WAGENINGEN UNIVERSITEIT
WAGENINGEN UR

Impact of contract farming on household income of smallholder farmers: The case of organic honey production in South West Ethiopia, Sheka Zone

By:
Jony Girma Meshesha








Supervisor:
Dr. ir. Koos Gardebroek

December 2011

Impact of contract farming on household income of smallholder farmers: The case of organic honey production in South West Ethiopia, Sheka Zone

Thesis submitted to the Wageningen University and Research Centre in Partial Fulfilment of the Requirements for the Master of Science Degree in Organic Agriculture (MOA)

By:

Jony Girma Meshehsa
Reg. Nr. 780427560120
MSC Thesis Agricultural Economics and Rural Policy Group – AEP-80436

Supervisor:

Dr. ir. Koos Gardebroek
Agricultural Economics and Rural Policy Group
Wageningen University
Web: http://www.aep.wur.nl/uk

December 2011

Wageningen

ACKNOWLEDGEMENTS

Above all I would like to thank the Almighty God for his provision of the capability to pass all the hardship and completion of the study successfully.

I would like to express my sincere gratitude to my supervisor Dr. ir. Koos Gardebroek for his invaluable comments, suggestions and encouragement. He deserves special appreciation for the input he added on my work from the initial proposal writing, interview schedule preparation and to the final research project writing. Koos I learn a lot from you. I don't have words to express your patience, sacrifice and motives to share your experience and knowledge. Without his close supervision and comment this thesis would not be like this. I look forward to working with him again and learning more from this expertise. Thanks KOOS!

My experience of the Netherlands is massive for my future career and I would like to thank NUFFIC for offering a scholarship to study MSc Organic Agriculture at Wageningen University. The skills and knowledge acquired from Wageningen help me to plan my future and many thanks to all the teachers who taught me.

I would like to acknowledge my heart-felt thanks to my lovely wife Eden Tamirat for her moral support, constructive comments, encouragement and being with me in the completion of this study. Without her taking responsibility in all activities at home on behalf of me in all aspects especially, taking care of our son Yeamanuel Jony this study would not be completed. I would like to thank Beza Mar Agro Industry P.L.C and the staff, particularly Mr. Hailgiorgis Demisse and Mr. Abiyu Feleke for provision of materials and computer facilities and the Sheka zone staff, especially Mr. Buzayehu Amen for assisting me during data collection.

I wish to express my thanks to all individuals contributed to the enrichment of this research project particularly, Mr. Shenkut Ayele, Mr. Werkeneh Abebe and Aschalew Seyum for their moral support, encouragement and provision of relevant reference materials.

Sample respondents also deserve special thanks for their cooperation, warm hospitability and because they generously shared their views and made this work possible. Moreover I would like to thank the Ethiopian community and friends at Wageningen for making my stay in the Netherlands pleasant.

ABSTRACT

In Ethiopia, honey production is a traditional occupation widely practised by farmers as a complementary enterprise. Immense, diverse botanical resources and suitable climatic conditions make the country favourable for beekeeping. However, an inefficient agricultural marketing system together with traditional production systems hinders smallholder farmers to benefit optimally from honey supply. In an attempt to address these problems, contract farming has been introduced in organic honey production since 2007 in Ethiopia. However, honey production via contracts is still very limited with only a small number of farmers engaged in it.

This study is, therefore, initiated with the aims of (i) assessing the impact of contractual honey production on smallholders' household income, and (ii) analysing the major factors affecting smallholder farmers income from contractual honey production in the Sheka zone, Ethiopia. In addition, the study examines structure and functioning of contract farming as it is practiced in the study area.

A multi-stage random sampling technique was employed to identify sample survey villages and respondents. Data was collected from both contract and non-contract beekeepers that were randomly selected from four villages in two districts. Propensity score matching was used to estimate the effect of contract farming on household income from honey production. Instrumental Variable regression analysis was used to explore factors that determine household income from honey production.

Results show that the processing firm uses the nucleus estate model of contract farming to collect raw honey from beekeepers. Prices are determined through negotiation based on the market price of honey. Estimation of the effect of contract farming on household income shows that participation in contract farming significantly improves beekeepers annual income. In comparison with selling their product at the local market farmers can earn about 426.7 to 472.8 USD per year from contractual organic honey production. Nevertheless, many beekeepers are not aware of the benefits of contractual organic farming. Regarding factors affecting household income from honey production, contract participation, number of hives or bee colonies, number of family members participating in honey production and the moisture content of honey positively affect income from honey production. On the other hand, household land size owned, access to training and number of visits by extension agents have no effect on the household income from honey production. However, percentage of liquid honey produced to honey comb and distance to market have a negative influence on household incomes.

Based on the results discussed above, the study argues that participation in contract farming is much more important for small holder farmers in terms of improving their household income rather than selling their products in local markets. Finally, increasing the awareness of beekeepers about contractual honey production, promotion of transitional beekeeping methods, strengthening the extension systems and the relation between the private sector and beekeepers are recommended to

promote and expand the contract farming approach to enable a larger number of farmers to benefit from contractual organic honey production in the study area.

TABLE OF CONTENT

LIST OF TABLES

LISTS OF FIGURES

ABBREVIATIONS

ATT	Average Treatment effect on Treated
CSA	Central Statistics Agency
HBRC	Holeta Bee Research Centre
MOARD	Ministry of Agriculture and Rural Development
NGO	Non Governmental Organization
NIE	New Institutional Economics
NTFP	Non Timber Forest Product
PSM	Propensity Score Matching
SNNPRS	South Nation Nationality People Regional State
SZFEDO	Bureau of Agriculture and Rural Development
TC	Transaction Cost
USA	United State of America
USD	United States Dollar

1. INTRODUCTION

1.1. Background of the study

In Ethiopia, apiculture is a traditional occupation widely practised by farmers as a complementary income generating activity. Large and diverse botanical resources combined with suitable climatic conditions make the country favourable for the beekeeping sector (Nuru et al., 2001). Accordingly, beekeeping is a well-accepted household activity throughout the country. Ethiopia has the highest bee colony density in Africa. It is estimated that around one million farmer households keep bees. Currently, traditional beekeeping accounts for more than 95 percent of the honey production and almost all the beeswax produced in the country (Central Statistics Authority (CSA), 2010/11). The remaining 5 percent includes transitional and modern beekeeping.

The total annual honey and beeswax production is more than 53.68 thousand tons and 4700 tons, respectively (CSA, 2010/11). This makes Ethiopia the fourth largest beeswax and tenth largest honey producing country in the world. Export of honey and beeswax is estimated to contribute 3.48 million USD to the annual national export earnings (Ethiopian Customs Authority and Export Promotion Agency, 2009/10). In the country, apiculture is considered as one of the income-generating activities for resource-poor farmers and unemployed people. Beekeepers are expected to earn about 62million USD/year from the total honey and beeswax sales (Ministry of Agriculture and Rural Development (MOARD), 2005/06).

Beekeeping does not require fertile land, a large area, or much initial capital. This makes the sector attractive for small farmers with limited resources. It is also an environmentally sustainable activity that can be combined with crop production, animal husbandry, horticulture and conservation of natural resources without competing with any of these activities. As a result, the importance of beekeeping in poverty reduction and conservation of natural resources have been emphasized by different stakeholders. In addition to being an income source honey also has traditional and cultural value in Ethiopia. It helps as article of trade in holidays, as a gift largely in dowries during marriage, as an important ingredient for *tej*, a honey mead (honey-wine) and beeswax used to produce Candles particularly in the Orthodox churches.

In south west Ethiopia, where there is an intact natural forest, honey production is entirely a means of maintaining livelihoods. Even though many farmers consider beekeeping as a supplementary source of income, it is one of the major sources of livelihood for forest-dependent communities. In this area, most of the households keep bees and the income generated from honey sales is used to purchase grains, clothes, and spent on different social payments. Generally in view of its existence in remote areas where vegetation is more available, beekeeping is widespread and creates income generating opportunities for many farmers who have limited access to other production opportunities and technologies. From a rural development point of view, beekeeping is therefore, an ideal occupation

that can bring an all-round development of the rural economy.

However, despite its potential role in the development of rural economy, the beekeeping sector faces a number of problems. Lack of beekeeping skills, inappropriate production technologies, weak market access, weak price incentive systems, and limited financial capacity of beekeepers are the major problems which largely reduce the potential contribution of the honey sub-sector (Wilson, 2006 and Melaku et al., 2008). This leads to low productivity and poor quality of bee products.

To address these challenges, there is a national interest in linking small scale beekeepers with agricultural marketing chains. Contract farming arrangements provide farmers with access to a wide range of services that otherwise may be unattainable. Access to market, credit, new technologies and risk reduction are some of the benefits for farmers from contract farming (Slangen et al., 2008 and Ton et al., 2007). Regarding to bee products marketing, private companies have emerged that are largely involved in collecting and processing table honey for local and export markets. This is a breakthrough in the development of the apicultural industries of the country. Reduced uncertainty about the quality of the product, sustainability of supply and reduction in price risk are the main driving forces that make contract farming attractive to agribusiness firms. Small-scale farmers are often reluctant to adopt new production technologies because of the risks and costs involved. In contract farming, agribusiness firms usually provide technologies and inputs more effectively than government agricultural extension services, because it is in their direct economic interest to improve farmers' production.

Recently, the Ethiopian government and NGOs have realized the importance of introducing contract farming arrangements as a strategy of integrating small scale farmers with agribusiness firms. For example, in the Sheka zone, the local government and NGOs working on natural forest took the initiative of linking agribusiness firms and small-scale farmers that led to the formation of contract farming agreements between producers and processer/exporters in 2005. Since 2007, Beza Mar Agro Industry that processes and exports organic honey and beeswax also started contract farming arrangements with small scale farmers in the Sheka zone. Such an arrangement could be an attractive opportunity for beekeepers as the area is well endowed with natural forest and suitable for organic honey production. The commonly used organic honey production guidelines include (i) location of the apiary site more than three km away from farms using chemical, (ii) the use of natural hive types, (iii) no artificial feeding, and (iv) no antibiotics for diseases control. Furthermore, harvesting, processing, labelling and record keeping for traceability are required in organic honey production.

In this regard, farmers from eight villages were certified as organic honey and beeswax producers in 2007. Beekeepers supply the product based on predetermined quality parameters such as moisture content, ripeness, postharvest handling of honey and others. It is mandatory for farmers to produce honey based on organic principles. In addition, they have to keep records of all activities carried out such as bee management, production and other records since their honey is certified as organic. The

agribusiness firm on the other hand, provides training, inspection, credit, honey containers and other necessary input can improve the product quality. For the farmers involved, market uncertainty is particularly reduced while the agribusiness is relieved from the high transaction costs that can be incurred due to quality problems and unreliable supply.

The contractual agreements enable farmers to sell their products at a price that is 15-20% higher than the spot market price. However, the number of farmers participating in the contractual farming is small.

1.2. Problem description

Currently, the Ethiopian government considers the intensification of production and commercialization of smallholders as a focal point in the agricultural development of the country. Its rural development strategy focuses on market-oriented agricultural progress as a means for achieving sustainable livelihoods for the rural population. An efficient, integrated, and responsive market mechanism is of crucial importance for optimal allocation of resources in agriculture and for stimulating farmers to increase output. Without links of farmers to markets, increments in output, increased rural incomes and improved livelihoods cannot be sustained. The current increasing demand for organic products in developed countries could provide opportunities for honey from developing countries like Ethiopia. There is a good start in Ethiopia in exporting organic honey. Support and encouragement of organic honey production provides the opportunity for poor farmers and those with little or no land to diversify income to improve their livelihood.

In the Sheka zone, the major constraint to increase the benefit of smallholders is their inability to access markets. Improving market access for poor smallholder farmers and enabling them to engage actively in the market process is, therefore, one of the most pressing development challenges. The remoteness of the area on the one hand and the lack of an organized market system on the other often result in low producers' prices (Nuru et al., 2006). Therefore, having good institutional arrangements is vital to promote this sector to contribute more. From a theoretical point of view, contractual farming is one of the ways used to solve such market problems especially in the agricultural sector. Studies have confirmed improvement in farmers' income as a result of participation in contract farming (Key and Runsten, 1999, and Warning and Key, 2002). There is also evidence that show situations where farmers received limited gains from participating in contract farming (Key and Runsten, 1999 and Simmons et al., 2005). Therefore, proper analysis of the factors influencing farmers' decision to participate in contract farming and its impact on household income are important for the design and implementation of policies and strategies that aim to create sustainable markets for honey producers.

