KU LEUVEN

FACULTY OF BIOSCIENCE ENGINEERING

Small-scale farmers' preferences for coffee certification: a choice experiment in Uganda

Preferenties van kleinschalige boeren voor koffie certificaten: een keuze-experiment in Oeganda.

Promotors:
Prof. Miet Maertens
Prof. Liesbet Vranken
Department of Earth and Environmental Sciences
Division of Bioeconomics

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Veerle Vermeyen

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Abstract

A rising consumer demand in high-income countries for higher production standards has led to an increase in the use of private sustainability standards for tropical imports such as coffee. Yet, an intense debate is still ongoing regarding the welfare impact of these standards on producers' livelihoods and whether or not these standards live up to their promises. In the literature an information gab exists concerning farmers' preferences to produce under private sustainability standards. This thesis conducts a choice experiment among 352 coffee farmers in the Mount Elgon region of Uganda to investigate their preferences for specific aspects of certificates. The sample is stratified between three groups: Fairtrade-organic double certified farmers, UTZ- Rainforest alliance-Baseline Common Code triple certified farmers and non-certified farmers. The data is analyzed using a conditional logit, mixed logit and latent class logit regression model. From the conditional logit model we learn that farmers dislike aspects that limit their potential productivity but highly value potential benefits of certification such as trainings. The mixed logit model reveals that there is significant heterogeneity present between respondents. The latent class divides the heterogeneity in the sample into three different classes: '*average farmers*', '*poor certified farmers*', '*well-off farmers*'. Thus it seems that these classes are mainly formed by the groups welfare. The first group is characterized by farmers looking towards certification as a way to overcome market limitations, the second group is distrustful of certification and the last is indifferent. Thus we conclude that the specific aspects of certificates are relevant factors to convince producers to participate. This research indicates a need for companies and NGO's to better understand and take into account producer preferences when designing and implementing certificates. Especially when the restrictions of multiple certificates are combined. The results in this study are relevant with certification being increasingly seen as a way for developing countries to raise foreign income earnings and improve the livelihood of small-scale farmers.

Keywords: coffee certification; smallholder preferences; choice experiment; Uganda

Abbreviations

AIC Akaike Information Criterion

ANA Attribute Non-Attendance

ASC Alternative Specific Constant

BCC Baseline Common Code

BIC Bayesian Information Criterion

CLM Conditional Logit Model

DCE Discrete Choice Experiment

FT Fairtrade

GCCE Gumutindo Coffee Co-operative Enterprises

GCP Global Coffee Platform

IIA Independence-from-Irrelevant Alternatives

IID Independently and Identically Distributed

ILO International Labour Organization

KCL Kyagalanyi Coffee Limited

LCM Latent Class Model

MLE Maximum Likelihood Estimation

MXL Mixed Logit Model

ORG Organic

PSS Private Sustainability Standards

RFA Rainforest Alliance

Ush Ugandan Shilling

UCDA Uganda Coffee Development Authority

WTP Willingness-To-Pay

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1. Introduction

The pressure from liberalization and globalization on agri-food production processes has, in some developing countries, led to a decrease in quality, fewer investments in sustainable practices and worsening labour conditions (Manning et al., 2012). In reaction to this situation, an increasing proportion of consumers in high-income countries are demanding better production standards for the products they buy (ITC, 2015; Verbeke, 2005). Although governments are working towards sufficient international mechanisms protecting producers, they are still far from reaching enforceable agreements (Manning et al., 2012). Alternatively, global actors such as NGOs and firms have responded to consumer demand by creating a large spectrum of private sustainability standards (PSS) (Giovannucci and Ponte, 2005). These PSS require producers to comply with a specific set of social, environmental, economic, quality or ethical conditions, surpassing those set by public organizations (Henson and Humphrey, 2010).

PSS are becoming increasingly popular with consumers in high-income countries (Beghin et al., 2015; Potts et al., 2014). The growth in demand for certified products is mainly observed for tropical luxury exports such as coffee, cacao and tea. Especially the market share of certified coffee is growing rapidly, with an 8% growth rate in 2009, which is expected to continue rising (ITC, 2011a). Coffee certification started in 1988 with Fairtrade (FT), today some of the most well-known standards for coffee include FT, Rainforest Alliance (RFA), Organic (ORG), UTZ and the Baseline common code (BCC). These organizations make strong promises like: '*Fairtrade offers consumers a powerful way to reduce poverty through their everyday shopping.*' (Fairtrade International, 2017a) and '*Through the UTZ program farmers grow better crops, generate more income and create better opportunities while safeguarding the environment and securing the earth's natural resources.'* (UTZ, 2017). This way standards are often presented to consumers as methods to improve the position of farmers in developing countries in the market (Ruben and Hoebink, 2015).

The composition of PSS has so far been largely based on what concerned consumers find important and thus what they are willing to pay (WTP) for (Vlaeminck et al., 2015). PSS initially emerged from a small group of western companies looking to sell to concerned consumers in high-income countries (Giovannucci and Ponte, 2005). These companies use certification among others to differentiate their product, manage supply risk and reputational risk (Henson and Humphrey, 2010; ITC, 2015). They tent to target socially and environmentally conscious consumers and this has for example led to certificates with both strict restrictions on labour (e.g. no child labour) and environmental (e.g. no pesticide use) issues. The resulting standards may be very difficult and confusing for farmers to comply with, making certification unattractive and inefficient.

So far very little consideration has been given to farmers preferences during the design phase of standards (Giovannucci and Ponte, 2005) and little research has been done into when they would be willing to work under the restrictions of PSS. However, designing standards with farmer preferences in mind could help firms to avoid problems with side-selling, contract non-compliance and limited participation (Abebe et al., 2013). Also concerns about PSS have been raised regarding the undermining of democratic, public governance mechanisms (e.g. WTO, SPS, TBT) with privately developed mechanisms, the power imbalance between buyer and seller and the possibility of smallholder exclusion by raising entry barriers (Henson and Humphrey, 2010). A significant portion of coffee is produced by smallholder farmers (less than 3 ha of land) (Manning et al., 2012). For

these farmers it may be especially difficult to obtain access to the technology and knowledge required to comply with standards, preventing them from becoming certified.

