



ISSN: 0975-833X

RESEARCH ARTICLE

VALUE ADDITION APICULTURE PRODUCT'S INCOME AND LIVELIHOOD, A STUDY OF FARMERS IN KAKAMEGA CENTRAL SUB-COUNTY, KENYA

Gladys Onditi Ominde and *Raphael Ondeko Nyonje

Department of Extra-Mural Studies, University of Nairobi, Kenya

ARTICLE INFO

Article History:

Received 05th October, 2015
Received in revised form
11th November, 2015
Accepted 14th December, 2015
Published online 31st January, 2016

Key words:

Apiculture,
Value addition,
Farmers income,
Household Livelihood
Field of Research- Agriculture.

ABSTRACT

Bees-hive products (honey, beeswax, Propolis and royal jelly) have high economic value (FAO ROME, 2011). However; the magnitude of value addition in Kakamega County has not been established. This study sought to investigate whether Value addition enhances bee farmers' livelihoods. Systematic and stratified random sampling were used to select 127 respondents from whom relevant data was collected by the aid of questionnaires, and data analysis done using Statistical Package for Social Science (SPSS). Qualitative data analysis was done by summing up total scores on variables under study, and finally analyzing the data in form of descriptive statistics presented in form of frequency tables. Respondents were categorized into three; value adders (basic (56.7%) and advanced (22.6%) and non-value adders (20.8%). Basic value adders generated Kshs.170 per kilo of honey, advanced, Kshs.211 and non value adders, Kshs.140. Advanced value adders were likewise able to make an extra Kshs.150 and Kshs.135 from sale of royal jelly and beeswax respectively. Advanced value adders generated more income therefore had better saving culture. Advanced and basic value adders had access to more meals per day and recorded less incidences of nutritional deficiencies compared to non-value adders. The study recommends training of farmers on harnessing hive products and value addition.

Copyright © 2016 Gladys Onditi Ominde and Raphael Ondeko Nyonje. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Gladys Onditi Ominde and Raphael Ondeko Nyonje, 2016. "Value addition apiculture product's income and livelihood, A study of farmers in Kakamega central sub-county, Kenya", *International Journal of Current Research*, 8, (01), 25192-25202.

INTRODUCTION

1.1 Background of the study

Bee keeping is the maintenance of honeybee colonies known as hives by human beings to collect honey and other products such as beeswax, Propolis, pollen and royal jelly. Value addition is the physical segregation of any agricultural commodity in a manner that results in the enhancement of the value of that commodity (USDA, 2002). The E.U has about 50,000 and 400,000 professional and amateur beekeepers respectively, all producing 130,000 tons of honey (Anon, 2001). It is estimated that the U.S.A has 115,000-125,000 beekeepers who mostly engage in the practice as a hobby, with each farmer having less than 25 hives. In the year 2012, honey production from U.S.A farmers with more than five colonies totaled to 147 million pounds down 1% from 2011. The average price per pound was USD1.951 Up 11% from USD1.765 in 2011 (NAAS, 2013).

Almost half the honey produced in America is sold through retail channels; the rest is sold in bulk for use in the food industry (NHB, 2013).

In Africa, Ethiopia is the largest producer of honey. Ethiopia is agro-ecologically endowed in honey production and boasts of a large number of bee colonies but production is still not at its maximum potential due to the use of traditional hives and lack of improved bee management techniques that can enhance quantity and quality of honey (Gebey *et al.*, 2010). One key challenge faced by rural bee farmers in Ethiopia is poor quality of honey because of use of traditional methods of harvesting (SNV Ethiopia, 2008). Tanzania has a good environment for producing bee products due to availability of many plant species that produce nectar and pollen that attract honeybees. The main bee products include honey and beeswax. 75% of the honey produced in Tanzania is sold locally for use in bakeries and confectioneries. There is also a marked use of honey for making honey beer in hotels and tourist attraction sites (MoNRT, 2004). In Uganda, beekeeping is a seasonal activity, with honey being harvested twice a year with a primary harvest season between March and June and a secondary one between August and October. Many farmers in Uganda do not have

*Corresponding author: Raphael Ondeko Nyonje,
Department of Extra-mural Studies, University of Nairobi, Kenya.

modern pressing machines hence press the combs by hand resulting in a lot of impurities in their honey. Production stands at between 800 MT and 1200 MT a year (Ochan, 2005).

In Kenya, Apiculture is mainly practiced in the arid and semi-arid areas of Kenya by both individual small-scale farmers and common interest groups. The apiculture industry has a potential to produce more than 100,000 MTS of honey and about 10,000 MTS of beeswax per annum, only a fifth of the capacity has been achieved so far (GOK, 2008). Kakamega among the 47 Counties found in Kenya on Western part of the country. The livelihoods of the small scale farmers in Kakamega Central Sub-county have been characterized by poverty of income for a long period of time. This in turn reflects on the food security status, health accessibility and affordability as well as access to education in the farmers' households. The sub-county depends mainly on agriculture for sustainability yet land sizes have been diminishing over time due to subdivision (Dose, 2007). It is important for the farmers to embrace other non soil dependent forms of agriculture so as to generate more income. There are 914 beekeepers (Anyanje, 2011), with the potential to produce 300MTS per year of honey but so far, the current production stands at 10 MTS per annum (GOK, 2010). This honey is sold in raw form hence it generates minimal income to the farmer; this is because most farmers neither add value to their honey nor put to use the other hive products. The extent of value addition on hive products in the area has not been established hence its potential benefits have not been maximized. The study aimed at addressing this issue by establishing whether or not Value addition on hive products increases income and hence improving the livelihood of bee farmers in Kakamega Central Sub-county. The study aimed at investigating whether the income earned by bee farmers translated to improved food security, status farmers health and nature of houses owned by bee farmers and the education levels in bee farmers' households.