A farmer's decision to participate in contract farming is affected by different physical, social and economic factors. This may explain why many beekeepers are not participating in contractual farming despite the provision of higher prices compared to the spot market. For the farmers, the benefit of

contract farming depends on different factors such as the type of agricultural sector, behaviour of the companies and other socioeconomic factors. For example, in some cases when farmers have no other option than trading with a single company, contractual farming may not be beneficial. Even though the contract approach is appreciated by different companies, it is questionable whether it really improves the farmers' income.

1.3. Objectives of the study

The general objective of this study is to analyse the impact of contract honey production on household income in the Sheka zone. The specific objectives of this study are:

1. To describe the characteristics and functioning of contractual honey production in the Sheka zone.

2. To assess the impact of contractual honey production on household income.

3. To analyse the major factors affecting the benefit of the smallholder farmers from contract farming.

To achieve the stated objectives, this study needs to answer the following research questions.

- What are the characteristics of honey contract farming in Sheka and how does it function?
- Does participation in contractual farming improve beekeepers incomes in comparison with selling their products at the local market?
- What are the main factors that contribute to the incomes of the smallholder beekeepers from the contractual honey production?

1.4. Organization of the study

The thesis is organized in six chapters. Each chapter has different sub topics. The next chapter contains an overview of honey production in Ethiopia with specific focus on organic honey production. The third chapter discusses relevant literature and concepts about contract farming while the fourth chapter deals with the description of the study area and the methodology of the study. The fifth chapter presents results with discussion. The final chapter summarizes the main findings of the study and provides recommendations.

2. AN OVERVIEW OF HONEY PRODUCTION IN ETHIOPIA

2.1. Current status of honey production in Ethiopia

In Ethiopia, honey production has been practiced for centuries in rural communities and already appears in the ancient history of the country (Ayalew and Gezahegn, 1991). It is traditionally a well established household activity in almost all parts of Ethiopia. In addition, Ethiopia has perhaps the longest tradition of all African countries in marketing of bee products. Immense natural resources and diverse agro-climatic conditions create conducive environmental conditions for the existence of many flowering plants. This enabled the existence of more than 12 million honeybee colonies in the country (Gezahegn, 2001). Ethiopia, having surplus honey sources of flora and the highest number of bee colonies, is the leading producer of honey and beeswax in Africa. The honey production data shows that Ethiopian honey production constitutes around 23.6% and 2.1% of total African and world honey production, respectively (MoARD, 2005).

Currently, total honey production in the country is 53.68 thousand tonnes. The largest portion (70 percent) of the marketed honey goes to the production of local beverage (*tej*) and around 30 percent is used as table honey. Even though the production technology is often still traditional, honey is being commercialized (MoARD, 2005). Many table honey processing firms are thriving and some have started to process and market table honey for local and export markets.

In spite of its potential, income obtained from this sector has been modest due to lack of improved beekeeping systems, low quality of hive products and lack of skill by farmers. To alleviate these problems, the Ministry of Agriculture and Rural Development (MoARD) has formulated a honey and beeswax development and marketing plan for the country.

2.2. Economic importance of the sector

Production and consumption of honey

In Ethiopia honey production is present in many parts of the country. Simplicity of the production system, low costs and favourable conditions result in a production process that appears everywhere. Especially, for resource poor farmers with no or little land, this activity is a main source of income. The economic benefit of this sector is the value of the bee product obtained. Currently, honey, beeswax and bee colonies are commercialized.

There are three types of bee hives used for honey production based on their technological level. These are traditional, intermediate (transitional) and modern beehives. Traditional beekeeping accounts for more than 95 percent of the honey produced and nearly all the beeswax produced in the country (table 1). This way of honey production makes the management of honey bees for better quality and quantity of honey more difficult. Modern hives give higher yields than the traditional and intermediate ones. However, they are expensive and often not affordable for poor farmers. The intermediate hive is the most appropriate for the resource poor as it requires little skills and has a low cost of production. The

yield from intermediate hives is significantly higher than from the traditional ones. Regardless of the type of hives, both honey and beeswax produced in Ethiopia fit to the internationally required qualities if properly handled.

Table 2.1: Annual honey production.

Year	Total number of hives	Annual honey production(tonnes)	Annual honey production from traditional hives(tonnes)	Percentage of honey production from traditional hives (%)
2005	4,546,245	30,381	30,059	98.93
2006	4,012,515	41,541	40,620	97.78
2007	4,870,679	51,174	50,042	97.78
2008	4,688,278	42,180	40,075	95.00
2009	5,149,244	39,661	37,025	93.35
2010	4,598,226	41,525	38,833	93.52
2011	5,130,322	53,675	51,023	95.06

Source Annual Livestock Sample Survey (CSA).

Honey has been highly prized for its nutritional and medicinal values, as well as its flavour by local communities. In most of the rural areas where there is deficiency of other sugar sources, it is highly demanded for its sweetness and energy-source capacity. Honey selling helps to redistribute money from the urban people with a relatively better standard of living to rural people. Currently, honey is a cash crop for almost all beekeeping households.

Export

Honey and beeswax are among agricultural products that contribute to the national economy through export earnings. There is an opportunity for Ethiopia to benefit from honey export as a result of its large and diverse flora resources for large–scale honey production. There is also a possibility to supply different flavours of honey throughout the year. Ethiopian honey is considered to be organic as the bee forages are forests and plants grown without the use of chemicals. This means, chemical residue is small in the Ethiopia honey, which is one of the issue emphasized on the international market.

Even though the honey sector is contributing to export earnings, the country's honey export is small compared to the estimated production per year. This is mainly because of the low quality of honey from traditional hives. In addition, informal export to neighbouring countries reduces the formal export. Apparently, the honey export shows an increasing trend as 23.2 tonnes in 2005, 274.4 tonnes in 2009 and 201.4 tonnes of honey in first quarter of 2010 were exported (Figure 2.1).

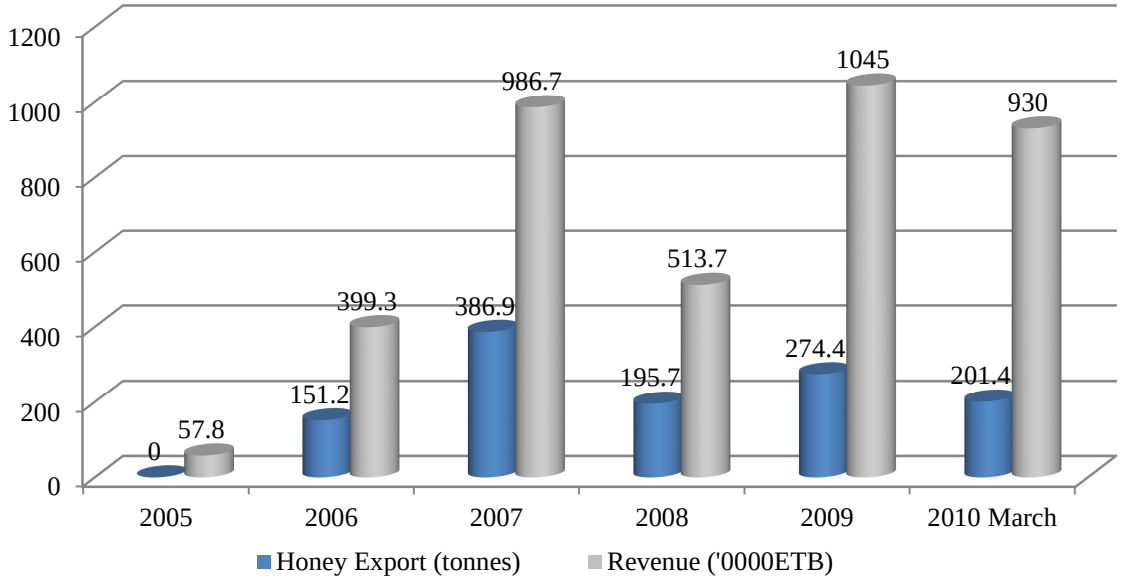

Figure 2.1.Trend of Ethiopian honey export and revenue (2005- March 2010) Source: Author's calculations based on Ethiopian Revenue and Customs Authority (2010)

The export prices increased from ETB 24.9 per kg in 2005 to ETB 46.2 in 2010. The average is about ETB 31.2 per kg annually for the stated period without correcting for inflation. This upward trend in export prices indicates that there are potential gains in exporting to international markets. According to the Ethiopian Customs Authority and Export Promotion Agency (2009/10), export of honey is mostly to Middle East Countries (Saudi Arabia, Kuwait, United Arab Emirates, Iran, Yemen), the Europe (Sweden, Germany, United Kingdom, Norway), Africa (Djibouti, Sudan) and others countries such as Israel, USA, Canada, etc.

Employment

Since honey production is a traditionally well-established household activity in almost all parts of Ethiopia, it contributes to rural employment. The employment effect of honey production includes farmers, traders, bee equipment producers, local *tej* makers and processors. The exact number of people engaged in the honey production in the country is not well documented. However, it is estimated that around one million farm households are involved in honey production (MOARD, 2005/06). In addition, it is also observed that large number of traders and middle men are participating from the farm gate until it reaches the final consumers at different level. Since local honey wine (*tej*) is a cultural drink, many people are engaged in this business. In fact, the emerging honey processing companies also contribute to the employment. Therefore, this indicates that the contribution of this sector to employment is vital. According to CSA (2009/10), 31.2 % of total household have land size less than 0.5 ha and 24.2 % has land size less than 1ha. As a result, looking for activities that require little or no land is a good solution to create job opportunities in rural areas. The simplicity of the honey

production system gives chances for women and older people to generate income. In this regard, honey production is an interesting option for rural communities.

2.3. Constraints and opportunities

The honey sector also experiences constraints which hinder its development. Some of the major constraints and problems are highlighted below (Holeta Bee Research Centre (HBRC), 2003 and MoARD, 2005/06).

Lack of organized markets and market channel

A well-organized market channel is one of the main driving factors for expansion of honey production. Through market channels, producers can be linked to potential buyers. An increased participation of farmers in these channels also leads to more supply for honey processors. In Ethiopia there has not been a strong organized market channel for bee products. Lack of standards and grading systems discourage farmers to produce high quality products. As a result, the honey price received varies based on the good will of buyers (Kerealem et al., 2009). In remote area, demand comes only from local consumption which leaves more supply on local market. In turn, this can bring low price of honey and discourage producers. The constraints related to marketing of honey and beeswax in the country include low prices in local markets, lack of market information and research and lack of infrastructure (Gezahegne, 2001).

Low quality of honey products

Lack of adequate production skills and post-harvest handling at all levels often results in poor quality of honey on the market. Excessive use of smoking during harvesting and using inappropriate containers are serious problems in this respect that increase processing cost for processing companies. Since honey producers have limited knowledge of the preferences of their target market, they do not try to make any changes in the quality of their product. The low price also discourages the farmers to add value. Most honey on local markets is un-extracted, unstrained and has post-harvest handling problems (Gezahegne, 2001).

Shortage of trained personnel

Well trained staff plays a significant role in informing actors in the honey channel. There is shortage of skilled personnel for beekeeping management, post-harvest handling, bee product marketing at all levels (federal, regional and district levels) and processing and quality control in the country (Gezahegne, 2001 and Nuru et. al, 2001). This increases the knowledge gap of the beekeepers in the rural areas.

Lack of improved technologies

In general, there is a serious lack of appropriate technologies for production, collection, processing, packing and storage in many. Improved technologies in honey sector are not widely available. In

addition, technology generating centres are not adequate. Poor extension systems are also a constraint in honey production in taking the improved technologies to farmers.

In addition to these challenges, inadequate support in promoting apiculture development, lack of access to consumer markets, lack of credit and lack of information about the sector are some of the constraints in honey production in the country.

Despite all these constraints, there is still a huge potential to increase honey production and to improve the livelihood of the producers and profits of the processors. There is encouraging support from the government and NGOs to link honey producers to processing companies. The government policy also highly encourages private investments in the processing and exporting of such products. In addition, intervention of NGOs in knowledge transfer and support of micro business working in this sector is an opportunity. Participation of processing companies in organic honey production has the potential to create access to the international honey market, which may encourage farmers to supply more honey of better quality.