There is still an intense debate ongoing with regard to the benefits of certification for smallholder livelihoods, and study results are mixed (Beghin et al., 2015). Generalizations of study results are difficult due to variation in the certificates and the local context (e.g. market structure) (Chiputwa et al., 2015). Normally a producer will agree to a certificate if he thinks that participation will increase his welfare level, however this does not imply that the producer thinks it is a fair offer, merely that it is better than his current situation (Barrett et al., 2012). When losses outweigh gains farmers will no longer be willing to take part (Vlaeminck et al., 2015). An important finding is that a higher selling price does not necessarily lead to improved livelihoods (Chiputwa et al., 2015). A higher price may be offset by certification costs, lower yields due to fertilizer restrictions or need for additional hired labour due to additional labour requirements. Thus not only price but also farmer preferences for other aspects of standards contain critical information needed to improve development and implementation of standards (Chiputwa et al., 2015; Ibnu et al., 2015).

Like demonstrated in the study done by Vlaeminck *et al.*, (2015) in Benin, conducting a choice experiment (CE) is a possible method to reveal preferences through a survey. In this research a similar approach will be followed to gain insight into farmer preferences for the various aspects of coffee certificates in Uganda's Mount Elgon region. Studies by Ibnu *et al.*, (2015), Abebe *et al.*, (2013), Meemken et al. (2016) and Schipmann and Qaim (2011) have also used CE to reveal farmers' general contracting and marketing preferences. While CE has already been well established in areas such as product marketing, it is only now starting as a promising technique in agricultural development. This thesis will contribute to the emerging literature on farmer preferences for private standards. The results are used to gain insights into the preferences of smallholder farmers for certification characteristics, the trade-offs they are willing to make and whether these results depend on certain household characteristics.

This thesis is organized as follows: first the study outline is presented, followed by a review of current literature. Next, some background information is given on the state of PSS and the coffee market. Thereafter, the various methods used are explained in detail. The results are then presented and discussed. Lastly, a general conclusion is drawn.

2. Study outline

The general research question of this thesis is: '*What are smallholder coffee farmers' preferences for coffee certification in Uganda?*'. This question is looked at from different angles, described in three more specific research questions:

I. 'How high is the overall willingness of farmers in the Mount Elgon Region to produce under certification?'
II. 'What are the preferences of smallholder coffee farmers' for characteristics of certification schemes?'
III. 'Do the preferences of smallholder coffee farmers' for certification depend on household characteristics?'

The hypothesis is that significant compensation, both monetary and non-monetary, will be required to make smallholder farmers prefer to produce under higher sustainable standards when these restrictions limit coffee yield or labour productivity. Some variation is expected based on household characteristics, such as level of education.

The expected outcome of this study is insight into the preferences of smallholder coffee farmers in Uganda for different certification schemes. This will contribute to the literature gap on farmer preferences for private sustainability standards. It will also inform policy makers, consumers and standard setting bodies, contributing to knowledge that can be used to improve the performance of certification systems.

3. Literature study

The objective of this section is to summarize the literature concerning coffee certification to ascertain the state-of-the-art. This literature study is organized around three sections: consumer motivation to buy certified products, the welfare effects of certification, and producer preferences to produce certified products. As the case study area is in Uganda, special attention is given to research done in Uganda and Eastern Africa, even so, it is not limited to this.

3.1. Consumer motivation

Any potential success of PSS is dependent upon consumers' willingness to purchase these products (Grieg-Gran, 2006). In recent years consumers are showing a higher concern for the safety and quality of the food they purchase, increasing their interest in certified products (Verbeke, 2005). Also the market for products that are produced under fair contracts are gaining in popularity (Andorfer and Liebe, 2012). Studies have shown that consumer WTP for ethically and sustainable produced products is substantial (Auger et al., 2003; Loureiro and Lotade, 2005). Yet, there is still an attitude/behavior gap between what consumers say they are willing to contribute and what they actually contribute (Eckhardt et al., 2010; Vermeir and Verbeke, 2006). Due to this, various studies are looking into how to change consumer believes into actual purchasing behavior. Consumers that are WTP for certified products are still a minority in the market. Thus there is a need to study what consumers are looking for in certificates and what heterogeneity is present between consumers. The results of this type of research can then be used to design certificates that are more appealing to the consumer, enlarging the market share of certified products.

Poor working conditions, use of child labour, deforestation, use of pesticides and environmental damage are the main sustainability concerns of coffee consumers. However, it seems that when it comes to consumer choice these concerns are outweighed by nutritional information and price (Grunert et al., 2014). In general consumers justify not buying ethical products through the following three reasonings: The first is economical rationalization, consumers tend to be very price sensitive, and they want to get the most out of their money. The second is institutional dependency; here the consumer reasons that it should be the job of the official institutions (government) to insure that products hold up to ethical and moral standards. Lastly, developmental realism occurs when a consumer reasons that some unethical practices are needed in order to be economically viable (Eckhardt et al., 2010). Consumer inclination to purchase ethical products seems to depend upon variables such as age, gender, lifestyle and ethnicity (Auger et al., 2003). E.g. women and buyers from higher social classes are more inclined to buy certified products (Grunert et al., 2014).

It can be noted that a lack of information concerning the meaning of labels also seems to be a factor contributing to the lack of consumer participation. A consumer may be WTP a premium for a product produced in line with his views, but is not aware that these factors are contained within a certain label (Vlaeminck and Vranken, 2015). While labels were meant to reduce information asymmetry it seems like they are often unable to communicate the full extent of their underlying characteristics.

Thus both adapting certificates to fit consumers and making sure consumers are well informed are important aspects to further grow consumer demand. The above research provides valuable information on where the demand for certified products comes from. However, this research should be complemented with studies looking into the welfare effects of PSS and studies looking into producer preferences for PSS. The former is necessary to justify the higher price asked of consumers. The latter is needed because certification is based upon compensation and thus it is important that farmers get adequately compensated for adapting their production process to what companies perceive as desired by consumers (Meemken et al., 2016). Thus companies should not only design certificates addressing consumer concerns but should also integrate producers' preferences.

3.2. Welfare effects

Studies concerning the welfare effects of certification try to measure to what extent participation in a PSS can improve the living standard of participants. Studying this provides important information needed to gauge to what extent PSS live up to the promises they make to their consumers and producers (Akoyi and Maertens, 2017). This topic can be further divided into effects on producers and effects on international sellers. Of interest to this thesis are the welfare effects on small-scale producers. This research can point out which PSS and what aspects of PSS are interesting to further study.