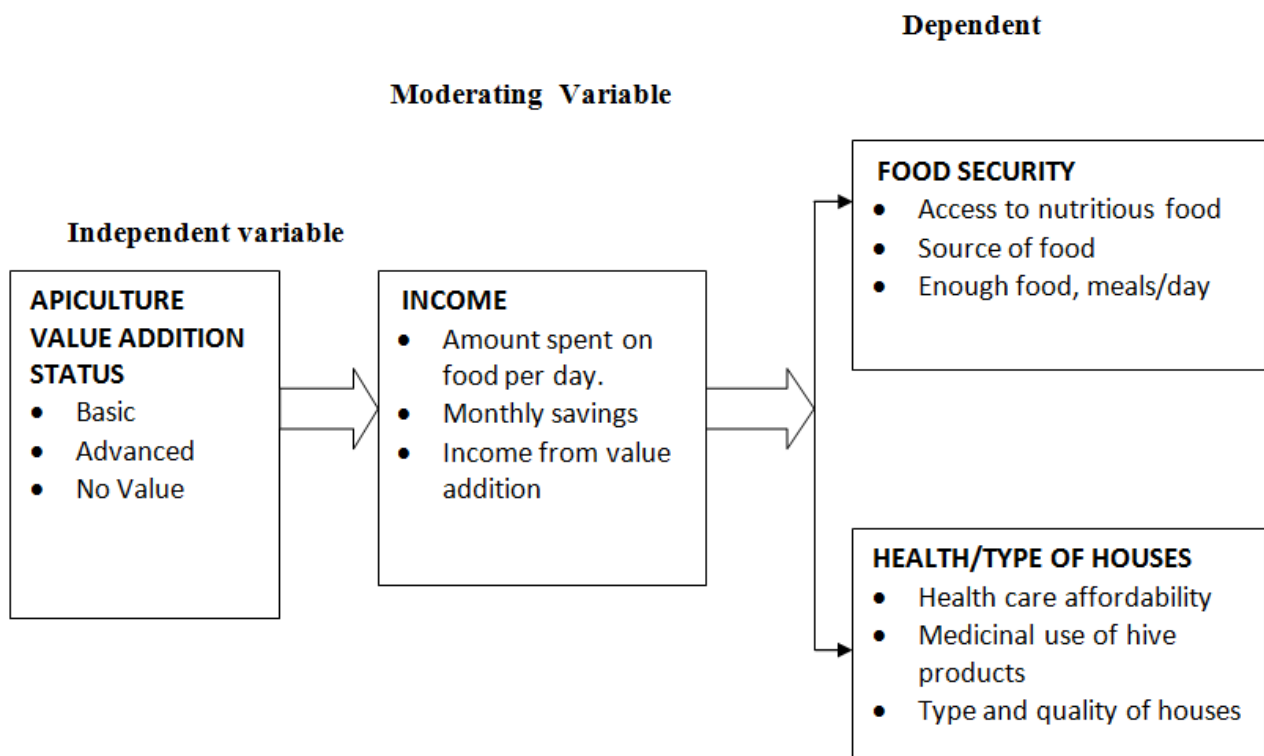
The study sought to answer the following research questions; How does value addition in apiculture products influence income of bee-farmers in Kakamega Central Sub-county? To what extent does value addition apiculture products income influence bee-farmers' household food security in Kakamega Central Sub-county? To what level does value addition apiculture products income influence the health and type of houses owned by bee-farmers in Kakamega Central Sub-county?

1.2 Conceptual framework

The study conceptualizes that bee farmers engaging in value addition, generates more income than those who does. This is reflected on their improved livelihood which in this study is represented by improved food security and household health and house owned

2.0 LITERATURE REVIEW

PATS (2005) defines value-addition as “any activity that allows producers to capture greater value than would normally be secured through conventional commodity channels, achieved by carrying out activities such as processing to distinguish the products from the standard agricultural commodities. NAAS-India (2002) brings a different point of view to the definition by explaining the concept from different angles: post-harvest level that involves primary processing by cleaning, grading and packaging of agricultural produce e.g. for vegetables, potatoes and fruits; level 2 that involves secondary processing, that basically entails packaging and branding e.g. for rice and *atta* and level 3 which is high end processing, supply chain management, modern processing technology, packaging for processed foods, branding, marketing etc.



It is important for any farmer who is venturing into value addition to keep his production cost on the minimum by examining value-added processing and marketing activities. Boland (2009) observed that only the low cost efficient producers would be able to survive and compete in agricultural production, therefore, farmers should consider the economies of scale before resorting to any value adding measure. Farmers have to weigh in on options of maintaining the economies of scale. One such option suggested by Senechal *et al.* (2009) is the formation of farmer alliances or organizations. The writers observed that farmer alliances are created to enable farmers to participate in processing and marketing of their commodities past the farm gate. Income is a measure of the economic viability for the operation of a farm (USDA, 2002). Studies by Ramirez (2001) established that value added agriculture contributed to a 350% increase in household income in Latin America, playing a key role in alleviating poverty by enhancing on-farm and off-farm employment creation, thereby generating more income. Further studies by Quagraine *et al.* (2000) indicate that value addition enhances demand for primary commodities through improvement of product quality and by facilitating production of new and alternative products that create an outward shift in the demand curve for farm commodities thereby, increasing the commodity prices and quantities sold.

Kumar *et al.* (2011) indicated that India has undergone great transformation as most farmers were concentrating on processing and proper marketing of agricultural produce, replacing the traditional way of food production by adopting manufacturing processes that entail value addition. Value addition was paying off for these farmers, for instance it was established that by adding value to *tur dal*, the farmers in Akola district of Maharashtra generated 19% more than by selling raw *Tur*.

A recent study done by Muli (2013) in Makueni, Machakos county indicates that farmers in the region have been able to break into bigger markets by adopting village-based value addition processing units through a program called 'The Village Value Addition for Food Processing Program' initiated by Farm Concern International. Until recently, the area was characterized by poverty-stricken peasant farmers who depended on donations to get by. The Farm Concern program introduced cassava farming to the farmers. Cassava is a highly perishable agricultural commodity that is very bulky making transportation an issue and goes bad within 72 hours upon harvesting. Farmers are however, making remarkable incomes from the cassavas through value processing units within the villages, making it possible for the farmers to generate extra income and enhance their savings. Food security is a situation that exists when all people at all times have access to sufficient, safe, nutritious food, to maintain a healthy and active life (The World Food Summit, 1996). Food security rests on three pillars; food availability which implies sufficient quantities of food being available on constant basis, food access, which means having sufficient resources to obtain appropriate foods for a nutritious diet and food use i.e. using food appropriately based on nutritional knowledge (W.H.O). FAO (2010) studies indicate that 0.9 billion people around the world are undernourished. Further studies by Amoaka (2003) reveal that

sub-Saharan Africa is the only region in the world where food insecurity and poverty situation are getting worse by the day.