2.4. Contract farming as institutional arrangement for the honey sector

As experience from different developing countries shows, contract farming is one of the institutional arrangements that may help to solve farming problems of smallholders (Bijman, 2008). Contract farming has not been applied in Ethiopia on a large scale yet. However, for some crops there have been some experiments. Oil crops, vegetables, barley, wheat and honey are some of the crops produced under contract farming. Nijhof (2010) made an inventory of nine contract farming initiatives in Ethiopia. Most of these are still in its initial phase. Oil crops, vegetables and honey are produced for export markets while barley and wheat are for local processing companies. In production of these crops the contracts have been made with smallholders. Supplies of improved technologies, credit, different input and a secured market outlet are some of the advantages for farmers under contract farming. In this regard, some of the problems in the honey sector could be solved through this institutional arrangement. The pricing system, enforcement and agreement of the contract vary depending on the company and other conditions.

3. THEORY ON CONTRACT FARMING

3.1. Concept of contract farming

In the developing world agriculture plays a significant role in leading economic development. Globalization, expanding agribusiness and the shift in consumer tastes change the agricultural production pattern. Moreover, the effort of many government policies towards more market-oriented solutions is playing a pivotal role in this shift. As market oriented production is expanding, it in turn strengthens the need for effective institutional arrangements. Smallholder farmers may face difficulties in fully participating in this market oriented approach. They might be marginalized as larger farmers become more important and influential. However, governments and development agencies try to empower these smallholders through developing different income generating farming activities for rural people. In many countries due to a lack of effective coordination mechanism the empowerment is not well implemented and achieved (Eaton and Shepherd, 2001).

Methods of coordination can be classified based on the degree of control over other vertical stages. Open market coordination is at one end of the spectrum and vertical integration on the other end (Figure 3.1). In an open market, sales are made on the spot market after production has been completed. In contrast, vertical integration refers to management and ownership of two or more stages of the marketing system by a single firm. In between, there are two intermediate forms of coordination. These are market-specification contracts and resource-providing contracts (Martinez, 2002).

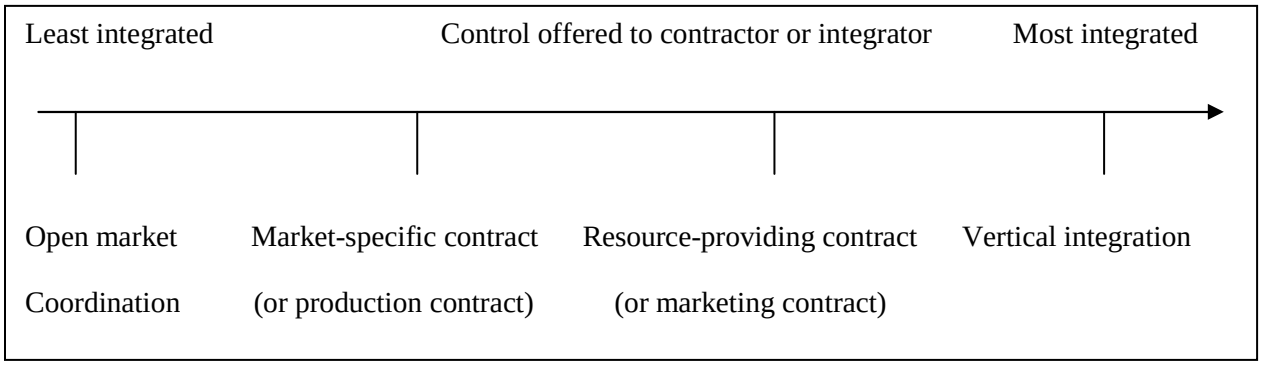

Figure 3.1: Methods of vertical coordination along the spectrum of control:
Source: Adopted from Martinez, 2002

3.1.1. What is contract farming

Eaton and Shepherd (2001:2) define contract farming as *"an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at predetermined prices."* According to Slangen et al., (2008), a contract is a governance structure and therefore also a transaction mechanism for conducting an exchange. In addition, Simmons (2002:3) defines a contract as "*a large agribusiness firm integrating backwards by forming alliances with groups of smallholders and, through written or verbal contracts,*

providing farm inputs such as credit and extension in return for guaranteed delivery of produce of specified quality often at a pre-determined price."

From all these definitions, it is apparent that contract farming involves three important elements: two parties, a product to be exchanged at a predetermined price and a contract stating the terms of the agreement which contain specified quality and quantity.

3.1.2. Models of contract farming

The way contract farming can be structured depends on the type of product, the intensity of vertical coordination between farmer and contractor, and the number of key stakeholders involved. Eaton and Shepherd (2001), in their FAO manual for contract farming, specify five models.

The centralized model

In this model of contract farming, the firm (processor and/or exporter) buys a product from a large number of small farmers with predetermined quantities and under strict quality control. The firm is supposed to give technical support, inputs and has control over the production process. The involvement of the firm depends on the characteristics of the product, intensity of the risk and farmers' skills. Mainly products which need a high degree of processing can be contracted under this model such as dairy product, coffee, sugar cane, tea and others. This model is commonly practised in Africa and is also called out growers' scheme. Cotton in Zambia, cacao in Kenya and Uganda and tobacco in Vietnam are some of the examples for which this model is practised (Woodend, 2003, Asian Development Bank (ADB), 2005 and Gibbon et al., (2009).

The nucleus estate model

This model is a variant of the centralized model. In addition to collecting from farmers, the firm has its own production farm. The firm helps mainly to demonstrate different technologies to the farmers and to secure supply throughout the year. It is mainly used for perennial crops but also applicable to other crops.

The multipartite model

This model involves legal bodies and private companies jointly participating with farmers as a joint venture. There is usually a separate organization which is responsible to supply input, technical support and management of production, processing and marketing. In this model the government often invests in contract farming through joint ventures with the private sector. According to case studies in Vietnam, this model fits best to smallholders as the integrated effort of many actors reduces the burden of contracting parties (ADB, 2005). This model is common in China.

The informal model

In this case, small companies contract informally with farmers on a seasonal basis. Crops like fresh fruits and vegetables which usually require only a minimal amount of processing can be contracted under this model. The achievement of these companies depends on the government support since they

are not investing in technical support. Sometimes farmers use this method to get credit from small traders. This means selling their crop before harvest. In this case, the price is usually lower than the normal market price.

The intermediary model

There is no direct linkage between the firm and farmers. There are middle men having a formal contract with a processing firm and informal contracts with farmers. As a result, it has several disadvantages in vertical coordination and in providing proper incentives.

Theoretically, an agricultural product can be contracted by means of any of the models. However, certain products favour specific approaches based on the nature of product, farmers' skills, and other environmental and economic factors. The model used can also affect the socioeconomic impact on smallholders.

3.1.3. Types of Contracts

The contract farming models discussed above can be implemented under different contract types that are not mutually exclusive. There are three types of agricultural contracts which differ in their main objectives, transfer of decision-rights (from the farmer to the contractor), and transfer of risk (Key and Runsten, 1999, Eaton and Shepherd, 2001, Singh, 2002 and Bijman, 2008).

Marketing contracts

A market contract is a pre-harvest verbal or written agreement between a farmer and a contractor that specifies quantity, quality, price and delivery time. Most management decisions remain to the farmer, who retains product ownership over his farming periods. The farmer shares price risk with the contractor. This type of contract can reduce the cost of gathering and exchanging information about demand, quality, timing and price, thus reducing uncertainty and the market risks. Furthermore, increasing information availability reduces coordination cost as compared to the spot market. Such contracts are mostly used in informal models of contract farming.

Resource-providing contract

The contractor not only provides a market for the product, but also provides key inputs at various stages of production to producers on a credit base. Credit has to be repaid when the crops are sold. This contract focuses on providing inputs and an output market, leaving most of the production decisions as well as a significant part of the risk with the farmer. For farmers, this type of contract reduces the risk of getting appropriate input on time. The buyer benefits from lower selling prices and reliable supplies of required quality and quantity at the right time. This kind of contract is generally used by well-established entrepreneurs in informal and centralized models of contract farming. Timely delivery of inputs is a key to success under this contract. This type of contract is applied when the product quality depends on the inputs used (Minot, 1986).

Production-management contracts

Under this type of contract, producers agree to follow precise production methods, input use, specific cultivation and harvesting systems. This contract gives more control to the contractor than the market contract. The producer shares most of the decision rights over cultivation and harvesting practices with the contractor. Since the production steps are under supervision, it increases the quality and reduces production cost. In contrast, inefficient producers may be a risk for the contractor.

The choice for any of these contract types depends on the type of product, the characteristics of the buyer, and market conditions (Eaton and Shepherd, 200; Key and Runsten, 1999). However, there are many alternative contracts that can be derived from the above three main categories.

3.1.4. Transaction costs and contract farming

The central theoretical explanation for contract farming is based on Transaction Cost Economics which is a part of New Institutional Economics (NIE). The main idea in NIE is that all transactions between economic actors involve costs. Which governance structure is most suitable in carrying out transactions depends on the transaction costs. Transaction costs (TC) are defined as the costs associated with negotiating, reaching and enforcing agreements (Da Silva, 2005). Transactions may have high or low costs depending on various environmental and human characteristics. These characteristics can be taken as sources of risk (Simmons, 2002, Meijerink et al., 2008 and Slangen et al., 2008).

Asset specificity, uncertainty and frequency of transaction are substantial environmental characteristics that affect transactions. According to Williamson (1987), cited by Slangen et al. (2008), asset specificity is the most critical characteristic which may result in “hold-up problems”. An investment made by the farmer and/or buyer specific to a certain transaction that has little or no value in an alternative use leads to asset specificity (Hobbs, 1996). The higher the degree of asset specificity, the higher the incentive to enter into a contract to protects those assets.

Uncertainty refers to factors which are difficult and costly to predict. Incomplete and asymmetric information is the main source of uncertainty. Lack of information about market conditions for farmers and quality of product for buyers is a challenge in carrying out profitable transactions (Bijman, 2008). Finally, if the frequency of transaction is low, the transaction cost will be high and vice versa.

Bounded rationality and opportunistic behaviour can also influence transactions. Bounded rationality is the lack of capacity of the parties to formulate and solve complex problems in a costless and straightforward way while opportunistic behaviour is associated with seeking personal benefit without considering the other party. Voluntarily providing incomplete and/or biased information or making promises which may not be kept is also opportunistic behaviour (Slangen et al., 2008). As a result, higher monitoring costs raise transaction costs for the other party who signs the contract. In the

absence of such problems, spot market trading is most efficient. However, in reality one or more of these problems may happen. The degree of these problems determines the transaction cost which indicates the need for contract farming.

3.2. Why contract farming

3.2.1. When is contract farming expected

Well-managed contract farming is an efficient way to coordinate and encourage production and marketing in agriculture. However, it is important to identify when contract farming is most appropriate. Depending on the type of product, buyer and the nature of market one can decide when contract farming is most suitable in agriculture (Bijman, 2008).

Usually, when a product is of uniform quality, non-perishable, when quality can easily be observed, and when farmers are familiar with the production methods and market requirements, then transaction costs are low and spot markets are the most efficient arrangements. However, for high quality products for which customers are willing to pay a premium, contract farming is more likely.

The need for producers and buyers to coordinate in all stages of production is more significant for perishable products. Therefore, contract farming is used for high quality fruits, vegetables, flowers, and other quality sensitive and perishable commodities. Furthermore, in dairy and poultry production, contract farming is common because of perishability and the need for technically specialized and sophisticated inputs which are not easily obtained by producers.

The type of market also influences suitability of contract farming. If products need a constant quality on the final market contract farming is favoured in order to control the production process (Miyata et al., 2007 and Minot, 2007). That is why products for export markets often use contract farming arrangements. In general, international markets, particularly those in developed world, need products which comply with high quality and food safety standards. Therefore, contract farming is expected when such standards are very important and guarantee of the quality of the products is crucial.

3.2.2. Reasons to enter into contract farming

According to Eaton and Shepherd (2001), Singish (2002) and Bijman and Ton (2008), the main objective of contract farming is to overcome certain problems and constraints that small scale farmers face in farming. The literature indicates that there are different reasons for the farmers and processors to engage in contract farming. In general, both parties are likely to choose contract farming instead of vertical integration or spot market exchange when transaction costs and risk can be minimized (Singh, 2002). The main potential reasons why farmers enter into contract farming are:

Market security

Smallholder farmers often have problems in deciding what to produce by limited marketing opportunities, which often makes diversification into new crops very difficult. With contract farming, uncertainties associated with the search for product markets are transferred to the processing firm. The

returns that farmers get from selling on the spot market depend on the current market prices as well as their ability to negotiate with local traders. This can create substantial uncertainty. Contract farming can overcome this problem since the contractors specify in advance the price to be paid (Singh, 2002). Contract farming offers market guarantees to the farmers and motivation for further expansion. In addition, farmers are exposed to different markets.