The welfare effects of PSS are however still a wildly disputed topic, with little consensus on the subject (Akoyi and Maertens, 2017; Ibnu et al., 2015). Study results are thus far contradicting (Beghin et al., 2015; Ruben and Hoebink, 2015), with some studies finding that PSS can improve smallholder welfare (Bacon, 2005; van Rijsbergen et al., 2016), others finding mixed effects (Chiputwa et al., 2015) or no effect at all (Mitiku et al., 2015). The current inconsistencies in the literature are partly due to several shortcomings. There are many possible outcome variables to look at, be it socio-economic (e.g. income, poverty indicator) or environmental (e.g. biodiversity), there are relatively few studies looking at multiple certificates, FT is studied proportionally more, the majority of studies are done in Latin America and it is very difficult to differentiate the effects of cooperatives and market set-up from the effects of certification (Akoyi and Maertens, 2017; Ruben and Hoebink, 2015). Yet, thus far, study results indicate a dependence on local circumstances and certification scheme, hence general statements about the effects of certification may be difficult and misleading (Beghin et al., 2015; Chiputwa et al., 2015). The specific location plays amongst others a role due to locally determined risk preferences, market organization and cooperative development (Ruben and Hoebink, 2015).

In a review for East Africa Ruben and Hoebink, (2015) argue that growing certified coffee is for most small-scale farmers only a limited percentage of farm activity and thus potential benefits are small and easily offset by increasing costs. In Ethiopia only a minimal impact of certification is found due to low productivity, small price premiums and poor access to inputs (Jena et al., 2012). For Kenya van Rijsbergen *et al.* (2016) concludes that FT increases returns on coffee, while UTZ generates higher

yields. Thus in general it seems that welfare effects for East Africa are small and mainly due to the low yields and productivity. This suggests that certification schemes that focus on helping farmers increase yields may hold greater promise in this region. Coffee markets in Latin America are compared to Africa more developed, and average yields and quality are higher (Chiputwa et al., 2015). However, studies in Mexico and Peru also found that higher yields are more important than higher prices (Barham et al., 2011; Barham and Weber, 2012) and in Nicaragua that a higher price does not suffice in low yields-low intensity certification schemes, which could lead to a poverty trap (Valkila, 2009). Thus also in these markets yield and labour increasing certificates seem to hold an advantage.

For Uganda two relevant studies were found concerning the welfare effects of coffee certification in the country. The first study concludes that in eastern Uganda the higher price in a double FT_Org certification scheme does not compensate for the decrease in land and labour productivity. For this certificate there is no increase income or reduction of poverty. For a triple UTZ_RFA_BBC certification an increase in coffee income, land and labour productivity is found, yet there is no significant effect regarding poverty reduction (Akoyi and Maertens, 2017). The second study finds that in central Uganda FT certification significantly increases the household living standards and reduces the prevalence and depth of poverty, while no significant results are found for Org and UTZ (Chiputwa et al., 2015). It could thus be that the losses in land and labour productivity caused by the combination of FT with ORG negate the effects of the price premium. Thus it may be better to combine FT with productivity enhancing standards.

The capacity of firms to help increase yields, overcome market failures, provide economies of scale and reduce risk may be more important than a price premium to small-scale farmers (Barham and Weber, 2012; Barrett et al., 2012). This calls into question the feasibility of combining certificates like FT with ORG (Akoyi and Maertens, 2017; Vlaeminck et al., 2015) and indicates a need to look at the specific aspects contained in PSS. Farmers see greater value in certificates or contracts that are adapted to their needs. In this regard domestic contracts may thus hold an advantage over international schemes in linking farmers to markets (Vlaeminck et al., 2015). In general one can conclude that the welfare gains from certification depend not only on receiving a higher price but also on other certificate aspects (Abebe et al., 2013). Thus further research is needed to design certificates that will fulfill all the promises made by certification bodies to both consumers and producers.

3.3. Producer motivation

Only a few studies can be found looking into producer willingness to participate in contracts (Abebe et al., 2013). This topic can be looked at from two sides: the role of the specific attributes of a certificate and the role of farmers' or household specific characteristics. Due to the limited literature on coffee certificates the scope of the literature study is expanded beyond coffee to include other products and beyond certificates to contracts in general.

Most relevant to this thesis is a study looking at farmers' preferences for the design of coffee certification schemes in Uganda. This study found that farmers show a general preference towards certification, but that there is a strong dislike for productivity limiting regulations, showing that certificate content is relevant (Meemken et al., 2016). Four factors were determined to be relevant to the decision of small-scale farmers to grow export crops under a contract: market uncertainty, indirect benefits (e.g. access to knowledge), income benefits and intangible benefits (e.g. satisfaction

or spillover effects) (Masakure and Henson, 2005). Thus producers are looking to certification as a way to resolve market failures regarding insurance, financial or input markets and provided information (Abebe et al., 2013; Barrett et al., 2012; Vlaeminck et al., 2015). It seems to be a reoccurring finding that farmers are only willing to accept productivity limiting aspects if sufficient compensation is present (Meemken et al., 2016; Vlaeminck et al., 2015). Thus the provision of inputs and extension services play an important role in engaging farmers to participate. Notably, some certificate obligations, such as record keeping or limited use of chemical inputs, can be seen by farmers as incentives to reach long-run pay-offs (Meemken et al., 2016). Successful implementation of PSS also requires building trust between firm and producer (Schipmann and Qaim, 2011). Certain aspects such as the time of payment, acquiring a bonus and implementation of exclusive contracts require trust (Blandon et al., 2009; Gelaw et al., 2016). Also the perceived fairness of an certificate is important to farmers (Ibnu et al., 2015).

These initial studies also found that significant preference heterogeneity for certification and certificate attributes can be found both between and within households. For example gender and certificate experience seem to be significant factors determining preference heterogeneity (Meemken et al., 2016), resulting in different attitudes towards risk and investment (Ruben and Hoebink, 2015). It is thus important to take the socio-economic characteristics of the target group into account when designing a certificate (Masakure and Henson, 2005).

So far only a few studies have highlighted the importance of more cooperation between companies and producers (Barrett et al., 2012; Giovannucci and Ponte, 2005). Designing certificates focused only on consumer demand could undermine the system by driving away producers (Vlaeminck et al., 2015). It seems that farmers preferences for certification are mainly economically driven, which is in contrast with the environmental and social preferences of consumers (Ibnu *et al.*, 2015). It can be argued that economic development is necessary for sustainable development and thus these aspects of certificates remain most important to producers (ITC, 2015). While the area of the literature concerning producer preferences is still very limited, initial results have however highlighted that producers' preferences are an important factor to consider when looking to improve the impact of certification. So far mostly contracts and markets have been studied. Further research on certification is needed to improve upon current commentary that certification is too demand-driven. This thesis aims to provide further insight into which trade-offs farmers make when deciding whether or not to participate in a voluntary production standard.