CGIAR (2011) stressed the need to reduce wastage in food systems by putting in place infrastructure, farming practices, processing, distribution and improving the ways in which households handle food. One most important way to achieve this is by assisting low-income producers to store food during periods of excess supply. The cassava for instance, is one crop in which this has been achieved. Cassava is cultivated mainly by marginalized smallholder farmers across forty countries in Africa and is considered as a poverty fighting food by providing 500 k cal per day in the diets. Usually, the crop is processed and stored for much longer by drying. The concept of preservation can be applied to several other agricultural commodities, bee products included. Agro processing and value addition are important activities for agricultural development and poverty eradication as they generate employment

Value addition increases the variety of food in the diet by enabling food to be stored for use in times of scarcity hence, ensuring that there is sufficient food to supply essential nutrients the whole year (Fellows, 2011). According to report by EAC Secretariat (2011), the East African region is always faced with frequent occurrences of food insecurity. This was further proven by studies conducted by FAO (2011) on the state of food insecurity in the world, revealing that small-import dependent countries in Africa were the most affected by volatile food prices between 2006-2008 and they were facing serious food and economic crisis, making it hard for them to achieve the MDGs. According to the report by EAC Secretariat (2011), one of the main reasons there is food insecurity is the inadequate food exchange or trade between times and places of plenty harvest and that of less.

W.H.O (1948; 2003) defined health as a state of complete physical, mental and social wellbeing, which does not merely mean the absence of infirmity. Shelter means housing, which is a state of being covered or protected. It is a building or structure that an individual(s) and their family live in that meets certain federal regulations (Business dictionary). A study in 2002 placed the average household size in Kakamega county at 4.8 members and a dependency ratio of 64.5/100 (G.O.K, 2002). A poverty rate is equally high at 52% with high population growth at an annual rate of 2.12%, about 64% of the population in the district depends on farming as a source of livelihood (G.O.K, 2012). It is important to sustain livelihood for the rural populations in Africa by putting in place measures that will enhance productivity in agriculture. Fuller (2011) carried out a case study of the goat-keeping sector and cassava farming in Nigeria, which is the largest producer of cassava in the world at about 40 million MTS. The study established that the waste from the cassava, which include the chaff and peel were never utilized, despite the fact that they are a key component of goat feed. The value addition project was initiated with a key objective of producing social change by increasing income of the poor rural farmers. There was marked success with a recorded monthly income increase by 39% from sell of cassava waste, that would be cleaned, dried and used to make goat feed. The farmers interviewed noted that they were

now able to cover their necessities such as health care and school supplies.

A review of five project initiatives by MATF in East Africa revealed that value addition among other agricultural undertakings has a huge potential of helping farmers access health care and improve the type of houses they have. In Kenya, Farm Africa initiated the tissue culture and indigenous vegetable project. The tissue culture project aimed at helping farmers to diversify markets and utilize the tissue banana through adding value onto it. The Tanzania initiative involved helping farmers to move from commodity coffee to specificity coffee through use of central pulperies, while the Uganda initiative was geared towards improving cassava production, processing and marketing in Nkasongola district. Both of these measures were based on the principle of value addition. An evaluation of the projects by Nyang' *et al.* (2010) revealed that farmers were upbeat about the initiatives as they felt that they had gained a lot from them. Some key results were; being able to guarantee better nutrition for their households, getting better incomes that made it possible for them to meet their obligations such as pay school fees with ease for their children, afford medical care and other social expenses.

The concept of value addition should be pursued with the ever-changing worldviews and orientation towards certain kinds of foods in mind. There is an increasing demand and interest in natural medicines based on the use of the natural medicinal plants and products (Gottret *et al.*, 2005). Need therefore, arises for farmers to intensify production of these products, diversify and add value to them to cash in on their benefits. Krell (1996) identified various medicinal uses of bees and bee products, for instance honey can be used in various ways such as treatment of burns and deep wounds because of its high concentration of sugars and natural antibiotic activity that kills bacteria, soothing external sores, hygroscopic action of honey hence, absorbs pus from wounds. Adebayo and Adedoyin (2012) added that honey is used in Nigeria to treat measles, mouth infections, ear infections and stomach aches. Propolis, which is the other product of apiculture, has a variety of medicinal uses, they include being a strong antibiotic, anthelmintic, antifungal and a pain killer, relieving toothache and gum disease, soothing sore throats, cure of chest infections and stimulating the immune system (Krell, 1996; Adebayo and Adedoyin, 2012). Royal jelly is believed to have aphrodisiac qualities, although few studies exist in that area.

3. MATERIALS AND METHODS

Descriptive research design was adopted for this research so as to find out how the independent variable, value addition on bee farming products influences the dependent variable, farmers' livelihood in Kakamega central sub-county. The target population for this research was 914 apiculture farmers in Kakamega central sub-county. A sample size of 127 was obtained using Krejcie & Morgan tables (1970). The study area comprised of three strata; Municipality, which had 301 bee farmers, Lurambi, 304 bee farmers and Navakholo 309 bee farmers as per data obtained from the MOLFD offices in Kakamega central district. These strata were purposively sampled, because they had the highest number of bee-farmers.

Systematic sampling was used to select the farmers from each stratum; stratified random sampling was adopted so as to achieve correct representation from the three strata in district; Municipality (301 Bee farmers), Lurambi (304 Bee farmers) and Navakholo (309 Bee farmers).

Primary data was obtained by the use of interviews facilitated by questionnaires, the questionnaire contained both open-ended and closed-ended. Analysis of quantitative data was done by using computer software known as Statistical Package for Social Science (SPSS), version 16.0. The questionnaires were scored, data edited to detect errors, coded by assigning numerals symbols to answers in the questionnaire so that responses could be put into limited number of classes and the data entered into the computer for analysis. For qualitative data, analysis was carried out by summing total scores on the variables of study and data presented statistically by use of frequency distribution tables using descriptive and statistics. The results were tabulated, discussed and recommendations and conclusion made as per the research findings.

4.0 DISCUSSION OF THE FINDINGS

4.1 Demographic characteristics of respondents

The survey explored the gender of the bee farmers. Table 4.1 shows the gender distribution of the bee farmers.