Access to technical assistance

Following Eaton and Shepherd (2001), technical support and information transfer from the firm is one of the main reasons why farmers decide to join contract farming. Contract farming can improve farmers' efficiency through the fact that management decisions are shared or transferred to contractors. In turn, farmers can benefit from managerial advice, technical support, and improve their production skills. In order to achieve the required quality and quantity of yields, the processing firms provide production specific technical support. The information that could be provided through contract farming includes production requirements in specific markets, time of planting and harvesting to meet markets, management of product quality and other market and technical information (Simmons, 2002).

Access to capital

Capital is important to invest in new production systems and to get quality products that fulfil market demand and that give the highest price. In most cases, smallholder farmers experience difficulties to get credit for farm inputs. As a result of the high risk of repayment, there is less possibility of borrowing money from banks and other local sources (Key and Runsten, 1999). High interest rates are also problematic in getting credit from informal sources. In this regard, contract farming allows farmers to access credit to finance production inputs. In this context, it is the firm who advances credit through enforced agreements. The firm also has an advantage from lending since it can monitor input use and control crop management decisions. Farmers sometimes use the contract agreement as collateral to have credit from local sources (Simmons, 2002).

Skill transfer

Skill transfer is also one of the reasons why farmers engage in contract farming. This is true by the extent to which contract farming offers the opportunity to learn basic concepts on how to run production activities efficiently. The skills that the farmer learns through contract farming may include the efficient use of farm resources, improved methods of applying inputs, record keeping, knowledge about the importance of quality and the characteristics of different markets especially export markets. Moreover, spill over effects from contract farming initiate the farmers to invest in market infrastructure and human capital. As a result, it improves the productivity of other farm activities (Eaton and Shepherd, 2001).

Income stability

It is difficult for smallholders to have stable income.

Traditional method of production on the one hand and poor market channels on the other hand, influence the returns from farming. Income instability is especially high in the case of spot market trading in which smallholders have no influence on the price. This can create considerable uncertainty. Farmers expect to achieve income stability through contract farming because of the reduction of risks and uncertainty in comparison to spot market (Johnson et al., 1996).

In relation to the above reasons, Guo et al. (2005) found in their study of contract farming in a number of the eastern provinces in China, that farmers enter to contract farming to obtain the advantages of price stability, market access and technical assistance to improve product quality. Masakure and Henson (2005) have listed why small-scale producers enter into contract farming to grow non-traditional vegetables for export. Among smallholders in Zimbabwe (2001-2002), they found four factors motivating contracting, namely market uncertainty, indirect benefits (e.g. knowledge acquisitions), income benefits, and intangible benefits (e.g. status).

Contractors also have different reason to enter into contract farming. Spot market purchases and own productions are the alternatives for the contractors to get raw materials for their processing and marketing activities. The reasons to enter into contract farming are observed in comparison with these alternatives. Production reliability, quality consistency, overcoming land constraints and reduction of transaction costs and risk are the main potential reasons for firms to enter contract farming (Eaton and Shepherd, 2001). As the firm has the power to control input supply and production process, it is an opportunity to keep the flow of uniform product and better respond to the market demand (Hall and Langemeier, 1994). Contract farming also gives the chance to expand and diversify their process.

In spite of the potential benefits of contracts for farmers, studies have shown that in developing countries contracts sometimes also have negative effects (Little and Watts, 1994, Porter and Phillips-Howard, 1997, Torres, 1997, Siddiqui, 1998 and Singh, 2002). In contract farming, processors are likely to contract larger farmers or they may offer different types of contracts to different farmers, which can increase social inequalities in a community (Singh, 2002). It may also create conflict within communities between farmers with and without contract (Singh, 2002). As specialization increases, it exposes farmers to asset specificity and prevents them not to look for other firms to find higher a price (Key and Runsten, 1999). Sometimes, firms can increase their quality standards if supply exceed the market demand and reject the surplus which is a loss for farmers (Glover, 1984).

3.3. Impact of contract farming on household income: Empirical evidence

In early assessments of contract farming in Africa, many studies showed a positive effect on income using comparative case study analysis (Minot, 1986, Glover and Kusterer, 1990, Little and Watts, 1994 and Porter and Phillips-Howard, 1997). Minot (1986) reviewed contract farming in developing countries and found that in general contract farming improved the income of farmers. In contrast, the frequent failure of contract farming was also an important finding in the study. In spite of some social problems that happened, Porter and Phillips-Howard (1997) conclude that African farmers were

generally better off as a result of their participation in contract farming.

Recently, there have been a number of studies that explore the impact of contract farming using econometric analysis. Based on survey data collected from 162 apple and green onion producers and four contracting firms, Miyata et al. (2009) examined the impact of contract participation on household income in China. Their finding suggests that small farmers can benefit from contract farming. Similarly, Birthal et al. (2005) found that the gross margins for contract dairy farmers in India were almost double those of non-contract farmers. The main reason for the difference is because of contract growers had lower production and transaction costs.

In their study on the impact of contract farming in poultry, maize seed, and rice seed in Indonesia, Simmons et al. (2005) found that contracts have a positive effect on the farmer's welfare. The contracts for broilers and seed corn brought increased returns to capital. For seed rice, the contracts had no effect on the returns to capital. All three contracts of poultry, maize seed and rice seed reduced absolute poverty.

An analysis of efficiency and distribution of contract farming of poultry production, in the state of Andhra Pradesh India, showed that contract production is more efficient than non-contract production. In addition, the study found that there was an income difference between the two groups. Farmers also gain appreciably from contracting in terms of higher expected returns and lower risk. From the average returns of contract and non-contract farmers, they concluded that the contract enables poor farmers to generate a comparable income (Ramaswami et al., 2006). Similarly, Gibbons et al. (2009) also analysed the revenue effect of participation in smallholder contractual organic cocoa production in Uganda. They found that there was a positive revenue effect of contract farming. Besides, contract farmers have exposure to improved farming techniques that can enhance their yields.

Warning and Key (2002) explore how participation in the NOVASEN (a private company) program affected the agricultural income of 32,000 peanut growers in Senegal. They found that farmers increased their income substantially by participating in the contract program compared to non-participating farmers. In addition, the authors found that the contract farming scheme did not favour larger or wealthier growers.

In general, the benefits of participating in contract farming vary between countries based on the agricultural sector, the type of contract, the number of agribusiness firms working in the area and so on. The degree of the income level as a result of contract farming also varies accordingly. Especially in countries where contract farming is not well established, exploitation of farmers by the firms may happen. Following Eaton and Shepherd (2001), there is a case in which contract farming has a negative effect on farmers' income because of a monopoly tendency and opportunistic behaviour of firms. Lack of transparent pricing and quality control is among the factors that result in a negative income effect.

4. DATA AND STUDY AREA

4.1. Description of the study area

This study was carried out in the South West of Ethiopia in the Sheka zone. This area is sometimes called 'the honey belt of Ethiopia' because of extensive honey production. The Sheka zone is one of the 13 zones of the Southern Nations, Nationalities and People's Regional State (SNNPRS). It has three districts Masha, Anaderach and Yeki. This area is covered with immense natural forests. According to the agricultural sample survey report of the country, the total land size of Sheka zone is about 217,528 hectares of which 43.4 % is covered with natural forest. Consequently, this area is the ideal place for organic honey production. In addition, the climatic conditions are also favourable for beekeeping. Three agro-ecological zones are distinguished in Sheka zone. These are the highland zone (17.65 %), mid altitude zone (59.85%) and low altitude (22.85 %). The area includes the upper catchments of several rivers such as Baro, Akobo and Omo. The districts of Sheka zone are generally humid with extended rainfall from May to October and from January to March with short dry periods. The total annual rainfall ranges from 2000 to 2200 mm which is fairly distributed throughout the year. The temperature of the study area is also very moderate which ranges from 15^{o}C - 25^{o}C with a mean of 21^{o}C.

The vegetation, which covers 50% in Masha and 70% in Andracha, is mainly natural forest, which provides natural sources of nectar for the honey bees. *Scheefflera abyssinica, Syzygiun gineensee, Croton macrostachys, Vernonia spp and Eucalyptus spp* are some of the dominant honeybee trees growing in the area. The natural vegetation coverage per household is about 4 hectares. In the Sheka zone agricultural plots are relatively small due to the large natural forest area. The acreage on average is about 1.97 ha. Every household has its own forest land with big trees used to hang traditional bee hives. The forest land is traditionally transferred from generation to generation through a system called *Kobo.* This cultural practise helps the farmers to conserve the natural forest. The involvement of household in honey production is 94 % in Masha, 98 % in Anderach and 60 % in Yeki (table 4.1).

Table 4.1 Population and households in Masha, Andracha and Yeki districts

District	Number of Households	Number of Beekeepers	Percent
Masha	6,615	6,200	94
Andracha	5,240	5,112	98
Yeki	14,500	8,700	60
Total	26,355	20,012	76

Source: Sheka Zone Agricultural and Rural Development Office, (2007)

According to a zonal agricultural office report (2007), the honeybee population density is about 73,000 and 170,000 colonies in Andracha and Masha respectively. In these districts, there are two honey harvesting periods, April to June and January to February, of which the former is the major harvesting period contributing 95 % of the annual honey production. Honey production is the main agricultural practise for most households. *Enste* (E. ventricosum) commonly known as "false banana", maize, coffee, pulses and beans are the major crops grown. The coverage of these crops is relatively small except *enste* which is the main staple food widely used in the area. Livestock and small-scale vegetable production are also practised.

Non Timber Forest Products (NTFPs) including honey, forest coffee, bamboo, cardamom, long pepper are a source of income for more than a quarter of farmers in the area (Sheka Zone Finance and Economic Development Office (SZFEDO), 2007). In Masha and Anderach a large share of annual household income is from honey sales. In contrast, in the district Yeki coffee production is the main income sources since this is a low altitude area. Beehives construction and charcoal making are income sources in the area. In addition, farmers are also employed in coffee plantations as daily workers.

4.2. Data

4.2.1. Sampling and data collection methods

Primary survey data were collected for the honey production year 2010/11 through a structured questionnaire which includes both closed and open-ended questions. The questionnaire was pre-tested and necessary modifications were made before execution of the survey. The primary data were supplemented by secondary data from the Ehiopian statistical office whenever necessary.

Multi-stage random sampling was used to select respondents. In the first stage, out of the three districts of the Sheka zone Masha and Anderach were selected on purpose because of the presence of certified organic honey production. In the second stage, based on the proportion of certified villages, four villages (three from Masha and one from Anderacha) were selected randomly. In the final stage, the total households in the four villages were stratified into two strata: contracted and non-contract beekeepers. The non-contract farmers were selected within villages of farmers under contractual organic honey production to ensure homogeneity of factors except contract farming. In total about 195 respondents (79 respondent under contract farming and 116 non- contract beekeepers) were selected using random sampling. The size of the two groups was determined based on the probability proportional to size principle.

Table 4.2: Sampled districts, villages and respondents.

Districts	Villages	Total number of beekeepers household	Number of sample selected		Total sample
			Contracted	Non- contract	
Masha	Beto	211	20	28	48
	Uwa	217	19	30	49
	Gadda	225	18	28	46
Anderacha	Chegecha	310	22	30	52
	Total	963	79	116	195

4.2.2. Current contract farming structure in the study area

In the Sheka zone, contractual organic honey production started in 2007 with a company involved in the export market. This company reached an agreement with smallholders in order to have reliable supply. The centralized model of contract farming has been used in which the company receives the honey from many beekeepers based on predetermined quality and quantity agreements. Since 2010 the company started its own beekeeping site for production and for use as demonstration site. Therefore, the contract farming model is switched to the nucleus estate model.

Structure and content of the contract document

The contract document used for the agreement between the farmers and the company in the study area contains articles which includes obligation of parties, quantity, pricing and others. The company is obliged to provide inputs which can improve the productivity of the farmers through credit. In addition, providing training is also a responsibility of the company. Based on the predetermined quality parameters and the agreement on this with farmers the company receives the honey. Follow up and technical assistance are also included in the duties of the company. The main responsibility of the farmers is supplying honey with a required quality. The quality parameters include moisture content, percentage of liquid honey to the comb, containers used, and others. Record keeping and supplying only to the company is also obligatory for the farmers. The contract document has an article which states the agriculture office's responsibility to resolve any conflict between the parties, which helps to enforce the agreement. How to deal with defaults and how to quit from the contract is also included in this contract.