4. Background information

4.1. Private sustainability standards

PSS are those standards regulating production processes through private actors. They require producers to comply with a specific set of social, environmental, economic, quality or ethical conditions, surpassing those set by public organizations (Henson and Humphrey, 2010).

Companies use certification for three main reasons: to differentiate their product, manage supply risk and reputational risk (Henson and Humphrey, 2010; ITC, 2015). The first reason of differentiation, implies that certified coffee can be sold to roasters as 'specialty' coffees, creating a premium price; a consumer consents to pay more for the added utility he receives from a certified product and a producer consents to produce in a certain way in order to receive a higher price (Andorfer and Liebe, 2012; Henson and Humphrey, 2010). This is thus a way of generating additional value to a product for sellers. Secondly, certification aims to reduce the risk for the firm by entering into contract with producers, ensuring a consistent supply. This is also beneficial on the producers' side by insuring long-term reliable contracts (Ruben and Hoebink, 2015). Lastly, public perception of product safety and fairness are important for the reputation of a seller. PSS are becoming increasingly popular with consumers (Beghin et al., 2015; Potts et al., 2014). Not only are they spreading among a wide spectrum of edible products traded between low and high income countries, such as tea, cocoa, and sugar but also for non-edible ones like cotton. PSS are continuously adapted by companies to remain competitive (Henson and Humphrey, 2010).

Creating and implementing a PSS requires the following five steps: 1/creation of the standard, 2/adoption of the standard, 3/implementation, 4/conformity assessment and 5/enforcement (Henson and Humphrey, 2010). Thus a certification company uses a standard created either by themselves or by a standardization organization, such as ISO, to create a certificate (Mutersbaugh, 2005). They create a document clearly stating the requirements of their standard. Then an entity, e.g. a firm or NGO, decides to implement this PSS. Certification for smallholders is usually done through a cooperative, where the farmer is certified if he agrees to a contract to sell his certified coffee to the cooperative. The advantages of cooperatives are that among others, farmers can generate a greater quantity, pool transaction costs, have easier access to training and have greater bargaining power (Barrett et al., 2012). The contracts offered to farmers are often exclusive, meaning that the farmer can only sell through the specific cooperative. This is because cooperatives see certification of farmers as an investment (ITC, 2012a), if a farmer were to sell his coffee elsewhere this investment would be lost. To assure credibility, compliance to the standard is usually determined by an independent third party accreditation organization. The certification process can be spread over multiple years or be instant, every so often there will be either announced or unannounced controls to check continuous compliance and recertification is needed every couple of years. The costs for all this fall usually on the individual trying to obtain the certificate. For all but BCC, a label is added once a product is certified to transmit information about compliance with the additional 'invisible' conditions to consumers (Vlaeminck and Vranken, 2015). While BCC uses a business-to-business model that is invisible to consumers and based upon verification. More information on this is given in section 4.3.

4.2. Coffee production and trade

There are two main varieties of coffee grown in the world, Robusta (*Coffee Robusta*) and Arabica (*Coffee Arabica)*. Arabica is more susceptible to disease and thus harder to grow, yet globally it is still grown more than Robusta (ICO, 2017). This is because it is considered to be of higher quality and thus value on the global market (Bacon, 2005). Arabica coffee is believed to have originated in the highlands of Ethiopia but can be grown throughout the region between the tropic of the Cancer and Capricorn. Coffee production is a delicate process, with increasing trouble from pests and diseases. Ripe coffee berries have to be handpicked at exactly the right stage of ripeness, within a window of a few days and then processed to so called 'green beans'. This processing can be done by the farmer, cooperatives or government. Further the methods used for picking and processing have important consequences on the quality of the coffee and thus the price it receives. Once the coffee is processed to green beans it can enter the international market to be traded.

Coffee is currently one of the most valuable traded agricultural products in the world (ITC, 2011b). The coffee market is known as very volatile, prone to large fluctuations in coffee prices, see Figure 1. These fluctuations are influenced by international deregulation, climatic conditions and entrance of new producers (Ruben and Hoebink, 2015). Due to the instability in the market coffee buyers' offer of a premium to producers at the end of the season based on the actual profit made from selling the coffee.

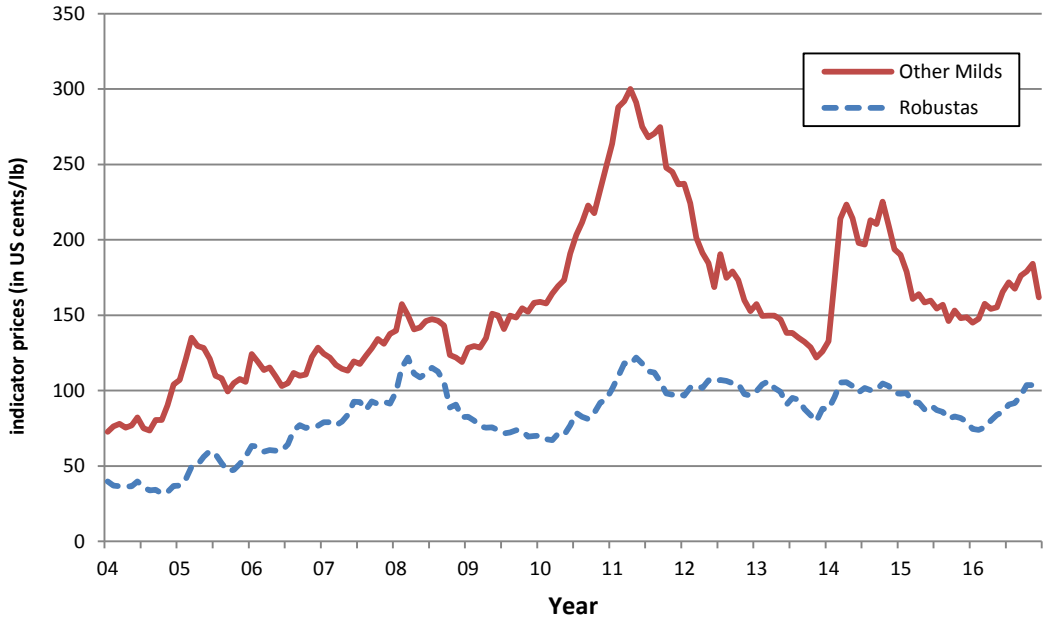

Figure 1: Fluctuations in prices in the coffee market between 2004 and 2016
Source: derived from ICO data, , accessed on 04/05/2017 (ICO, 2017)

The largest coffee exporters are Brazil, Vietnam and Colombia, see Figure 2, while most consumption is done in North America and Western Europe (ITC, 2015). This makes the coffee trade an important North-South trade product. The coffee value chain can be classified as buyer-driven, meaning that buyers, not producers, are in control over the coffee trade. This is because coffee is mainly produced by a large number of small farmer organizations in many countries, while coffee distribution is controlled by a handful of multinationals in consuming countries (Manning et al., 2012). The International Coffee Agreement, in 1989, was the most notable institutional attempt to regulate the coffee market and protect producers. However, it fell apart under pressure of market liberalization

(Manning et al., 2012). In this setting PSS emerged to offer a way to link the consumption, production and trade of sustainable products (ITC, 2015).