Table 4.1. Gender of Bee farmers in Kakamega Central sub-county

Gender	Frequency	Percentage
Male	76	63.3
Female	44	36.7
Total	120	100

It was established that 63.3 % of the bee farmers are male and 36.7% are female, there were a greater proportion of men than women undertaking bee keeping which is an indication that bee keeping is predominantly a male activity. This is supported by studies by Pact Kenya (2010) and Shackleton (2011) that indicated that bee keeping is predominantly a male activity in Africa.

The survey sought to establish the level of education of the household head and how it influences the choice to add value; the results are summarized in Table 4.3.

Table 4.3. Education levels of bee farmers in Kakamega central sub-county

Education level	Frequency	Percentage
None	3	2.4
Primary	39	32.5
Secondary	50	41.7
Middle level	20	16.7
University	8	6.7
Total	120	100

Less than a half 50 (40.7%) of the respondents had received secondary education only, 39 (32.5%) had received primary education only, 20 (16.7%) had gone to middle level colleges, 8

(6.7%) had received university education and only 3 (2.4%) had not gone to school at all. It is therefore evident that apiculture is practiced predominantly by farmers who have not attained college education. This is supported by a study in the same area by Dose (2007) that highlighted that subsistence agriculture was the main source of income for respondents who had attended or attained secondary education and below in Kakamega, a factor that can be attributed to lack of skills and employment opportunities in for the cadre. Value addition can therefore go a long way in boosting incomes as it does not require formal training for one to venture into it.

Household characteristics surveyed included number of household members, age of household head and bee keeping experience in years. The results are presented in Table 4.5.

Table 4.5. Household characteristics in Kakamega central sub-county

Characteristic	Mean	Standard deviation
Household members	6.04	1.817
Age of household head	51.01	10.644
Years practicing of bee keeping	4.452	4.083

On average, each household in Kakamega Central sub-county has 6.04 members, with an average household head age of 51.01; a previous study by Salanya *et al* (1998) estimated the average household head in Kakamega Central district to be 52.8 years, which is within the range of the findings of this study. Age has a positive implication on adoption of new technologies (Chirwa, 2005) Most of the surveyed bee keepers had engaged in the trade for about 4.4 years. This implies that bee keeping is a trade that the farmers have mastered over time, it is safe to argue that production mechanisms are not the main challenges the farmers face, but rather value chain competitiveness.

The number of household members of 6.04 differs with that stated in the Kakamega District Development Plan of 4.8 members; this is due to the small sample size used for the study. However the number is almost similar to that stated in a previous study in the same study area by Dose (2007) that found the household size to be 6.28. The large standard deviation of the age of household head was attributed to the fact that there were both young and aged farmers practicing bee keeping who were surveyed, the age of the farmers interviewed ranged from 29 to 87 years. This is equally the same for the bee keeping experience which ranged between 1 and 20 years. Bee farmers were interviewed on the amount of land they own, amount leased in, leased out and that owned jointly by the extended family. Table 4.6 is a summary of the land ownership in Kakamega central sub-county.

Table 4.6. Land ownership in Kakamega central sub-county

Land ownership	Mean	Standard deviation
Owned	3.4	3.483
Leased in	0.326	1.231
Leased out	0.05	0.465
Communal (family)	1.385	3.632

The average size of land owned by a bee farmer family was 3.4 acre which is almost similar to a the size stated in a study by

Salanya *et al.* (1998), on average the size of land leased in was 0.326 acres with negligible sizes being leased out. Approximately 1.3 acres of land were owned communally/by the extended family.

There is a huge variation in the average size of land owned by bee farmer households which is indicated by the large standard deviation. This is attributed to the fact that some of the surveyed households owned larger pieces of land while a good proportion had very minimal land sizes, with surveyed sizes ranging from 0.25 to 20 acres. This is equally the case for the size of land owned by extended family which ranged from as low as 1 to 20 acres. Studies by Jayne *et al.* (2007) show that land ownership influences rural household welfare by promoting diversity in farming and hence having a negative impact on poverty. Therefore, with the small sizes of land in the County, farmers need to move away from soil dependent forms of agriculture to those that require less acreage of land, as is the case with apiculture

This study defined value addition as harvesting of honey combs, straining of honey from the combs, purification by sieving of honey, packaging, labeling, harvesting of beeswax, Propolis and royal jelly for nutritional, medicinal and other benefits. The bee farmers were categorized into three categories as per the kind of value addition they carried out on their hive products, Basic value adders who practiced straining of honey from combs and purification of honey by sieving to remove impurities, and advanced value adders comprised of those involved in packaging of honey in hygienic bottles, labeling of honey bottles, harvesting of beeswax, Propolis and royal jelly and finally non value adders, who do not carry out any form of value addition Table 4.7 is a summary of the findings .

Table 4.7. Categories of value adders in Kakamega Central sub-county

Value Addition Category	FREQ	%
Basic Value Addition	68	56.6
Advanced Value Addition	27	22.6
Non Value adders	25	20.8
Total	120	100

Slightly more than a half 68 (56.6%) of the bee farmers interviewed were engaged in basic value addition while 27 (22.6%) were practicing advanced forms of value addition. 25 (20.8%) of the respondents did not carry out any form of value addition on their hive products. A majority of the farmers were either involved in basic value addition or none at all, for those doing basic value addition, honey was the only product harvested inferring that farmers were less knowledgeable with other hive products; royal jelly, Propolis and beeswax.

4.2 Value Addition and Bee-farmers Income

The researcher tabulated income of the bee farmers from various farm and non-farm enterprises as well as income from bee keeping for both value added and non-value added hive products. The Annual bee farmer family income was tabulated against annual expenditure so as to establish and be able to rate the bee farmers as per their annual income. Table 4.8 shows the

household income against some of the key household expenditures.