The price is determined through negotiation between both parties. The price of honey is based on the market price of honey. Farmers can get from 15 to 20 % more than the market price based on the quality requirements maintained. Therefore the spot market price is used as floor price. Both farmers and the company participate actively in the pricing process. This helps to make pricing transparent, which contributes to the success of contract farming. It also reduces defaults since both parties have information on honey prices.

Achievement through contract farming

Through contract farming the company provides training to improve the quality and the quantity of honey. Since 2007 the honey supply and export from Sheka zone shows an increasing trend (Figure 4.1). Currently the honey from the study area is exported to the UK, Germany and Norway.

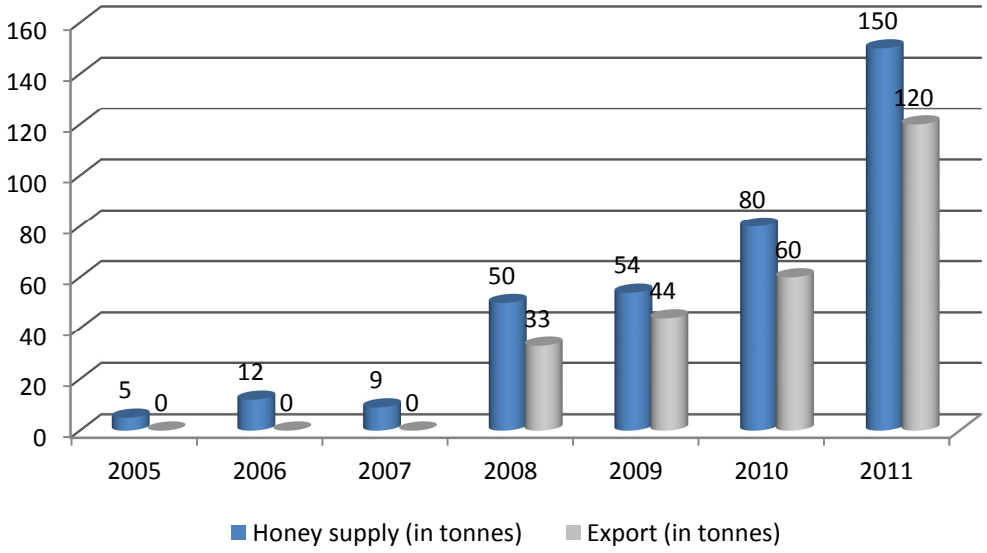

Figure 4.1: Trend of export of honey from Sheka zone in tonnes. Source: Beza mar Agro Industry.

In addition to quantity, the quality of the honey also improved. The wastage of honey which was more than 30% in 2007 decreased to 15% in 2011. Since the moisture content of honey is a substantial quality parameter, intensive training has been provided for the farmers to reduce it. The average moisture content was more than 25% in 2005 but it reduced to 20% in 2011.

4.2.3. Socioeconomic and institutional characteristics of the households

Different socioeconomic characteristics of households were collected from both contracted and non-contract beekeepers. In table 4.3, variables are listed to show the distribution between contracted and non-contract beekeepers. Access to credit, extension service, training, communication and social position in society show significant differences between contracted and non-contract farmers. This suggests that participation of farmers in contract farming can be affected by these variables. The distribution of total sample respondents in terms of literacy level shows that 29.7% and 70.2% are illiterate and literate respectively. As a result there is no significant difference in literacy level between contracted and non- contract beekeepers (table 4.3).

Table 4.3: Socio-economic and institutional characteristics of respondents (mean/frequency)

Characteristics	Contracted	Non-contract	t/χ^2-value	
Literacy			0.23	
Illiterate	22.0	36.0		
Literate	57.0	80.0		
Social position			32.99	***
Not participated	39.0	101.0		
Participated	40.0	15.0		
Access to credit			86.68	***
No credit	14.0	98.0		
Access	65.0	18.0		
Access to extension service			8.13	***
No access	7.0	29.0		
Access	72.0	87.0		
Access to training			17.19	***
Not trained	14.0	54.0		
Trained	65.0	62.0		
Access to communication facilities			5.84	**
No access	29.0	63.0		
Access	50.0	53.0		
Age of household head	41.4	39.4	1.2	
Education level	4.9	4.4	0.99	
Total family size	7.9	6.3	3.53	***
Family members participated in beekeeping	4.4	2.9	4.78	***
Beekeeping experience	23.3	20.4	1.82	*
Number of traditional hives	65.4	80.0	2.24	
Number of transitional hives	6.8	2.0	4.93	***
Number of modern hives	0.3	0	0.82	
Distance from market	1.4	1.0	2.42	**
Distance from forest area	1.7	1.4	2.40	**
Distance from extension agent office	0.6	0.5	1.05	
Moisture content of honey	19.9	23.7	-20.98	***
Percentage of liquid honey	65.0	45.2	8.80	***
Sales price	38.4	30.4	46.90	***
Annual income from honey production	13165.2	4678.7	13.54	***

***, ** and ** Shows the value statistically significant at 1%, 5% and 10% level of critical level
Source: Own survey result, 2011

In terms of age and education level of household heads there is no significant difference between contract and non-contract farmers. In contrast, total family size and family members that participate in

honey production both have significantly different mean value at 1% critical level. Furthermore, household beekeeping experience and transitional hives owned show significant difference in mean values while insignificant mean difference in terms number of traditional hives owned. The number of modern bee hives owned has an insignificant mean difference. This is because the distribution of modern bee hives is small in the study area. In terms of distance from the market and the forest, the mean difference is significant at 5% level while the distance from extension agents is insignificant.

In this study the quality aspect of the honey is also included. Moisture content (MC) of honey is a substantial quality determinant in honey production, especially for table honey. Honey with a high moisture content is more likely to ferment. Besides, it indicates ripeness of honey. The time of harvesting and the storage condition determine the moisture content. Since honey has a hygroscopic nature, it can trap moisture from the air unless stored in sealed containers. The international honey standard shows that the final product ready for consumption should have a moisture content between 18-20 % which may vary across countries (HBRC, 2003). Therefore exporters of honey set the MC of raw honey not higher than 20% since it can then be lowered to the 18% standard through processing in the factory. In places where most of the honey is from traditional beekeeping the percentage of liquid honey to honey combs can be used as a quality parameter for the raw honey. In this regard, in terms of both quality aspects the mean difference is significant at 1% level between contracted and non-contract beekeepers.

The annual income from honey production shows a significant mean difference at 1% level between contract and non-contract beekeepers (table 4.3). Beekeepers under contract farming earn more annual income from honey production than non-contract farmers. This difference can be due to the higher price the contract offers to farmers under contract farming. The sales price of honey shows a statistically significant mean difference. Furthermore, the difference in transitional hives owned also helps contracted farmers to supply honey of a better quality compared to non-contract farmers.

5. METHODOLOGY

5.1. Methods of impact evaluation

5.1.1. Basic theory of impact evaluation: The problem of selection bias

Different programs have been designed in order to change the income level of targeted groups. The implementation of these interventions usually entails commitment of substantial resources. Such interventions often have a positive welfare effect, but it is not always clear whether the intended objectives are achieved. As a result, conducting impact evaluation is essential to assess the effect of interventions either before scaling up existing projects or commencing new projects. Impact evaluation can help policy makers, resource owners and other actors in a system to know if the approach has the intended effect. Effective impact evaluation helps not only to analyse the effects but also identifies the contributing factors. In addition, it explores whether the observed changes are indeed due to the program or due to other factors.

In analysing program effects one needs to assess how individuals would have performed without the program. This is the basic challenge in impact evaluation because only the realised outcome is observed for each individual. This implies a missing data problem since one cannot observe the outcomes of program participants if they had not participated, which is called the counterfactual outcome or unobserved outcome (Caliendo and Hujer, 2005).

To proceed with the analysis, comparing outcomes of treated individuals with those of a comparison group, which has not been treated, has been taken as the best option to overcome this counterfactual problem (Caliendo and Hujer, 2005, Caliendo and Kopeinig, 2008 and Khandker et al., 2010). Therefore, one has to find a comparison group similar to the treated group. According to Khandker et al. (2010:25), two solutions can be applied to solve this problem. The first solution is creating a comparison group through statistical design. The second solution is modifying the targeting strategy of the program to clean out differences that would have existed between the treated and non-treated groups.

In the process of comparing outcomes across treated and non-treated individuals, selection bias is a major problem that needs careful attention. Since the treatment assignment is often non-random, selection bias is likely to happen. This results from selective program assignment and self-selection into the program, leading to a difference between treated and non-treated individuals before intervention, so that ex post, the observed difference may not be entirely due to the treatment (Caliendo and Kopeinig, 2008).

5.1.2. Impact evaluation approaches

To overcome these fundamental problems, different methods can be used in impact evaluation. According to Khandker et al.(2010), these methods include randomized evaluations, propensity score matching, double-difference, instrumental variable techniques, regression discontinuity design and

structural and other modelling approaches. These methods differ by their assumptions and data requirements to solve selection bias in estimating treatment effect.

Randomized evaluations solve the problem of selection bias through random assignment of the program. A propensity score matching method is useful in the absence of an experiment as there is no need to have a baseline and panel data (Caliendo and Kopeinig, 2008). It compares treatment effects across participants and matched non participants based on the propensity to participate. The matching is carried out based on observed characteristics. Different matching techniques can be used. Double difference methods can be used in both experimental and non-experimental settings. This method assumes that invariant unobserved characteristics exist and the evaluation is done by considering the difference in outcomes across treatment and control group before and after the treatment. Instrumental variable methods can be implemented using cross-section or panel data. Selection bias in model parameters is corrected by using instrumental variables. These variables should be correlated with participation but not correlated with unobserved characteristics affecting the outcome (Khandker et al., 2010). These instruments are used to predict program participation. The regression discontinuity design method extends instrumental variable and experimental methods. This method allows for observed and unobserved heterogeneity in comparing participants and nonparticipants.

5.2. Estimation of the effect of contract participation on income: Propensity Score matching

In a situation without randomization it is not possible to directly estimate the effect of contract farming on household income. In this case, there is a need to investigate what would have happened to household income if they had not participated. To solve this problem, the potential outcome approach or Roy-Rubin model is the standard framework to estimate the treatment effect (Caliendo and Kopeinig, 2005). In this model households have two choices. The treatment indictor *D* is one if a household participated in contract farming and zero otherwise. The potential outcomes can be defined as $Y_i(\mathrm{D_i})$ for each individual *i*. The treatment effect for an individual *i* is then:

$$T_i = Y_i(1) - Y_i(0) \quad (1)$$

From equation 1 the counterfactual problem is clear because only one of the potential outcomes is observed for each individual *i*. Y_i (0) is not observed for contract participants, whereas Y_i (1) is not observed for non-participants. Therefore, estimating the individual treatment effect T_i is not possible and there is a need to focus on average treatment effects. The average treatment effect on the treated (ATT) is one of the parameters mostly used in estimation of treatment effects. It is given by

$$T_{ATT} = E(T_i|\mathrm{D_i} = 1) = E[Y_i(1)|\mathrm{D_i} = 1] - E[Y_i(0)|\mathrm{D_i} = 1] \quad (2)$$

The expected value of ATT is now the difference between expected outcome values with and without treatment for those who actually were treated.

In this expression, the counterfactual for contract producers, $E[Y_i(0)|\mathrm{D_i} = 1]$, is not observed. In order to estimate ATT this has to be dealt with in a proper way. A solution seems to take the mean outcome of non-contracted individuals $E[Y_i(0)|\mathrm{D_i} = 0]$.

$$T_{ATT} = E(T_i|\mathrm{D_i} = 1) = E[Y_i(1)|\mathrm{D_i} = 1] - E[Y_i(0)|\mathrm{D_i} = 0] \quad (3)$$

The problem here is that the contract and non-contract farmers may initially not be the same (before introducing the contract), so the expected difference between those groups may not entirely be due to the contract. To overcome this problem the expected outcome for non-contracts had they participated in contract farming $E[Y_i(0)|\mathrm{D_i} = 1]$ can be used in equation 3 (adding and subtracting).

$$T_{ATT} = E[Y_i(1)|\mathrm{D_i} = 1] - E[Y_i(0)|\mathrm{D}_i = 0] + E[Y_i(0)|\mathrm{D_i} = 1] - E[Y_i(0)|\mathrm{D_i} = 1] \quad (4)$$

If we rewrite this

$$T_{ATT} = ATT + E[Y_i(0)|\mathrm{D_i} = 1] - E[Y_i(0)|\mathrm{D}_i = 0] \quad (5)$$

$$T_{ATT} = ATT + \varepsilon \quad (6)$$

ATT is the average gain in income of participants compared to nonparticipants, as if non-participating households also participate in contract farming. It is similar to a condition in which a randomly chosen household from the population is assigned to participate in the contract farming. Therefore, participating and non-participating households have an equal probability of participating to contract farming.