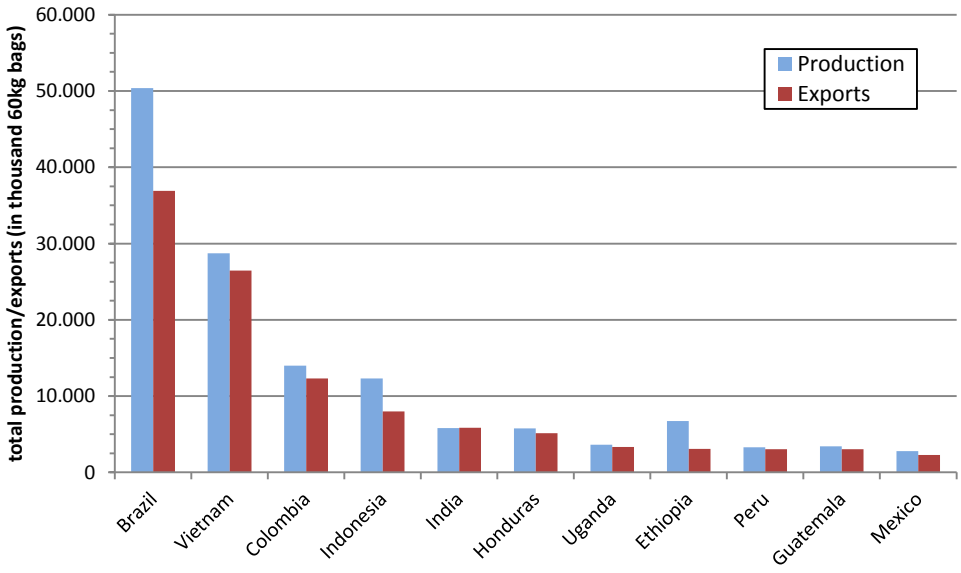

Figure 2: Main countries producing and exporting coffee for season 2015/16
Source: derived from ICO data, accessed on 04/05/2017 (ICO, 2017)

Economies of many low income African countries, like Uganda, are still highly dependent on agriculture. Within agriculture, the coffee sector is a major player. Uganda produces both Robusta and Arabica coffee, with about 80% being Robusta (UCDA, 2016). They produced 3650 thousand bags (60Kg) of green coffee in 2015 and 3800 thousand bags in 2016 making them the second largest coffee producer in Africa, after Ethiopia with 6600 thousand bags in 2016 (ICO, 2017). Consumption of coffee in Uganda itself is very low, around 3%, and thus most of the coffee is exported providing an important source of revenue for the country (ICO, 2017). Figure 2 shows that Uganda was during the 2015/16 coffee season the seventh largest coffee exporter in the world and the largest exporter in Africa (ICO, 2017). While Uganda is the largest in terms of export volume in Africa, Ethiopia still has the highest export value in Africa due to the higher quality of the coffee they export. Ugandan coffee exports are valued at around 17,5% of foreign exchange earnings in Uganda and employ about 1.32 million smallholder farmers directly (ITC, 2012b). These small-scale producers are the main producers, providing about 90% of the coffee (GAIN, 2012). Coffee production provides an important source of income to these farmers.

Before 1991, the coffee sector in Uganda was controlled by a central marketing board. The marketing board often paid farmers prices below the world price and premiums were often delayed (Chiputwa et al., 2015). The liberalization in the 1990s led to the collapse of the existing sector which was unable to adapt to the new market conditions and private companies took their place. In 1994 the Ugandan government created the Uganda Coffee Development Authority (UCDA) with the mandate to expand and oversee the coffee industry in order to ensure optimized foreign exchange earnings.

The current fraction of certified coffee produced in Uganda is still very small (~3%), nevertheless, the Ugandan government recognizes that certification offers an interesting pathway to add value to one of its main exports. They have identified ‘increasing the amount of certified coffee’ in their National Export Strategy as a key objective to improve the revenue from coffee (ITC, 2012b).

4.3. Coffee standards studied

There are five main coffee standards being implemented globally: SAN, FT, UTZ, BCC, ORG (ITC, 2011a). In Figure 3 data from the International Trade Centre (ITC) – standards map was used to generate an overview of each standards focus. As this figure indicates certificates are mainly focused on environmental and social issues, while ethical, quality and managerial issues represent only a small fraction of requirements. From this figure it may seem like there is quite some overlap between certificates, but each standard is still further differentiated in the way they fill in their focus area, there certification process/costs and how strict they are, as demonstrated in Figure 4.