Table 4.8. Annual income and expenditure

Annual Income per household (average)	Kshs 82453
EXPENDITURE	
Farm input	Kshs 41,304
Farm labor	Kshs 9364
School fees	Kshs 35,940
Food stuffs	Kshs 65,851
Clothing	Kshs 7430
Health	Kshs 8561
Entertainment	Kshs 2368

The average annual house hold income of the bee farmers in Kakamega central sub-county is Kshs.82453 which translated to Kshs.37.60 per person per day for a household of 6 people. This is quite low compared to the rural poverty line per capita income of Kshs.41 defined by the Government of Kenya (Republic of Kenya, 2000). Dose (2007) found the average income from small scale farmers in Kakamega who grew cash crops to be Kshs.75, 755 and Kshs.66, 112 for those who grew food crops only, there is a slight variation in this findings which can be attributed to the small sample size selected for this study. The study then divided the annual family income into three categories, low (Kshs.0-50,000, middle (Kshs.51, 000-80,000) and High (over Kshs.100, 000) as per the three categories of value adders. The results are summarized in table 4.9

Table 4.9. Distribution of bee farmers across the annual income categories

Category	LOW		MIDDLE		HIGH		TOTALS	
	Freq	%	Freq	%	Freq	%	Freq	%
Basic	20	16.7	43	35.8	5	4.2	68	56.7
Advanced	1	0.8	5	4.2	21	17.5	27	22.5
No Value	16	13.3	5	4.2	4	3.3	25	20.8
Totals	37	30.8	53	44.2	30	25	120	100

A big proportion of the bee farmers, 53 (44.2%) were in the middle income category, 37 (30.8%) in low income category and 30 (25%) in the high income category. The study findings further revealed that most, 43 (35.8%) of the Basic value adders were in the middle income category, most of the advanced value adders, 21 (17.5%) were in the high income category and a larger proportion of the non- value adders in the 16 (13.3%).

Table 4.10. Income from hive products harvested by bee keepers in Kakamega central Sub-county

Category	Income from hive products (Kshs/Kilo)				
	Honey/kilo	Beeswax	Royal jelly	Propolis	Total(Kshs)
Basic	170	-	-	-	170
Advanced	211	135	150	-	496
No value	140	-	-	-	140

Table 4.11. Bee farmers' savings in Kakamega Central sub-county

Category	>2000		>1000		500		<500		No savings		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Basic	14	11.7	20	16.7	21	17.5	13	10.8	0	0	68	56.7
Advanced	19	15.8	7	5.8	1	0.9	0	0	0	0	27	22.5
No Value	0	0	3	2.5	6	5.0	6	5.0	10	8.3	25	20.8
Totals	33	27.5	30	25	28	23.4	19	15.8	10	8.3	120	100

This signifies that availability of more income at a farmer's disposal influences the farming systems he adopts as well as participation in an agricultural commodity value chain. Bee farmers were asked to state the amount they generate from selling a kilo of the hive products they harvest. Table 4.10 is a summary of the findings.

Farmers who practice basic value addition, mainly on honey earned Kshs.170 per kilo, those who were involved in advanced value addition earned a total of Kshs.211 while non-value adders earned the lowest amount, Kshs.140. A kilo of processed honey fetched an average of Kshs.41 more for the bee keeper, while harvesting of the other hive products i.e. beeswax and royal jelly earned an extra Kshs.285 per kilo. A study in Kitui by KREP established that a kilo of unprocessed honey retailed at Kshs.150 (Maundu, 2006) which is quite low compared to findings from Kakamega, however this is quite the opposite compared with findings from Baringo by Mutsotso in 2013 that show that crude honey retails at Kshs.180. A further research by Berem (2009) in Baringo established that value addition on honey can generate as high as 150% profit for a bee keeper. Although bee farmers who add value were able to generate extra income unlike those who did not, a comparison with studies from other regions show that the potential from value addition has not been achieved yet by farmers in Kakamega Central, which is shown by the lower prices generated from value addition compared to areas such as Baringo and Kitui. The respondents were interviewed to find out if they were able to put some of their income in savings. Table 4.11 shows a summary of the amount bee farmers surveyed are able to save.

Basic value adders were the highest savers with 55 (45.9%) of them saving at least Kshs.500, all the advanced value adders, 27 (22.5) were able to save at least Kshs.500 while non-value adders saved the least as 16 (10%) of them saved Kshs.500 and below while 10 (8.3%) did not save at all. Only 3 (2.5%) of non value adders were able to save above Kshs.500. The findings indicate that there is a relationship between value addition and the amount of savings a farmer can make probably because value addition generates more income compared to crude product sales. To further ascertain the saving culture among bee farmers in Kakamega central sub-county, the researcher sought to find out how often the farmers save. Table 4.12 shows the saving frequencies of beekeepers in Kakamega Central Sub-County.

Table 4.12. Saving frequency of Bee farmers in Kakamega Central Sub-county

	WEEKLY		MONTHLY		NOT OFTEN		TOTAL	
	Freq	%	Freq	%	Freq	%	Freq	%
Basic	16	14.5	12	10.9	40	36.4	68	61.8
Advanced	4	3.6	18	16.4	5	4.6	27	24.6
No Value	2	1.8	4	3.6	9	8.2	15	13.6
Total	22	19.9	34	30.9	54	49.2	110	100

From this findings, it emerged that a major proportion of basic value adders, 40 (36.4%) do not save oftenly, 16 (14.5%) save on weekly basis and 12 (10.9) save on monthly basis. For the advanced value adders, 18 (16.4%) save on monthly basis, 4 (3.6) save weekly and 5 (4.6%) do not save oftenly. 9 (8.2%) of the non value adders do not save often while 4 (3.6%) save monthly, only 2 (1.8%) save weekly. 10 (7.2%) of non value adders did not save at all. From these findings it emerges that saving frequency is inconsistent among basic value adders and even lower among non value adders. Advanced value adders save more frequently than the basic and non value adders. This further stresses the fact that value addition generates extra incomes that expedite saving.

4.3 Value Addition and Household food security

The study sought to find out if bee farmers' households were food secure by collecting and analyzing data on key indicators of food security such as number of meals consumed per day, meal content (balanced diet), source of food and whether or not the farmer family had registered any nutritional deficiencies. The respondents were asked to state the number of meals they were able to provide for their families. Table 4.13 is a summary of the number of meals farmer households in Kakamega Central sub-county consume per day.