The term ε is the selection bias which is the difference between the counterfactual mean of contract participation and the mean output of non-participation.

The true parameter of ATT is only identified if the outcome of treatment and control in the absence of contract are the same. This is written as:

$$\mathrm{E}[Y_i(0)|\mathrm{D_i} = 1] - \mathrm{E}[Y_i(0)|\mathrm{D_i} = 0] = 0 \quad (7)$$

Therefore, the main goal of impact assessment is to get rid of selection bias. Propensity Score Matching (PSM) has become one of the major approaches to estimate causal treatment effects. It helps as a treatment effect correction used to reduce bias when estimating the effect of treatments (Rosenbaum and Rubin, 1983). This method tries to capture the effects of different observed covariates *X* on participation in a single propensity score or index. Then, to obtain the program effect,

the outcomes of participating and non-participating households with similar propensity scores are compared. Households for which no match is found are dropped because they cannot be compared. Therefore, based on a model for the probability of participation in contract farming *D* conditional on observed characteristics *X*, the propensity score can be obtained. This is given by

$$P(X_i) = \Pr(\mathrm{D}_i = 1|X_i) \quad (8)$$

For the matching method to be valid, there are assumptions that should be satisfied. These are Conditional Independence (CIA) and presence of a common support (Khandker et al., 2010). CIA states that given a set of observable covariates *X* that are not affected by treatment, potential outcomes *Y* are independent of treatment assignment *D* (Rosenbaum and Rubin 1983; Khandker et al., 2010). In the present case, this means that the counterfactual income is the same as the income level that would have existed if the household had not participated in contract farming. This is given by:

$$(\mathrm{Y}_0), (\mathrm{Y}_1) \perp \mathrm{D}_\mathrm{i}|\mathrm{X}_\mathrm{i} \quad (9)$$

The common support or overlap condition is the second assumption: $0 < P(\mathrm{D}_\mathrm{i} = 1|\mathrm{X}_\mathrm{i}) < 1$. This condition implies that treatment observations have comparison observations "nearby" in the propensity score distribution (Rosenbaum and Rubin 1983; Khandker et al., 2010).

As these assumption holds, the PSM estimator for ATT can be written in general as

$$\mathrm{T}_{\mathrm{ATT}}^{\mathrm{PSM}} = \mathrm{E}_{\mathrm{P(X_i)|D_i=1}}\{\mathrm{E}[\mathrm{Y_i}(1)|\mathrm{D_i} = 1, \mathrm{P(X_i)}] - \mathrm{E}[\mathrm{Y_i}(0)|\mathrm{D_i} = 0, \mathrm{P(X_i)}]\} \quad (10)$$

In this study, application of PSM uses the probability of participation obtained from a probit model. Next, the controls were matched to each treatment using a selected matching algorithm. Different matching criteria can be used to assign participants to non-participants on the basis of the propensity score. In this study, households with and without contract farming were, therefore, matched using the nearest neighbour, kernel and stratification matching methods. These methods are described below (Rosenbaum and Rubin, 1984, Caliendo and Kopeinig, 2005 and Khandker et al., 2010):

Nearest-neighbour matching

Each treated observation is matched with a control observation that has the closest propensity score. In the nearest neighbour matching, it is possible that the same household in the control group can neighbour more than one household in the treatment group. Therefore, after matching, the difference between their incomes is calculated as the average effect of contract participation on the household income (ATT).

Calliper or radius matching

If the closest neighbour is far away nearest-neighbour matching has the risk of bad matches. This can be controlled through imposing a tolerance level on the maximum propensity score distance (calliper). Applying calliper matching means an individual from the control group is chosen as a match for a treated individual that lies within the calliper (propensity range). Therefore, it is closest in terms of propensity score. According to Smith and Todd (2005) a possible shortcoming of calliper matching is that it is difficult to know what choice for the tolerance level is reasonable.

Stratification matching method

This method divides the common support into different intervals and calculates the treatment impact within each interval. A weighted average of these interval impacts is taken as the overall program impact.

Kernel matching method

All treated observations are matched with households in the control group based on the weighted average. The weighted average is inversely proportional to the distance between the propensity scores of the treated and control groups.

It is important to note that each matching method has its own strengths and weakness. Using a combination of different matching methods has the advantage of testing the robustness of impact estimates (Caliendo and Kopeinig, 2005 and Khandker et al., 2010).

The matching methods build on the assumption of conditional independence, which require a set of observable covariates *X* that are not affected by the treatment. Hence, the variables *X* used in matching should credibly satisfy this condition. Economic theory, related previous research and information about the institutional setting help to select the variables to estimate the probability of participation (Caliendo and Kopeinig, 2005). Using many variables in the probit model is not recommended since over specification of the model can result in higher standard errors for the estimated propensity score (Khandker et al., 2010). Of course, the main purpose of propensity score estimation is not to predict selection into contract farming but to balance all covariates. Based on these issues six variables are included to estimate the propensity score. These are education level, number of family members participating in honey production, social position, number of visits by extension agent, experience in honey production, and distance from forest.

5.3. Factors affecting smallholders' incomes from contractual honey production

The second analysis of this study is to investigate the factors that affect income from honey production. Regression analysis is one of the standard method used to assess the effect of different factors on household income.

$$Y_i = \beta X_i + \alpha T_i + \varepsilon_i \quad (11)$$

Where Y is income of household i, X_i are explanatory variables, T is a participation dummy and ε is the error term.

In case of this study endogeineity may arise since participation in contract farming is one of the variables included in the model. This problem may arise due to unobservable characteristics such as managerial skills, entrepreneurial skills and others which may affect contract participation but also correlate with income. Therefore, this results in correlation between T and the error term which violates one of the key assumptions of ordinary least square in obtaining unbiased estimates, i.e. $cov(T, \varepsilon) = 0$. Instrumental variable (IV) methods can be used to overcome this endogeneity problem and to obtain unbiased estimates (Pindyck and Rubinfeld, 1998). The instrumental variable method bypasses the problem of correlation between T and error term. To proceed with IV methods one needs to find one or more instrumental variable(s) Z that correlated with T: $\text{cov}(\text{T}, \text{Z}) \neq 0$ and uncorrelated with ε : $\text{cov}(\text{T}, \varepsilon) = 0$.

Based on theory and related previous research, household, institutional, environmental and economic variables which are expected to determine household income from honey production are included in the model. Moreover, variables related to quality aspects of honey are also included in the estimation of the model. Table 4.4 gives an overview of the included variables:

Table 5.1: Variable used in the model to explain household income.

Variables	Units
Household income from honey production	Local currency
Education level of household head	Years of schooling
Family members participating in beekeeping	Number
Land holding	Hectares
Contract farming participation (dummy)	Yes/No
Number of transitional hives	Number
Number of traditional hives	Number
Number of modern hives	Number
Distance to market	Hour
Distance to forest	Hour
Moisture content of honey	Percentage
Percentage of liquid honey	Percentage
Social position (dummy)	Yes/No
Access to training (dummy)	Yes/No
Access to credit (dummy)	Yes/No
Number of visits per year by extension agent	Number
Price difference	Local currency

6. ECONOMETRIC RESULTS

6.1. Estimation of the effect of contract participation on household income

The first part of the econometric analysis is the propensity score matching analysis to investigate the causal effect of contract participation on household income. Or more, specific to investigate if contract participation improves beekeepers income in comparison to selling their product at the local market. The balancing property is tested to confirm that individuals with the same propensity score have the same distribution of observable characteristics independent of contract farming (annex 1).

Table 6.1 shows the matching estimates of the average treatment effect of contract farming on household income. Nearest neighbor, kernel, radius and stratification matching methods are used to assess the robustness of the results.

Table 6.1: Matching methods and average effect of contract on household income

Matching methods	Average effect of contract participation	Standard error	t-value	
Nearest neighbour matching	7579.2	721.1	10.51	***
Kernel matching	7581.3	573.4	13.22	***
Radius matching	7253.9	1003.0	7.22	***
Stratification matching	8037.7	660.7	12.16	***

*** Significant at one percent critical level. The standard errors are bootstrapped.

The estimates for the average annual household income earned from contract farming participation range from 7253.9 to 8037.7 in local currency which is equal to 426.7 to 472.8 USD[1] depending on the matching method used. All estimates are significantly different from zero at 1% critical level. The income effect from PSM is similar to the significant income mean difference between contract and non-contract farmers as presented in table 4.3.

From these results we conclude that participation in contract farming has a significant positive effect on annual household income. This income effect can be due to the higher price the contract offers to farmers under contract farming. The sales price of honey shows significant mean difference at 1% critical level (table 4.3). Furthermore, the difference in transitional hives owned also contributes to the income difference between contracted and non-contract farmers through both quantity and quality effects.

The main challenge for beekeepers in organic honey production is record keeping since it is crucial for traceability. The cost of organic honey production is not large. The bee hives can be made from locally available materials, which are not expensive. Moreover, it is easy to keep the quality of the honey since the company provides the honey containers. In general, organic honey production can therefore considered to be an interesting opportunity for the beekeepers in the study area. Nevertheless, many

[1] 1USD is equal to 17 Ethiopian Birr.

beekeepers are not aware of the benefits of contractual organic farming. From non-contract farmers 67% lack information on this and 35% think that organic honey production under contract implies strong requirements.

6.2. Factors affecting the benefit of the smallholder farmers from contract farming

The result from propensity score matching shows contract farming participation has a significant effect on annual household income from honey production. The second analysis of this study is to investigate the influential factors that affect the income from the honey production. In chapter five it was already explained that an endogeneity problem is expected in this model due to inclusion of the dummy variable for contract participation. A preliminary Durbin-Wu-Hausman test shows at 10% critical level that this variables indeed endogenous. Therefore, Instrumental Variable is used. Contract participation is instrumented by distance to the forest and income from other sources since both are correlated to participation and uncorrelated to income (annex 2). Instrumental Variable estimation results of the model presented in chapter 5 are shown in table 6.2:

Table 6.2: Estimation results on determinants of household income from honey production.

Variables	Coefficient	z-value	
Dependent variable household income from honey production			
Family members participating in beekeeping	276.9	2.5	**
Education level of household head	56.5	0.95	
Contract farming participation (dummy)	8198.5	1.8	*
Land holding	86.2	0.75	
Number of traditional hives	20.6	5.39	***
Number of transitional hives	138.4	3.84	***
Number of modern hives	449.8	2.01	**
Distance from market	-518.7	-2.56	**
Moisture content of honey	-1215.5	-3.25	***
Percentage of liquid honey	-21.7	-1.37	
Social position (dummy)	-1674.8	-2.39	**
Price difference	-453.0	-1.16	
Access to training (dummy)	154.9	0.33	
Access to credit (dummy)	-1.0	-3.96	***
Number of visits per year by extension agent	-29.7	-1.34	
Constant	32389.3	3.81	***

***, ** and * shows the value statistically significant at 1%, 5% and 10% level

The number of family members participating in honey production positively and significantly affects the income from honey production at 5% level (table 6.3). This is as expected as more labour increases the number of hives constructed which increases honey yields. In honey production hive construction and preparation, transporting the hives to the sites or to the forest and putting them in trees are some of the activities which require labour. In this regard, having more family members who participate in production can improve the income from beekeeping. The education level of the household has no

effect on income from honey production. In fact beekeeping does not require specific education. This means most individuals, educated or not, can benefit from honey production. The household land holding has no effect on household income from honey production, which is not surprising since honey production does not need much land. This is why honey production is an interesting opportunity in land-scarce area. Moreover, irrespective of the agricultural land size one can integrate honey production in order to increase household income.

Contract participation significantly affects income earned from honey production at a 10% critical level. This is as expected and in line with the propensity score matching results. The result shows that contracted farmers earn about 482 USD than non-contract farmers, which corresponds to the PSM results. Social position in society negatively and significantly influences the household income at 5% level. The household head may participate in leadership of formal and informal institutions in the society. This reduces the available time for honey production which can influence income from production negatively. Therefore, farmers having additional responsibilities may not be fully engaged in honey production. This effect apparently outweighs the contribution of social position in obtaining market information more easily.