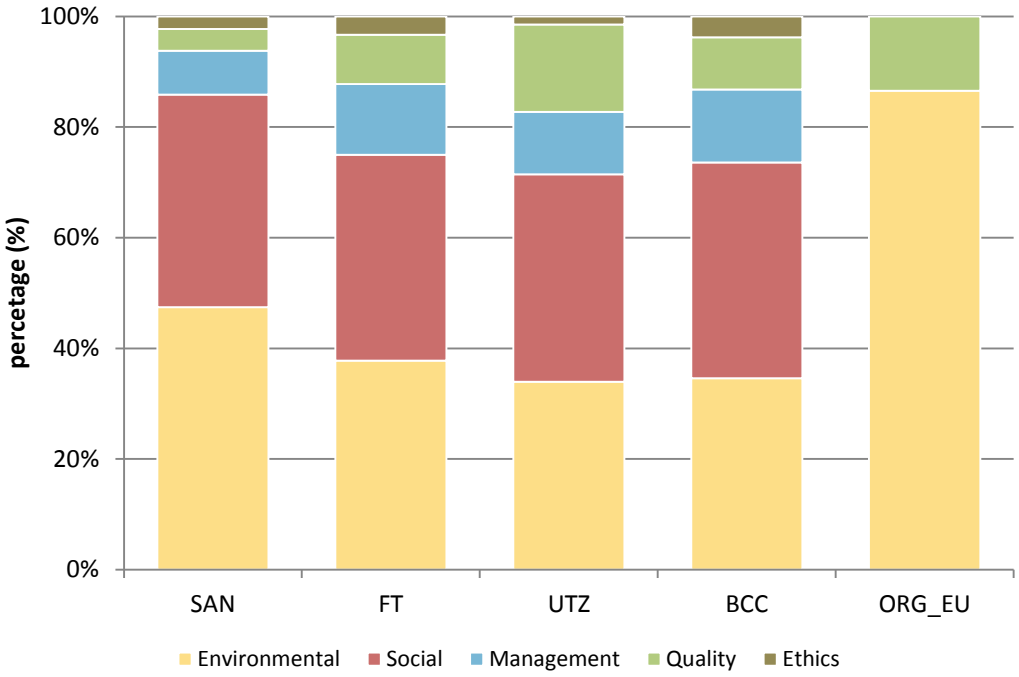

Figure 3: Focus areas for SAN (Sustainable agricultural network – Rainforest Alliance), Fairtrade – small producers, UTZ, BCC and EU organic standards on coffee.
Source: own creation based on data from ITC –standards map [accessed on 24-04-2017]

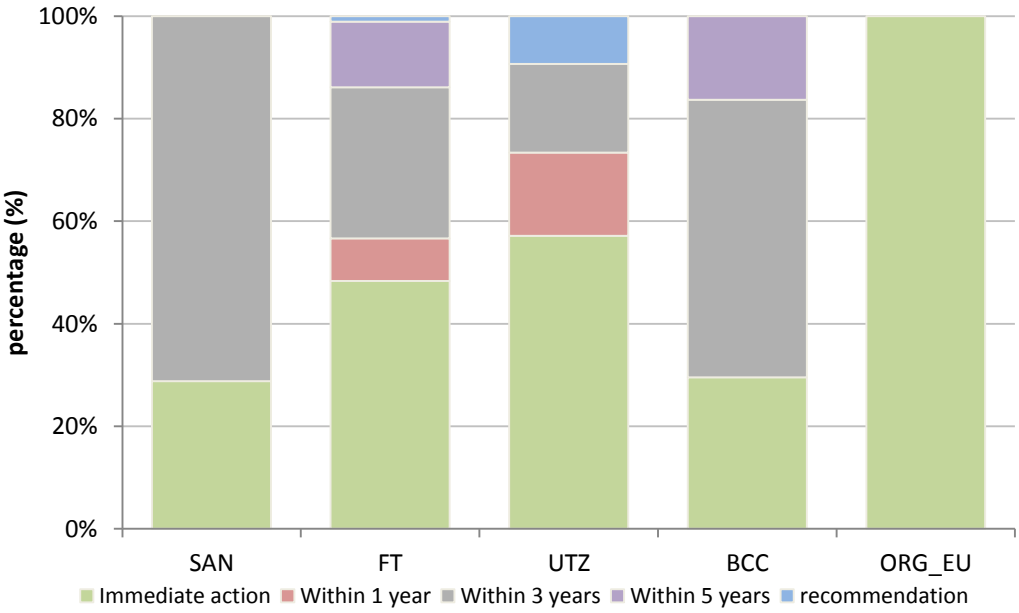

Figure 4: Time to meet obligations for SAN (Sustainable agricultural network – Rainforest Alliance), Fairtrade – small producers, UTZ, BCC and EU organic standards on coffee.
Source: own creation based on data from ITC –standards map [accessed on 24-04-2017]

The rest of this section details the five standards further, the information in this section is gathered from the official websites of the respective labeling and standard setting organizations (Fairtrade International, 2017b; Flocert, 2017; Rainforest Alliance, 2017; SAN, 2017; Utz, 2017), and from a review done on '*the state of sustainability Initiatives*' by Potts *et al.* (2014). The logos matching these standards are shown in Figure 5.

Fairtrade

Fairtrade was founded in 1988, and as its name suggests, was created to encourage fair trade between developing countries and the developed countries. Under the motto 'Trade not aid' they aim to help the development and empowerment of developing countries by offering the guaranty of a fair price and good labour conditions (compliance with the ILO norms). Today FT certifies 17 different products across 120 countries. However, they originally started with coffee, making FT one of the oldest standards concerning coffee and probably the best known and studied.

There exists a specific standard for small producer organizations that produce coffee. FT defines small-scale producers as producers that do not relay on hired labour most of the time for the farm work. Individual certification is not possible, small-scale producers are required to organize into democratic organizations, cooperatives. A distinct aspect of FT is the guaranty of a minimal price and social premium. The social premium is a sum of money given to the cooperative to be invested back into the community, by e.g. building of a school, clean water well or maternity ward.

Certification is done by FLO-Cert, an independent certification body that is in accordance with ISO 17065. Full recertification is done every three years, with smaller audits and random checks within this period. The costs of certification fall mostly to the cooperatives, but some grants are available.

Organic

There is not one universal ORG standard and label, instead many slightly varying ORG standards exist. Even so, in general do ORG standards have a very strong focus on environmental restrictions, aiming to create productive farming systems without the use of synthetic pesticides and fertilizers, GMO, etc. The most notable ORG standard was made by the International Federation of Organic Agriculture Movements (IFOAM) and has 4 guiding principles: health, ecology, fairness and care. The IFAM was founded in 1972 and its standard has been used as the basis for many other organic standards. Unique to ORG is that standards are often adopted at a national level and its requirements get incorporated into the national legislation of the country to some extent.

Rainforest Alliance

Rainforest alliance (RFA) was founded in 1987 and is most known for its advocacy on protecting biodiversity. It nevertheless also aims to improve producer welfare by creating a completely sustainable system, aiming at environmental protection, social equity and economic viability. RFA is active across 43 countries and works not only on agriculture products but also on sustainable tourism, sustainable forestry and climate change.

For agricultural products, such as coffee, RFA acts as an accredited certification body (ISO065), allowing its label on the finished product if it consists of at least 30% RFA certified ingredients. Certification for more than 100 different crops is possible for both small and large scale farmers. To get certified production has to be in compliance with the requirements provided in the standard created by the Sustainable Agriculture Network (SAN). Recertification is done every three years.