Table 4.13. Number of meals per day in bee farmer households in Kakamega Central sub-county

CATEGORY	NUMBER OF MEALS							
	ONE		TWO		THREE		Totals	
	Freq	%	Freq	%	Freq	%	Freq	%
Basic	0	0	9	7.5	59	49.2	68	56.7
Advanced	0	0	1	0.8	26	21.7	27	22.5
No value	0	0	18	15	7	5.8	25	20.8
Totals	0	0	28	23.3	92	76.7	120	100

The findings indicated that 59 (49.2%) of the basic value adders can afford three meals a day, 9 (7.5%) afford two meals. 26 (21.7%) of the advanced value adders were able to afford three meals a day while only 1 (0.8%) had two meals a day. Most of the non value adders, 18 (15%) had access to only two meals a day as only 7 (5.8%) could afford three meals a day. It was evident that non value adders had access to less meals in a day compared to both the basic and advanced value adders. The implication of these findings is that value addition generates extra incomes that enable households to purchase and supplement their own farm food sources, as studies by Dose (2007) show that farms in Kakamega could not generate enough food to feed households hence farmers have to supplement on-farm production with markets supplies.

Respondents were interviewed on the dietary content per day with an aim of finding out whether or not the diets contained key elements of a balanced diet; carbohydrates, fruits and vegetables and proteins. This was to further ascertain the food security situation as food security is determined not just by the number of meals but by how balanced the diet is. Table 4.14 shows how the respondents scored across each dietary component.

Table 4.14. Meal content in bee farmers' households in Kakamega Central sub-county

Dietary component	Daily		Frequency		Rarely	
	Freq	%	Freq	%	Freq	%
Carbohydrates	93	77.5	27	22.5	0	0
Fruits & vegetables	33	22.5	82	68.3	5	4.2
Proteins	32	26.7	70	58.3	18	15

An analysis of the diet content revealed that carbohydrates were more common with 93 (77.5%) of the respondents having them on a daily basis; only 33 (22.5%) of the farmers have fruits and vegetables on a daily basis. Of the 120 farmers, only 32 (26.7%) of them have proteins in their diets on a daily basis. Proteins are less consumed by farmers mainly due to the cost aspect involved in purchasing animal protein. Carbohydrates are majorly grown hence much accessible.

To further access how food sufficient bee farmer households were, the researcher interviewed them on their source of food to establish whether they grow enough on their farms to feed their families or they purchase food stuffs. Table 4.15 indicates the findings of this research.

Table 4.15. Source of food

Category	Grow		Buy		Both		Totals	
	Freq	%	Freq	%	Freq	%	Freq	%
Basic	0	0	6	5	62	51.7	68	56.7
Advanced	0	0	3	2.5	24	20	27	22.5
No value	3	2.5	2	1.6	20	16.7	25	20.8
Totals	3	2.5	11	9.2	106	88.4	120	100

The results revealed that 6 (5%) of basic value adders get their food solemnly by buying from food markets while 62 (51.7%) grow their food crops but supplement with buying from food markets. 3 (2.5%) of the advanced value adders solemnly grow their food but 24 (20%) get their food by both buying and

growing on their farms.3 (2.5%) of non value adders grow their food,2 (1.6%) buy while 20 (16.7%) both grow and buy from markets. From these findings it is evident that a big proportion of both value and non value adders gain food sufficiency by supplementing what they grow on their farms with purchases from food markets. This is supported by previous studies by Dose (2007) that established that expenditure on own staple food was 44.5% while own production accounted for 55.5%.This is a clear indication that value addition generated more income enabling value adders to have better diet.

To further ascertain if households were food secure, respondents were asked to record whether they had suffered from any nutritional related deficiencies. Table 4.16 shows the response from bee farmers on the various nutritional deficiencies.

Table 4.16. Nutritional deficiencies in bee farmers' households in Kakamega Central sub-county

Category	Basic		Advanced		No Value		Totals	
	Freq	%	Freq	%	Freq	%	Freq	%
Kwashiorkor	2	4.2	0	0	2	4.2	4	8.3
Anemia	4	8.3	3	6.3	16	33.3	23	48
Pellagra	0	0	1	2.1	0	0	1	2.1
Rickets	0	0	0	0	0	0	0	0
Scurvy	0	0	0	0	0	0	0	0
Hunger	5	10.4	0	0	15	31.2	20	41.6
Totals	11	22.9	4	8.3	33	68.8	48	100

48 (40%) of the respondents had registered nutritional deficiencies in their households, for Basic value adders, 4 (8.3%) had registered Anemia while 5 (10.4%) had registered Hunger. For the advanced value adders, 3 (6.3%) had experienced Anemia in their households and 1 (2.1%) Pellagra. Non value adders had registered more nutritional deficiencies i.e. Anemia 16 (33.3%),Kwashiorkor 2 (4.2%) and hunger 15 (31.2%),from these findings it is evident that Anemia and Hunger were the most prevalent nutritional deficiencies, with Anemia having been experienced by all categories of value adders and Hunger by basic and non-value adders. This is again attributable to available incomes at a household's disposal for accessing better dietary supplements.

4.4 Value Addition and the Health/Type of houses owned by bee farmers

The researcher aimed at establishing whether or not the bee farmers in the study area had enough money to spend on their health or rather access health care and also if they were aware of the medicinal uses of hive products. An analysis of expenditure on health care revealed that the average household expenditure on health was Kshs.8561 per annum which translates to Kshs.1426 per person per annum for a household of 6 members. This is minimal considering the need for frequent health checkups and other health uncertainties that a human being is prone to today. The study sought to establish the level of knowledge on the medicinal use of hive products among the three categories of bee farmers. Table 4.17 is a summary of the findings.

The findings revealed that 25 (20.8%) of the respondents used hive products for medicinal purposes, the use of hive products for medicinal purposes was prevalent among advanced value adders with 14 (11.6%) having used them, unlike among basic value adders and non-value adders. The advanced value adders can be said to better understand the medicinal value of hive products as they were able to identify and harvest them, unlike non value adders and basic value adders. The researcher asked respondents to state the type of houses they own; this is because the study assumed that increased income from bee keeping would reflect on the kind of house a farmer lives in. The results are presented in Table 4.18.

The study revealed that 3 (2.5%) of the basic value adders live in permanent houses, 64 (53.3%) in semi-permanent houses and 1 (0.8%) in traditional/thatched houses. For the advanced value adders, 16 (13.4%) live in permanent houses, 11 (9.2%) in semi-permanent houses and for non value adders, 1 (0.8%) live in a permanent house, 20 (16.7%) in semi-permanent houses and 4 (3.3%) in thatched houses. It was established that advanced value adders live in better housing structure than both the basic and non value adders. The implication of this finding is that value addition generates more income which reflects on the affordability of better housing structures among bee farmers.