The number of hives or bee colonies owned varies, which explains variation in production capacity. The number of bee colonies significantly affects the income from honey production. Transitional hives are more productive than traditional hives, increasing the honey yield. In addition, these hives can be made from locally available materials such as bamboo and eucalyptus and therefore are cheap and easy to construct. The processing company provides training to increase the awareness of farmers to use this technology since it is easy to control quality problems. Contracted farmers have six transitional hives while non-contracted farmers have two hives on average.

Distances to market was measured in time taken to reach the market. This was done to make estimation easy for the respondents. The variable therefore captures distance in time rather than in kilometres. The distance to market significantly affects the income from honey production at 1% critical level. As the time required increases, the income from honey production will decrease. In fact this can determine the quantity of honey supply to the market. Furthermore, this is sometimes related to road quality since farmers bring the honey to the market on the back of animals.

Access to training and number of visits by extension agents have no effect on the household income from honey production. This is not expected since these variables can improve productivity of honey. However, this finding may result from the weak extension system in the area. The attention given to honey production in the study area is not strong compared to other agricultural activities. This way the number of modern hives distribution and adoption is very small while it is one of the ways to improve honey productivity. Moreover, the reason why farmers are still practising forest beekeeping is as result from weak extension service.

The moisture content of honey has a significant negative effect. This is expected since honey moisture content is an indicator of the quality the honey. The processing company can pay more for honey with low moisture content since it decreases processing cost in the factory. The percentage of liquid honey to honey comb shows a significant negative influence on household income. Naturally this is not expected since higher prices can be given to honey with a high proportion of liquid honey. However, in the study area liquid honey is susceptible to high moisture content due to the high humidity of the area.

6.3. Effects beyond income

The econometric results indicate the positive effect of contract farming on household income earned from honey production. Beyond this income effect contract farming also contributes to forest conservation and preventing accidents among households. The forest conservation program is mainly affecting the farmers that live in the forest. Convincing the farmers to protect the forest is a challenge in the area. The problem is the incentive of keeping the forest through payments or any other form of compensation for the farmers. Farmers do not have direct benefits from forest conservation. Many of them question why they should keep the forest without any direct and substantial benefits from conserving it. Faced with small plots for cropping, farmers often cut trees to expand their agricultural land. However, in recent years this issue has been partly resolved by honey contract farming. Farmers have benefited from honey production as a main non-timber forest product. The supply of honey to the processing companies fully depends on the existence of the forest. The motivation to conserve the forest is a critical issue for the exporters. Especially for export markets the organic and natural forest features are important promotion issues used by processors. This can strengthen the link between farmers, forest and the firms. Recently, since farmers have been receiving higher prices for honey, the practise of forest conservation has increased. Therefore, both parties should have as their motto *"no tree, no bee, no honey, no money"*.

In the Sheka zone the traditional beekeeping method is forest beekeeping. Farmers hang many traditional hives in tall trees. They prefer tall trees to protect the bee colonies from bee enemies and to make the nectar collection easy for bees. In this practise they struggle with honeybees in the trees during harvesting period. Since bees in tropical areas are more aggressive, farmers face many stings from the bees. Consequently, many farmers fall down from the big trees, leading to death or broken hands and/or legs, preventing them from participation in economic activities. If this happens to the household head, it is big challenge for the family to survive. Honey exporters are not supporting this method due to difficulties in obtaining honey of good quality. Once the farmers put the hives in the trees, the next visit is only for honey collection. Companies pay lower prices for honey from this type of beekeeping. Currently, backyard beekeeping is promoted which reduces occurrence of accidents. So, contract farming also positively contributes in reducing this problem. Besides, backyard beekeeping gives opportunities for women and the old farmers to participate in honey production.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusion

Since agriculture plays an important role in improving household income and livelihoods of the rural population, it is clear that improving the efficiency of agricultural marketing systems is important. Contractual arrangements are one of the options in this regard. This study analysed the impact of contracts farming on household income originating from organic honey production in the Sheka zone, Ethiopia. Factors which affect household income from honey production were also investigated. In addition, the structure and functioning of contract farming are examined.

Stratified sampling was used to select survey villages and respondents. Data were collected from both contracted and non-contract beekeepers that were randomly selected from four villages in two districts. Propensity score matching was used to estimate the casual effect of contract farming on household income from honey production. Moreover, Instrumental Variable regression analysis was used to explore the factors that determine household income from honey production.

The first part of the study deals with the function and structure of contract farming. The nucleus estate model of contract farming is used in the study area, which includes owning of a production site and collection of honey. The contract document used for the agreement contains obligations and rights of parties, and stipulations regarding quantity, quality, pricing and enforcement. The price is determined through negotiation based on the market price of honey. Farmers can get from 15 to 20% higher price if they fulfil the quality requirements as described in the agreement.

In order to answer the research questions, the effect of contract on household income from honey production is investigated. Indeed, the propensity score matching estimation results shows that contract farming has a positive significant effect on household income. The estimates for the average annual household income earned from participation in contract farming ranges from 426.7 to 472.8 USD[2]. This result indicates that participation in contractual organic honey production significantly improves beekeepers incomes in comparison with selling their product at the local market. Nevertheless, many beekeepers are not aware of the benefits of contractual organic farming.

The second analysis focused on investigating the major factors affecting household income from contractual honey production. Results show that contract participation contributes to household income from honey production positively. The number of hives or bee colonies owned, which captures the production capacity, is one of the major factors affecting household income from honey production. The number of family members participating in contractual honey production also affects household income. Another factor that significantly affects household income is the moisture content of the honey, which is the main quality parameter of honey production. Since processors are interested

[2] 1 USD is equal to 17 Ethiopian Birr

in this parameter, beekeepers who produce honey with the required moisture content can earn more income. These results imply the need to increase the distribution of improved bee hives that can help farmers to increase honey production and its quality. In this regard, transitional hives, which can be made from locally available materials, would be a better option. It also implies the need to provide farmers with the knowledge on how to maintain the required moisture content of honey during the production process.

On the other hand, household land size owned has no effect on household income from honey production. This suggests that contractual honey production can also be possible even for land less households or for households who own a small plot of land. Both access to training and number of visits by extension agents also has no effect on the household income from honey production. This may be a result of weak extension service in the study area. Percentage of liquid honey produced to honey comb and distance to market have a statistically significant and negative influence on household incomes. The percentage of liquid honey to honey comb is important mainly due to high humidity in the study area. This suggests the need to increase farmers' awareness about post-harvest handling of honey. Distance to market can also determine the quantity of honey supply and keep the farmers better informed about market information.

The study also indicates the contribution of contract farming in forest conservation and preventing accidents among households. Production of organic honey is strongly dependent on the existence of natural forest. This has increased the concern of the exporters about conservation. Especially for export markets organic and natural forest features are important promotion issues used by processors. Furthermore, promotion of backyard beekeeping by honey exporters through contract farming indeed helps to reduce occurrence of accidents on farmers that can result during placing the hives on big trees.

7.2. Recommendations

To promote and expand the contract farming approach of organic honey production sustainably the following policy recommendations are given:

- *Increase the awareness of beekeepers about contractual honey production:*

  Although participation in contract farming positively affects household income, it was indicated that farmers' awareness of contract farming is very low. Organizing experience sharing programs among farmers, preparing field visits for farmers and workshops for concerned governmental officials and NGOs can help to increase the awareness of contractual honey production.
- *Promote transitional beekeeping methods:*

  Transitional hives are more productive than traditional hives and do not demand expensive high tech beekeeping accessories. The only costs involved are providing the design of the hives, training and initial support. In addition, transitional hives significantly improve the quality of honey since it allows farmers to inspect ripening of the honey. Farmers' annual incomes from honey can be

improved through increasing the adoption of improved bee hives. The higher income also motivates the beekeepers to adopt the technology more intensively. Therefore, honey processors, governmental and NGOs should intensively promote the adoption of transitional beekeeping to help farmers increase their income with low cost.

- *Strengthen the extension systems:*

  To reach beekeepers with improved technologies and to increase their awareness about better production systems, a strong extension service is important. However, this study indicates that the existing extension service does not have an impact on income suggesting that it does not function. Strengthening the extension service can help to easily disseminate the required knowledge to increase productivity. In this regard, improving the extension requires, designing and providing specific training on production systems as well as strict follow-up system by processing companies and the government.

- *Strengthen the relation between the private sector and beekeepers:*

  Positive linkages between the private sector and the beekeepers are important in contractual farming as one is dependent on the other and vice versa. However, disputes happen between the two groups that can have an impact on honey productivity. Discussion forums could be created to discuss, evaluate and exchange any information that can help to improve the linkage.

- *Create zonal stakeholder forum:*

  Government offices, NGOs, microfinance institutions, beekeeping input suppliers, processing companies and beekeepers are among the major stakeholders in the study area regarding organic honey production. All these stakeholders have an interest in the existence of the forest directly or indirectly. Therefore, bringing these individuals efforts together can substantially help to solve major problems in honey production. Organizing stakeholder forums can easily support and encourage farmers in conserving the forest.

This study focused on one aspect of contractual farming. However, there are many aspects of contractual farming that need to be researched. These data pertains to only four villages in two districts in rural Ethiopia. Given the limited scope of the study, this research suggests that further research should be undertaken in order to understand the nature of contractual farming in different contexts. It is important to extend its potential effect on livelihood, social setting, environmental actions and technology adoption of households. In addition, since the focus of this study is on organic honey, it is important to extend this study on different export oriented agricultural products like coffee, oil seeds and other contractual seed production schemes. This will provide a broader view on the value of contract farming and suggests better ways to increase the benefit of participation.

REFERENCES

Asian Development Bank (ADB) (2005). 30 cases of contract farming: An analytical overview. Asian Development Bank.

Ayalew K. and Gezahegn T. (1991). Suitability Classification in Apicultural Development, Ministry of Agriculture, Addis Ababa.

Bijman J. (2008). Contract Farming in developing countries. An overview of the literature, Wageningen University, Department of Business Administration (Working Paper).

Bijman J. and Ton G. (2008). Producer organizations and value chain Capacity.org ISSUE 34, August 2008.

Birthal, P.S., Joshi, P.K. and Ashok, G. (2005). Vertical coordination in high value commodities: implications for the smallholders. MTID Discussion Paper No. 85. Washington, DC: IFPRI.

Caliendo, M., and Hujer, R. (2005). The Microeconometric Estimation of Treatment Effects An Overview, Working Paper, J.W.Goethe University of Frankfurt.

Caliendo, M., and Kopeinig , S. (2005). Some Practical Guidance for the Implementation of Propensity Score Matching. Discussion Paper no.1588, Bonn, Germany, The Institute for the Study of Labor (IZA).

Caliendo, M. and Kopeinig S. 2008. “Some Practical Guidance for the Implementation of Propensity Score Matching.” Journal of Economic Surveys . Vol. 22 No. 1, pp. 31–72.

CSA (Central Statistics Agency) (2010). Abstract.

CSA. (2010/11). Survey on Livestock, Vol. 2, No. 468. CSA, Addis Ethiopia.

Da Silva, C. A. B. "The growing role of contract farming in agri-food systems development: drivers, theory and practice." FAO, Agricultural Management, Marketing and Finance Service.

Eaton, C. and Shepherd, A.W. (2001). Contract farming; partnerships for growth. FAO Agricultural Services Bulletin. Rome, FAO.

Ethiopian Customs Authority and Export Promotion Agency (2009/10). Annual Report for the year 2009/10.

Gazahegn T. (2001). Apiculture Development Strategies, Ministry of Agriculture and Rural Development, Addis Ababa, Ethiopia

Gibbon, P., Y. Lin & S. Jones (2009). Revenue effects of Participation in Smallholder Organic Cocoa Production in Tropical Africa: A Case Study, DIIS Working Paper 2009:06 Copenhagen: Danish Institute for International Studies.

Guo, H., Jolly R.W., and J. Zhu (2005). Contract Farming in China: Supply Chain or Ball and Chain? Paper presented at the 15th Annual World Food & Agribusiness Symposium, IAMA, Chicago.

Glover, D.J. (1984). Contract farming and smallholder out grower schemes in less-developed countries. World Development. Vol. 12, No. 11-12, pp. 1143-1157.

Glover, D.J. and Kusterer K. (1990). Small farmers, big business: contract farming and rural development. Houndsmills/London: Macmillan.

Hall,C., Langemeier, M. (1994). Contracts as a risk management tool. Texas Agricultural Extension system.

Hobbs J.E. (1996). A transaction cost approach to supply chain management, Supply Chain Management: An International Journal, Vol. 1, pp.15 - 27

Holota Bee Research Centre (2003). Annual Progress Report 2002/03.