UTZ certified

UTZ Certified was founded in 2002 with as focus the use of good agricultural practices and the traceability of products. UTZ hopes to improve the market price producers get by having their product recognized as a higher quality product (Ruben and Hoebink, 2015). Unlike FT, UTZ hopes to help producers by creating a more socially and environmentally responsible market rather than through provision of direct assistants (minimum price). The company works with coffee, tea, cacao and hazelnut certification across 33 countries.

To become UTZ certified, farmers have to comply with the UTZ code of conduct. The certification process is spread out over a four year period, with each year requiring more. UTZ works with more than 50 independent third party certification bodies (e.g. CERES, AfriCert) around the world. Both individual as group certification is allowed. UTZ also offers a certificate for following their guideline on the chain of custody, making products fully traceable from farm to shelve.

Global Coffee Platform

The Global coffee platform, formally known as the Common Code for the Coffee Community (4C), was founded in 2006 and works with a sector wide standard oriented toward stakeholders in the coffee chain across 22 countries. This organization works with a business-to-business model and does not use certification, instead they verify that members comply with the requirements. Verification entails that the company makes a fair effort to determine compliance but does not guaranty anything with a certificate. Because of this the verified products do not carry a logo. Verification is less costly than certification but also less rigid.

In the baseline common code (BCC) the GCP describes 27 general principles divided over the 3 pillars of sustainability that producers have to comply with. Their standard is based on the principles of GLOBALG.A.P., and aimed to increase good agricultural practices and management practices. Verification is done by the Coffee Assurance Services.

Figure 5: Logos found on certified coffee – Fairtrade, IFOAM organic, Rainforest Alliance and UTZ certified.

4.4. Research area: Mount Elgon

The area studied is the Mount Elgon region in Eastern Uganda, an extinct volcano lying on the border of Uganda and Kenya, see Figure 6. On the Ugandan side the inhabitants of the eight districts of the Mount Elgon region are traditional coffee producers. The largest town in this region is Mbale. Coffee is the main cash crop in the region and is mostly grown in combination with subsistence crops, such as bananas, beans and cocoyam. The higher altitude of the region (above 1500 meters above sea level) and the relatively rich volcanic soils constitute an appropriate agro-ecological condition for the production of Arabica coffee. Peak harvest for this region is between September and November. Through a cross-sectional household survey conducted for the PhD research of Kevin Teopista Akoyi in 2014 of 600 smallholder farmers, general household data for this area has already been collected (Akoyi and Maertens, 2017). Through her work it is known that in the area there are three main companies implementing certification through contract arrangements with farmer cooperatives: the farmers of Gumutindo Coffee Co-operative Enterprises (GCCE) work under a double certification of Fairtrade-Organic (FT_ORG), secondly Kyagalanyi Coffee Limited (KCL) works under a triple certification of UTZ- Rain Forest Alliance-Baseline Common Code (UTZ_ RFA_BCC) and Kawacom farmers under organic. Still other farmers are not certified and sell to traders on the spot market without prearranged contracts.

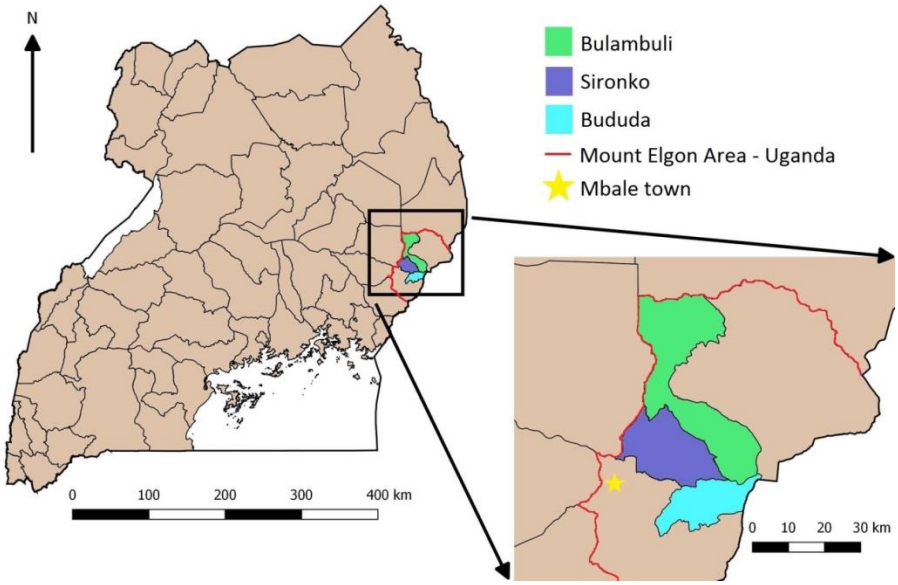

Figure 6: Map of Uganda and Mont Elgon Region – source: own creation

This study looks at non-certified farmers, KCL farmers and GCCE farmers. KCL is one of Uganda's oldest coffee exporters and has been active in Mount Elgon sins 2006. They are organized around six washing stations and recruit farmers within a 12.5 km radius of these stations. KCL oversees the UTZ_ RFA_BCC certification process, provides extension services and inputs (i.e. agro-chemicals) on credit. Farmers sell fresh berries to the washings stations, which are located close to a river, where they are fully processed. They receive an immediate cash payment based on the market price upon delivery and a bonus at the end of the season. GCCE consists of a network of cooperatives societies in the region. Members become FT_ORG certified and are organized in societies which are responsible for delivering fully washed berries to Mbale. Farmers are guaranteed a fixed minimum price paid a after the delivery of coffee to Mbale and receive a bonus at the end of the season. These farmers are not allowed to use inorganic chemicals. (Akoyi and Maertens, 2017)

5. Methods

In this section the reasoning behind why various techniques were chosen and how they were used during the research are explained. This is done for the design of the choice experiment, the gathering of the data and the econometric methods used to analyze the data. An overview of the methodological process is given in the diagram below (Figure 7).