Table 4.17. Medicinal use of hive products

Category	Basic		Advanced		No Value		Totals	
	Freq	%	Freq	%	Freq	%	Freq	%
Yes	8	6.7	14	11.6	3	2.5	25	20.8
No.	60	50	13	10.9	22	18.3	95	79.2
Total	68	56.7	27	22.5	25	20.8	120	100

Table 4.18. Type of houses owned by bee farmers in Kakamega Central sub-county

	Type of housing							
	Permanent		Semi-Permanent		Thatched		Totals	
	Freq	%	Freq	%	Freq	%	Freq	%
Basic	3	2.5	64	53.3	1	0.8	68	56.6
Advanced	16	13.4	11	9.2	0	0	27	22.6
No Value	1	0.8	20	16.7	4	3.3	25	20.8
Totals	20	16.7	95	79.2	5	4.1	120	100

5.0 Conclusion

The purpose of this study was to establish the influence of value addition on bee farming products on the livelihood of bee farmers in Kakamega Central Sub-county. The study classified bee farmers into three categories of value addition, basic value adders who mainly engage in straining of honey from combs and purification to remove impurities by sieving, Advanced value adders who package honey in hygienic bottles, label the bottles and also harvest other hive products such as royal jelly, Propolis and beeswax, and non value adders who sell honey in its crude form. The majority of the bee farmers, 68 (56.7%) fell under the category of basic value adders, 27 (22.5%) were advanced value adders and 25 (20.8%) did not engage in any form of value addition. The first objective of the study was to determine how value addition in apiculture products influences bee-farmers' income in Kakamega Central Sub-county, the study established that advanced value adders generated more income from sell of hive products compared to basic and non value adders. On the saving culture of bee farmers, the study concluded that basic and advanced value adders save more compared to non-value adders.

The second objective of the study was to investigate the extent to which value addition in apiculture products influences bee-farmers' household food security in Kakamega Central Sub-county. The study analyzed food security by addressing the number of meals accessed in a day by a bee farmer household, meal content and source of food, although a majority of the farmers could afford three meals in a day, 70 (58.3%) of those interviewed were not having a balanced diet on a daily basis while 106 (88.3%) of them access food stuffs by both growing and buying from food markets. 20 (16.7%), which was the highest score attested to the fact that they had suffered from hunger in their households. Among those who had suffered from hunger attacks in their households were basic and non value adders. On the basis of these findings, the study concluded that advanced and basic value adders were more food secure in terms of number of meals per day, source of food and vulnerability to nutritional deficiencies, this was attributed to the fact that they were able to generate more income than the non value adders.

The third objective of the study was to establish the level at which value addition in apiculture products influences the health and type of houses owned by bee-farmers in Kakamega Central Sub-county. The study established that the available income per household member to be spent on health in a year was Kshs.1426 which was quite low basing in mind need for regular medical check ups, based on this it is evident that health care accessibility is inadequate in the study area. The study further established that use of hive products for medicinal purposes was more common among advanced value adders unlike basic and non value adders. Based on these findings, the study concluded that value adders were less exposed to nutritional deficiencies and more likely to use hive products medicinally than the non value adders.

The fourth objective of the study was to determine how value addition in apiculture products influences household education of bee-farmers in Kakamega Central Sub-county. The findings

of the study revealed attendance of primary education was good for both categories of value adders but the transition rates of bee farmers' children from primary to secondary schools were lower for basic and non value adders, compared to that of advanced value adders. The transition rates from secondary to college were even lower for basic and non value adders. This is due to the fact that primary school education is free and compulsory unlike secondary and college education. Based on these findings, the study concluded that basic and advanced value adders are more likely to afford higher education for their children compared to non value adders.

6.0 Recommendations

Based on the findings of this research, it is essential that the government and relevant development partners work hand in hand to design and promote forums through which bee farmers can be trained on management of bee hives, identification of hive products and how to add value onto the products. The central Government in conjunction with the County government should carry out public education to sensitise the farmers on how agricultural services can be accessed given the new system of devolved governance. Most farmers did not know whether to seek advice from the former Ministry of Agriculture offices or the County Government offices.

Financial empowerment is also an essential determinant of whether or not bee farmers can venture into value addition. It is important for banks and other micro financing institutions to consider collaborating with NGOs working in the sub-county to train farmers on financial management and also lend them money so that they can start small industries that are geared towards manufacturing of value added products like soap, candles, packed honey and confectionaries. This will greatly improve bee farmers' accessibility to markets, far beyond the county level thereby increasing income from hive products. Farmers should also be encouraged to form farmer groups and actively participate in these groups so as to access credit, training and do collective marketing of hive products.

REFERENCES

- Adebayo, A.A., and Adedoyin, B.D. 2012. Apitherapy in southwestern Nigeria: An assessment of therapeutic potentials of some honeybee products, *Journal of Pharmaceutical and Biomedical Sciences*, 2(2).
- Amaoke, K.Y. 2003. Harnessing technologies for sustainable development in Africa, 5th edition. Annual Peter Doherty distinguished lecture, International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia.
- Anyanje, P.W. 2011. "Factors influencing production of honey; the case of Kakamega central District". A research project submitted in partial fulfillment of the requirement for the Master of Arts degree in project planning and management of the University of Nairobi.
- Berem, M.R. 2009. "Analysis of the constraints and effects of value addition in honey among producers in Baringo district, Kenya". A thesis submitted to the graduate school in partial fulfillment of the requirements for the master of science degree in Agricultural and applied economics of Egerton University.