Johnson J., Morehart M., Perry, J. and Banker D. (1996). Farmers' use of marketing and production contracts. Agricultural Economic Report No. 747. U.S. Dept. Agr. Econ. Res. Serv.

Kerealem E., Tilahun G. and Preston T. R, (2009). Constraints and prospects for apiculture research and development in Amhara region, Ethiopia

Key N. and Runsten D. (1999). Contract farming, smallholders, and rural development in Latin America: The organization of agro-processing firms and the scale of out- grower production. World Development Vol. 27, No. 2, pp. 381-401.

Khandker S. R., Koolwal, G.B. and Samad, H. A. (2010). Handbook on impact evaluation : quantitative methods. Washington, DC, World Bank.

Little, P.D. and Watts M.J. (1994). Living under contract: contract farming and agrarian transformation in Sub-Saharan Africa. Madison [etc.], University of Wisconsin Press.

Martinez S. (2002). Vertical coordination of marketing systems: lessons from the poultry, egg and pork industries. Agricultural Economic Report No. 807.

Meijerink, G., Eaton D., and Bijman J. (2008) Transaction risks in market chains. Wageningen University. Strategy & Policy Brief No.11-3.

Ministry of Agriculture and rural development(MOARD) (2005/06). Honey and Beeswax, Development and Marketing Plan. (Amharic). Addis Ababa, Ethiopia.

Minot, N.W. (1986). Contract Farming and its effects on small farmers in less developed countries. MSU International Development Papers. East Lansing, MI, Michigan State University, Department of Agricultural Economics.

Minot, N. (2007). Contract Farming in Developing Countries: Patterns, Impact, and Policy Implications. Case Study #6-3 of the Program: "Food Policy for Developing Countries: The Role of Government in the Global Food System". Ithaca: Cornell University, New York.

Masakure, O. and S. Henson (2005). Why do small-scale producers choose to produce under contract? Lessons from non-traditional vegetable exports from Zimbabwe. World Development Vol. 33, No. 10, pp. 1721–1733

Miyata, S., Minot, N. and D. Hu (2009). Impact of Contract Farming on Income. Linking Small Farmers, Packers and Supermarkets in China. World Development Vol. 37, No. 11, pp. 1781–1790.

Nijhoff, H. (2010). It takes two to tango': Critical contract farming issues for linking up small-scale Ethiopian farmers with the world market. CDI, Wageningen UR.

Nuru, A., Admasu, A. and Dereje, W. (2001). Pollen Spectrum of Honeys and Honey Bee floral Calendar of West Shoa. Third National Annual Conference of the Ethiopian Beekeepers Association, Addis Ababa.

Porter, G. and Phillips-Howard, K. (1997). Comparing contracts: An evaluation of contract farming schemes in Africa. World Development Vol. 25, No. 2, pp. 227-238.

Ramaswami, B., Birthal, P.S. and Joshi, P.K. (2006). Efficiency and Distribution in Contract Farming: The Case of Indian Poultry Growers. MTID Discussion Paper No. 91. Washington DC, IFPRI.

Rosenbaum, P. and Rubin, D. (1984). Reducing bias in observational studies using subclassification on the propensity score. Journal of the American Statistical Association Vol. 79, No. 387, pp. 516-524.

Siddiqui, K., (1998). Agricultural exports, poverty and ecological crisis-case study of Central American countries. Economic and Political Weekly Vol. 33, No. 39, pp.128-136.

Singh, S. (2002). Contracting Out Solutions: Political Economy of Contract Farming in the Indian

Punjab. World Development Vol, 30 No. 9, pp. 1621-1638

Simmons, P. (2002). Overview of Smallholder Contract Farming in Developing Countries. ESA Working Paper Rome, FAO.

Simmons, P., Winters, P. and Patrick, I. (2005). An analysis of contract farming in East Java, Bali,and Lombok, Indonesia. Agricultural Economics Vol. 33, No. 3, pp. 513-525.

Sheka Zone Agricultural and Rural Development Office (2007). Annual report 2006/2007.

Slangen, L., Loucks, L., Slangen, A. (2008). Institutional economics and economic organization theory. Wageningen Academic Publishers. Wageningen, The Netherlands.

Smith, J. and Todd, P. (2005) Does matching overcome LaLonde's critique of nonexperimental estimators? Journal of Econometrics Vol. 125, No. 1–2, pp. 305–353.

Torres, G. (1997). The force of irony: power in the everyday life of Mexican tomato workers. Berg, Oxford/New York.

Warning, M. and Key, N. (2002). The Social Performance and Distributional Consequences of Contract Farming: An Equilibrium Analysis of the Arachide de Bouche Program in Senegal.World Development Vol. 30, No. 2 pp. 255-263.

Wilson R. T. (2006). Current Status and Possibilities for Improvement of Traditional Apiculture in Sub-Saharan Africa. Livestock Research for Rural Development. Vol 18, No.111. Bartridge House, Umberleigh, UK

Woodend, J. J. (2003) Potential of contract farming as a mechanism for the commercialization of smallholder agriculture: The Zimbabwe case study. FAO.

Appendix 1. Propensity score matching estimation

```
Algorithm to estimate the propensity score

The treatment is CFPARTICPATION

Particpatio |
       n in |
   contract |
    farming |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |        116       59.49       59.49
        Yes |         79       40.51      100.00
------------+-----------------------------------
      Total |        195      100.00

Estimation of the propensity score

Probit regression                                 Number of obs   =        195
                                                  LR chi2(6)      =      65.49
                                                  Prob > chi2     =     0.0000
Log likelihood = -98.885626                       Pseudo R2       =     0.2488

------------------------------------------------------------------------------
CFPARTICPA~N |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     EDUC1_4 |   .0432812   .0315444     1.37   0.170    -.0185446     .105107
    FAMBK1_7 |   .1309702   .0568177     2.31   0.021     .0196096    .2423308
   SOCPO1_10 |   1.065315   .2331803     4.57   0.000     .6082905     1.52234
HOWEXTVT3_13 |   .0352522    .011015     3.20   0.001     .0136632    .0568412
   EXPRBK3_1 |   .0023674   .0106699     0.22   0.824    -.0185452      .02328
DISFOREST~13 |   .2787991   .1024999     2.72   0.007      .077903    .4796952
       _cons |  -2.094013   .4098471    -5.11   0.000    -2.897299   -1.290728
------------------------------------------------------------------------------

Description of the estimated propensity score
                 Estimated propensity score
-------------------------------------------------------------
      Percentiles      Smallest
 1%     .0384307       .0308568
 5%     .0682736       .0384307
10%      .096122       .0630579       Obs                 195
25%     .1522622       .0633516       Sum of Wgt.         195

50%       .34938                      Mean           .4068965
                       Largest       Std. Dev.      .2738699
75%     .6097915       .9750775
90%     .8349117        .979666       Variance       .0750047
95%     .9067704       .9902546       Skewness       .4989395
99%     .9902546       .9909776       Kurtosis       2.020553
*******************************************************
Step 1: Identification of the optimal number of blocks
Use option detail if you want more detailed output
*******************************************************
The final number of blocks is 5
This number of blocks ensures that the mean propensity score
is not different for treated and controls in each blocks
*******************************************************
Step 2: Test of balancing property of the propensity score
Use option detail if you want more detailed output
*******************************************************
The balancing property is satisfied

This table shows the inferior bound, the number of treated
and the number of controls for each block
  Inferior |    Particpation in
  of block |   contract farming
```

```
of pscore  |        No        Yes |     Total
-----------+----------------------+----------
         0 |        55          8 |        63
        .2 |        29         15 |        44
        .4 |        19         16 |        35
        .6 |        12         15 |        27
        .8 |         1         25 |        26
-----------+----------------------+----------
     Total |       116         79 |       195
```

ATT estimation with Nearest Neighbor Matching method
(random draw version)
Bootstrapped standard errors

```
-------------------------------------------------------------
n. treat.   n. contr.         ATT   Std. Err.           t
-------------------------------------------------------------
       79          38    7579.234     721.106      10.511
-------------------------------------------------------------
Note: the numbers of treated and controls refer to actual
nearest neighbour matches
```

ATT estimation with the Kernel Matching method
Bootstrapped standard errors

```
-------------------------------------------------------------
n. treat.   n. contr.         ATT   Std. Err.           t
-------------------------------------------------------------
       79          92    7581.298     573.396      13.222
-------------------------------------------------------------
```

ATT estimation with the Radius Matching method
Bootstrapped standard errors

```
-------------------------------------------------------------
n. treat.   n. contr.         ATT   Std. Err.           t
-------------------------------------------------------------
       51          78    7253.915    1003.769       7.227
-------------------------------------------------------------
Note: the numbers of treated and controls refer to actual
matches within radius
```

```
ATT estimation with the Stratification method
Bootstrapped standard errors
-------------------------------------------------------------
n. treat.   n. contr.         ATT   Std. Err.           t
-------------------------------------------------------------
       79          92    8037.662     660.683      12.166
-------------------------------------------------------------
```

Appendix 2. Instrumental Variable regression analysis selection for instruments for contract participation

```
logit estimation


Logistic regression                               Number of obs   =        195
                                                  LR chi2(11)     =      96.60
                                                  Prob > chi2     =     0.0000
Log likelihood = -83.334352                       Pseudo R2       =     0.3669

------------------------------------------------------------------------------
CFPARTICPA~N |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      AGE1_2 |  -.0650027   .0315738    -2.06   0.040    -.1268863   -.0031191
     EDUC1_4 |  -.0666684   .0668159    -1.00   0.318     -.197625    .0642883
    FAMSZ1_6 |   .0347202   .0864595     0.40   0.688    -.1347373    .2041777
   LANDSZ2_2 |   .2227021   .1387841     1.60   0.109    -.0493098     .494714
INCOMORTH2_3 |   .0001481    .000074     2.00   0.045     3.09e-06    .0002931
DISFOREST~13 |   .8293312   .2114569     3.92   0.000     .4148833    1.243779
```

```
   SOCPO1_10 |   2.240368    .465315     4.81   0.000     1.328368    3.152369
   EXPRBK3_1 |   .0343968   .0309611     1.11   0.267    -.0262858    .0950795
TRANSHIVE3_4 |   .1679743   .0456596     3.68   0.000     .0784831    .2574655
DISMARKET~13 |   .4749249   .2353979     2.02   0.044     .0135534    .9362963
         trd |    -.00959   .0041688    -2.30   0.021    -.0177606   -.0014194
       _cons |  -2.043868    1.18555    -1.72   0.085    -4.367505    .2797677
------------------------------------------------------------------------------

Ordinary least square estimation

      Source |       SS       df       MS              Number of obs =     194
-------------+------------------------------           F( 13,   180) =   52.57
       Model |  4.8394e+09    13   372258983           Prob > F      =  0.0000
    Residual |  1.2746e+09   180  7081104.19           R-squared     =  0.7915
-------------+------------------------------           Adj R-squared =  0.7765
       Total |  6.1140e+09   193  31678577.9           Root MSE      =    2661

------------------------------------------------------------------------------
  INCOMBK2_4 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      AGE1_2 |  -5.241652   18.38325    -0.29   0.776    -41.51604    31.03274
    FAMBK1_7 |   223.9622   112.9229     1.98   0.049     1.139196    446.7851
TRANSHIVE3_4 |   117.5915   35.14571     3.35   0.001      48.2409    186.9421
   QUALMC5_7 |  -1681.257   139.6917   -12.04   0.000    -1956.901   -1405.613
DISMARKET~13 |  -385.2595   195.0187    -1.98   0.050    -770.0765   -.4426069
DISEXTAG~132 |   109.7431   91.83041     1.20   0.234    -71.45946    290.9457
PRICEDIFF~30 |   218.8814   91.09491     2.40   0.017     39.13011    398.6327
 QUALPLQH5_7 |  -.1462553   12.63637    -0.01   0.991    -25.08073    24.78822
   SOCPO1_10 |  -700.4692   468.4752    -1.50   0.137    -1624.879    223.9406
INCOMORTH2_3 |   .1059585   .0707348     1.50   0.136    -.0336176    .2455345
DISFOREST~13 |   76.14478   209.9787     0.36   0.717    -338.1917    490.4813
         trd |   15.96518   3.366433     4.74   0.000     9.322435    22.60793
  MODHIVE3_4 |   148.7863   228.4556     0.65   0.516    -302.0093    599.5819
       _cons |   42686.89   3701.965    11.53   0.000     35382.05    49991.72
```