majority 95.77% of the respondents reported that they are engaged in other income generating activities, while 4.23% of the respondents reported they have no other income generating activities apart from the beekeeping.

Average monthly incomes from Beekeeping activities

The researchers wanted to find out the average monthly incomes from beekeeping influenced adoption of bee keeping technologies.

Table: 2 Average Monthly Incomes

Average Monthly income from beekeeping	Frequency	Percentage
Below Kshs 10,000	7	9.86
10,000-15,000	40	56.34
16,000-25,000	23	32.39
26,000-35,000	1	1.41

The findings revealed that majority 56.34% of them earned between Kshs 10,000-15,000, 32.39% of the respondents reported to earn between 16,000-25,000, 9.86% of the respondents earned below 10,000, while 1.41% of the respondents earned Kenya shillings. 26,000-35,000 per month. This was an indication that majority of these farmers earn between Ksh.10,000 to 16,000 per month. This was a profitable harvest from one to two hives. Economic considerations influencing adoption of new technologies. The study sought to find out what economic considerations influenced adoption of modern technologies. Table: 8 shows the data on some economic considerations that influenced adoption of modern technologies among the women beekeepers. From these findings majority of the respondents strongly agreed that consumer incomes highly influence adoption of a new technology as shown by a mean of 4.54. The beekeeping must be more profitable than other enterprises as shown by a mean of 4.38. Government policies and the available ready markets are also necessary conditions for a technology to be adopted as shown by mean score of 4.28. Beekeepers incomes positively or negatively influenced adoption of a new technology as shown by a mean of 4.26. Beekeepers will quickly adopt a new technology if

prices of honey are high as shown by a mean score of 4.21 and that difference in prices between honey and other alternatives influences adoption of a new technology as shown by a mean of 3.98.

Table: 8 Economic considerations influencing adoption of modern technologies

Economic considerations (on a Likert scale)	Mean	Std. Dev
Availability of ready markets and Government policies.	4.28	0.539
High prices of honey.	4.21	0.532
Increased farmers yield and net benefits.	4.38	0.517
Beekeeping more profitable than other alternative enterprises	4.38	0.594
Beekeepers incomes low or high	4.26	0.505
The consumer income	4.54	0.501
Difference in prices between honey and alternatives	3.98	0.768

Other respondents strongly agreed that new technologies should increase beekeepers yields and net benefits. Hence for a new technology to be adopted in beekeeping it must be basically profitable or at least more profitable than other alternatives.

DISCUSSION

The researchers found out that adoption of new beekeeping technologies among the beekeeping women groups was influenced positively or negatively by various economic factors. Key among them was product market prices, market prices of related products, consumers' income, beekeeper's income and Government policies. Salim (2006) concluded that farmer's degree of readiness and exposure towards improved agricultural technologies act as incentives or disincentives to new technology. From the findings, majority of the respondents strongly agreed that consumer incomes highly influenced adoption of a new technology and that for the technology to be adopted the beekeeping enterprise must be more profitable than other businesses. This is in line with Behera and Mahapatra (1999) who concluded that for technology to be accepted, farming must be basically profitable or at least more profitable than other alternatives. The study found out that movable comb top bar hives should result in higher net returns per colony compared with local hives and that adoption of new technologies should increase farmer's yields and net benefits. This is supported by Behera (1999) who concluded that for new technology to be accepted, beekeeping must be basically profitable or at least more profitable than other alternatives. Ambrosini *et al.* (2002) reported that beekeeping is a source of valuable food and off-farm income in rural areas. He indicated that some of the valuable beekeeping products include honey, beeswax and propolis. Beekeepers income and Government policies can therefore positively or negatively influence adoption of new technologies. This implies that new technology like movable comb top bar hives should result in higher net returns per colony compared with local hives and that adoption of new technologies should increase farmers yield and net benefits. Therefore for new technology to be adopted beekeeping must be basically profitable or at least more profitable than other farming alternatives. From the key informant interviews held with an Extension Officer, a Farm Manager, and a Project Coordinator, it was found out that economic considerations that make it easy to adopt modern technologies included appropriate Government policies, good product prices, reasonably priced hives, ready markets, available extension services, higher profits that accrued from the sale of honey and less labour required. Feder *et al.*, (1985) states that adoption is the degree of use of a new technology when a farmer has full economic value of the technology and its potential to generate extra income.