- Boland, 2009."What is value added agriculture?"AGMARC. <http://www.agmarc.org/value-added-agriculture/articles.htm>.
- Buchmann, C. 1999."The state of schooling in Kenya. Historical development and current challenges". *Africa today*, volume 46(1) pgs 9-15.
- Business dictionary; Definition of housing; <http://www.businessdictionary.com/housing.htm>.
- CGIAR, 2011. Research program on climate change, Agriculture and food security; CCAFS," Achieving food security in the face of climate change; Summary for policy makers from the Commission on sustainable climate change.
- Chirwa, E. W. 2005. Adoption of fertilizer and hybrid seeds by smallholder maize farmers in Southern Malawi. *Development southern Africa volume 22*.
- Coombs, P., and Ahmed, M. 1974."Attacking rural poverty. Baltimore, The John Hopkins University press.
- EAC Secretariat, 2011. East African Community; the EAC food security Action Plan 2011-2015.Nairobi, Kenya.
- FAO, 2010. State of food insecurity in the world, FAOSTAT; FAO Statistical Yearbook.
- FAO, 2011. "The state of food insecurity in the world; how does International price volatility affect domestic economies and food security?" Food and Agriculture Organization of the United Nations, Rome.
- FAO, 2012."The state of food insecurity in the world in 2012; contribution of agricultural growth to reduction of poverty, hunger and malnutrition". The Food and Agriculture Organization of the United Nations, Rome.
- FAO, Rome; Agricultural cooperatives and gender equality. International year of cooperatives, issue brief series. <http://www.fao.org>.
- Fellows, P. 2011."Value from village processing". Rural Infrastructure and Agro-industries Division, Food and Agriculture Organization of the United Nations. Diversification booklet N0.4, 2nd edition.
- Fuller, D. 2011. "Adding value to waste in the cassava processing-Goat keeping systems in Nigeria; case study on potential for scaling up". The Heller school for social policy and management, Brandeis University, for the Agriculture and Rural Development Department, The World Bank.
- G.O.K. 2002. Government of Kenya; Kakamega District Development Plan, 2002-2008, Government printer, Nairobi.
- G.O.K. 2008. Government of Kenya, "Geographic dimensions of wellbeing in Kenya, who are the poor? A constituency level profile." Ministry of Planning and National Development.
- G.O.K. 2010. Provincial Forest Report; Ministry of Forestry. Government printer press, Nairobi.
- Gebey, T., Berke. K and Hoekstra, N. 2010. Beekeeping development using value chain approach in Fogera District; experience from IPMS project.
- Gottrel, V., Lundy, M., Ostertag, F., Best, R. and Femis, S. 2005. A guide to identifying market opportunities for rural smallholder producers; The traditional approach to rural agro-enterprise Development, CIAT (Centre International Agriculture Tropical). Manual2.
- Green W.H. 2000. Economic analysis, 4th edition, Pentice Hall, upper Saddle River, New Jersey.
- Henriette, D. 2005. "Securing Household incomes among small-scale farmers in Kakamega District; possibilities and limitations of diversification."University of Leipzig, Germany. GIGA working paper No. 41.
- Hilmi, M., Bradbear, N. and Mejia, D. 2011. Beekeeping and sustainable livelihoods. Rural Infrastructure and Agro-industries Division, Food and Agriculture Organization of the United Nations, Rome.
- Jayne, 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, Spier Estate, Stellenbosch, South Africa. Hosted by the Chronic Poverty Research Centre and the Overseas Development Institute
- Krell, R. 1996. Value –Added products from bee keeping. Food and Agriculture Organization of the United Nations bulletin No.124.
- Maundu, P.M 2006. Financing the honey chain in Kitui, Eastern Kenya, and K-REP Development Agency.
- Ministry of Education; about the ministry. <http://www.education.go.ke/Resources.htm>.
- MoNRT, 2004. "People and Bees"; plain language guide to the United Republic of Tanzania's National Beekeeping programme, Ministry of Natural Resource and Tourism.
- Muli, M. 2013. AGRA-Alliance for a Green Revolution in Africa;"Farmers crack open the doors to bigger markets through value addition." <Http://www.agra.org/cassava-farmers-crack-open-the-doors-to-bigger-markets-through-value-addition.htm/>
- Mutsotso, B.M, B.M. 2013. Conflict and social change: The East Pokot Pastoralists' adjustment to conflict: *American International Journal of Social Science*, Vol.2, No.8.
- NAAS, India 2002."Value added farm products" National Academy of Agricultural Sciences, India. Policy paper No.16.
- Norris, E., and Batie, S. 1987. Virginia Farmers soil conservation decisions; an application of Tobit analysis. *Southern Journal of Agricultural Economics*, issue No.19 (1).
- Nyang'. M., Webo. C., and Roofhaert, L. 2010."The power of farmer organization in smallholder agriculture in East Africa."A review of five project initiatives of the Maendeleo Agricultural Technology Fund (MATF); Farm Africa working papers.
- Ochan, B. 2005. "Beekeeping in Uganda," New Agriculturalist, online magazine. Available at; <http://www.new-ag.info/00-5/focus/focus 2.html>.Retrived on 11/10/13.
- Pact Kenya 2010. Scoping study and value chain analysis for bee keeping and honey products, draft copy. Retrived from www.pactkenya.org
- PATS, 2005. "How important is value added agriculture in Wins-cousin?"*Programme on Agricultural Technology Studies (PATS)*, fact sheet No.22.
- Quagraine, K.K., Unterschultz, J.and Jeffrey, S. 2000. "The impact of post-farm gate value-Adding on Western Canadian Agriculture."A Paper presented at the Western Agricultural Economics Association Annual meetings, Cancouver, British Columbia, June 29-July 1 2000.

- Ramirez, L. 2001. "Globalization and livelihood diversification through non-traditional crops; the Mexico case." Overseas Development Institute, London, United Kingdom.
- Salanya, B.D.S., Mwangi, W., Verkwiji, H., Odendo, M.A. and Odenyo, J.O. 1998. An assessment of the Adoption of seed and Fertilizer packages and the role of credit in small holder maize production in Kakamega and Vihiga Districts, Kenya.
- Senechal, M.D., Luistriz, L.F., and Hodur, M.N. 2009. "The role of farmer alliances in business formation." A publication of AGMRC; *Agricultural Marketing Resource Centre*.
- Shackleton, S. 2011. Opportunities for enhancing poor women's socio-economic empowerment in the value chain of three Africa non-timber forest products (NTFP). International forestry
- SNV Ethiopia 2008. "Women in bee keeping." The Netherlands Development Organization. Available at; <http://www.beesfordevelopment.org/portal/women-in-beekeeping>
- UNESCO 1975. International standard classification of education. United Nations documents on food security. Available at; FAO: <http://www.fao.org/docrep/017/aq194e/aq194e00.html>
- UNIDO 2012. "Women in agribusiness." United Nations Industrial Development Organization (UNIDO). Gender newsletter issue No.2.
- USDA 2012. United States Department of Agriculture.
- W.H.O 1948; 2003. World Health Organization; Definition of health.
- World Food summit report 1996. Definition of food security.