Conclusions and Recommendations

Economic factors play a major role in adoption process of new technologies. It was evident that economic factors influenced the adoption of modern beekeeping technologies. The study found out that all the identified economic factors influenced adoption of modern

technological approaches to beekeeping in one way or the other. Following the findings of this study, therefore, the researchers recommend that there is need for implementers of new technologies to address economic factors before and during the process of introducing new beekeeping technologies. Implementers of new technologies should first explore the strengths, limitations or otherwise of these influencing economic factors in a particular area or region before introducing new technologies. Farmers should be trained and made aware of the consequences of the economic factors of adoption of the technologies they are about to engage in. Policy makers and managers of beekeeping projects should always make appropriate policies and programs to deal with the identified economic factors in order to make new technologies acceptable and adopted. In addition, the researchers recommend that there is need for both the Government and Non-governmental organizations to render financial support in form of credits to farming groups in order to increase the adoption of new technologies for profits and overall development.

REFERENCES

- Albrecht, Goldstein, D.K. 1987. The case of research strategy in studies of information systems, *MIS Quarterly* (11:3), 1987 pp-369-385.
- Ambrosini, F., Diop, C.T., Oliveros, O., Cianci, D. 2002. The therapeutic effects of propolis in beekeeping. *Journal of agriculture and environment for international development*.V.96 (1/2), p.13-22.
- Ayalew Kassaye, 1990. The honey bees (*Apis Mellifera*) of Ethiopia. *A morphometric study*. M.Sc. thesis, Agricultural University of Norway, Norway
- Behera, U.K. and Mahapatra, I.C., 1999. Income and employment generation for small and marginal farmers through integrated farming systems. *Indian Journal of Agronomy*, V.44(3), p.431-439
- Carroll, Thomas 2006. A Beginner's Guide to Beekeeping in Kenya Cooper and Schindler (2003) Research methodology and design writing in proposal and thesis writing.47:14-16.
- 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
- Demeke, A.B. 2003. "Factors Influencing the Adoption of Soil Conservation Practices in Northwestern 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.
- Feder 2005. Multinomial logit models for Australian labor market. *Australian Journal of Statistics* 4: 453-786.
- Feder, G., Just, R.E. and Zilberman, D., 1985. Adoption of agricultural innovations in developing countries: a survey. *Econ. Dev. Cult. Change*, 33: 255-297.
- Gakuu M. Christopher, Kidombo H.J. and Keiyoro N. Peter. Fundamentals, of research Methods: *Concepts, practice and application*. Aura publishers, Kenya.
- Gavain and Gemechu, D. 1996. *Aspects of climate and water budget in Kenya*. Nairobi University Press, pp. 77.
- GoK, 2004. Second report on poverty in Kenya, Vol.ii. Poverty and social indicators. Nairobi: Ministry of Planning and National Development.
- Hagmann, Gizaw Ebsa, Amsalu Bezabih, & Debisa Lemessa, 2003. Effect of honeybee pollination on seed *Allium cepa*. Holeta Bee Research Center, Holeta
- Hoffmann, V. 2005. Rural Communication and Extension, Reader, University of Hohenheim, Stuttgart Germany.
- Hoffmann, V. 2006. Knowledge and Innovation Management, Reader, University of Hohenheim, Stuttgart, Germany.
- Karealem, T.S., Burke, W. J., Freeman, H.A. and 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,
- KBA., 2005. Kenya Beekeeping Association, fourth annual conference proceedings. Nairobi. Kenya bureau of statistics, 2009 report.
- Kurt Lewis, 1986. Stochastic Field Theory of Behaviour. *Commendations Scientia rum Socialism*, 34. Societal Scientia rum Fennica, Helsinki.
- Leeuwis, C. 1993. Of Computers, myths and modelling; the social construction of diversity, knowledge, information and communication Technologies in Dutch horticulture and agricultural extension.
- Mann, I. 1976. Bees are Wealth. Kenya Literature Bureau. Reprinted 1991.
- Mbae, R.M. 2012. Factors Influencing Implementation of ALLPRO Beekeeping Project in Kajiado and Mwingi Districts. An MBA research project paper, Kenyatta University
- Mold, 2010. Adoption and Diffusion of beekeeping apiculture in Kenya; An empirical study carried out in the Centre, Southwest and Northwest Provinces.
- Paterson, 2006. The tropical agriculturist. Macmillan Publishers limited (2006).
- Rogers, E. M. 2003. Diffusion of innovations, fifth edition. Free Press, New York, U.S.A.
- Salim, C., Uwe Jens, N. 2006. Factors affecting farmers' acceptance measures; Leibniz Centre for Agricultural landscape Research (Zalf) e.V., Institute of Socio Economics; Humboldt University of Berlin, Faculty of Agriculture and Horticulture.
- World Bank, 2007. *Enhancing Agricultural Innovation: How to go beyond the strengthening of research system*.