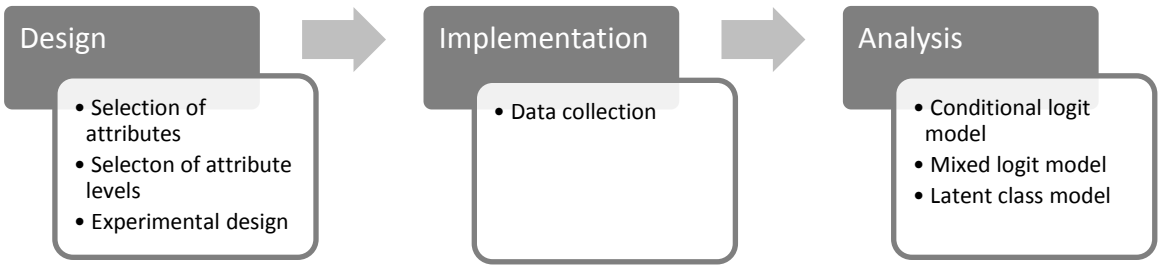

Figure 7: Diagram illustrating methodological process of creating a choice experiment

5.1. Design of a choice experiment

5.1.1. Conceptual framework

To determine the preferences of smallholder farmers for the different aspects of coffee certificates a Discrete Choice Experiment (DCE) was designed. This is a survey-based stated preference elicitation method developed by *Louviere and Hensher* (1982) and *Louviere and Woodworth (1983)*. A DCE reveals preferences through the choices a participant makes regarding a set of alternatives, in this case hypothetical alternatives of coffee certificates. These alternatives are described by a number of categorical variables known as attributes. The attributes are drawn from the main characteristics of actual certification schemes being implemented in Mount Elgon and are either requirements imposed on the farmer (e.g. no child labour) or benefits the farmer receives in compensation (e.g. price premium). For each attribute a number of different attribute levels are considered, detailing specific certificates further. Each different combination of attribute levels represents a hypothetical coffee certificate, known as a profile. The different profiles are placed on choice cards and each participant is asked to choose their most preferred profile for that card. When doing this the respondent will have to weigh the requirements and benefits of each profile against the other options. Each choice card will contain three possible profiles: two hypothetical coffee certificates and a status quo option. The status quo option is the same on every card and represents the 'opt-out' conditions, meaning that farmers choose not to participate in any certification scheme and freely choose how to grow and sell their coffee. This option is included to avoid forced choices, where a respondent may otherwise have to choose between options he would in reality not consider (Carson et al., 1994).

By choosing one option on the cards over the other 2 alternatives, respondents indirectly indicate that they obtain greater utility from the selected option. This relates back to the theory of consumer choice, which assumes that the characteristics of a good determine the utility of a good, rather than the good itself (Lancaster, 1966). The good is in both cases a coffee certificate where the attribute levels vary, thus:

(eq. 5.1) $$U_{ij} > U_{im}$$

Where U_{ij} is the utility observed by respondent i for good j and U_{im} is the utility observed by respondent i for good m. In this case the farmers' utility for good j is higher than for good m. By making multiple choices it can be deduced which trade-offs farmers make among attributes and the probability of an individual agreeing to work under a certain certificate. The model is further defined later on in section 5.3.

5.1.2. Selection of attributes and attribute levels

The first step of constructing a DCE consists of deciding on attributes and attribute levels to be studied. An attribute should be included if without it a respondent would reach a different conclusion (Kjær, 2005). It is important that these attributes are independent from each other to be able to make accurate estimations of the main effects (Kjær, 2005). Thus careful consideration has to be given that there is no overlap between attributes leading to correlation between these attributes. Attribute levels should be selected so that they provide a realistic range of possibilities (Kjær, 2005). For this CE a set of ten attributes were selected based on elements of the certification schemes active in the area, see section 4.4. Research was done into which restrictions influence farmers most and which are common compensations given in return. This research was done through reading the relative standards and through group discussions with farmers, cooperative management and thesis supervisors. The selected attributes should provide relevant and realistic insights into which farmers prefer which conditions. Table 1 contains an overview of the attributes and attribute levels, the status quo options are shown in bold.

The level of the first attribute *'Chemical use and provision'* determines to what extent the use of chemical substances is allowed and facilitated by the certification organization. Certification schemes often provide farmers improved access to inputs as a way to help small scale farmers overcome the often strong constraints in the local input market. The provision is often done on credit, meaning that the farmer can ask for the chemicals when he needs them and the cost is later deducted from his profits. In our study area KCL implements a system where inputs are advanced to the farmer and have to be paid back when they receive their bonus. The increased access can help to improve yield and quality of coffee produced. On the other hand there are often also limitations on the amount of chemicals that can be used for health and environmental reasons. Especially in ORG schemes use is severely restricted. When only an exact dose of chemicals is allowed farmers are informed that compliance will be checked regularly.

The provision of *'Extension services'* determines what type of training/support is given to the farmers. Under extensions services falls training on fertilizer use, pesticides and best practices for coffee production and processing. This definition was as such communicated to the respondents. Current certification schemes offer extension services either in the form of a single big training once (or twice) a year to keep up to date with the required practices or as group trainings provided in combination with more regular and individual access to an extension agent when requested.

'*Child labour'* is often not allowed or at least restricted by many certificates and is included to see how farmers value this loss of labour. Child labour was defined to farmers as the prohibition of paid labour for children under 15 years and the prohibition of any unpaid labour that could be harmful to the child's welfare (mentally, physically or socially).

The attribute '*On farm requirements***'** refers to whether or not the certification body wants farmers to implement a package of agronomic practices, consisting of planting of shade trees, legumes, minimum tillage, mulching, erosion control and proper disposal of chemicals. This was as such defined to the farmers, they were also informed that compliance of implementation would be regularly checked. While these practices increase the workload they should provide long-run benefits toward farm productivity and health.

The level of *'Location of delivery'* determines how far the coffee has to be brought to sell it. The further away the point of sale is from the farmers' home the more time and money (transaction costs) it will take the farmer to sell his harvest. When farmers do not participate in contract schemes, traders will often come to their farm to trade, saving the farmer time and effort. Cooperatives however often require participants to bring their harvest to a certain location. The level 3 km roughly refers to delivery at village level and the 10 km to delivery to the nearest washing-station, these estimates were based on information from local stakeholders. The last level 'Mbale' refers to the nearest urban center.

'Selling agreement' states whether or not it is allowed for the farmer to sell to other buyers. In exclusive contracts there is more incentive for investment by certification organizations. Yet, when farmers have an urgent need for cash (e.g. due to school fees, medical costs) they will be more likely to sell to others. Thus this is included to see what it takes for farmers to commit to a buyer and is presented as a written contract farmers have to sign.

Also *'Time of payment'* plays an important role when farmers sometimes have an urgent need for cash. If certification contracts are unable to provide immediate cash when needed, farmers will be more likely to sell to others. Delayed payment also requires farmers to trust the seller to pay the agreed amount.

A ***'bonus'*** can be awarded on top of the selling price. This can be done in two ways, as money to the community (social premium) or to an individual farmer. The individual bonus is an additional amount farmers get at the end of the season per kg of coffee sold to the company. The social bonus is a percentage of the profit made from selling the coffee which is given back at the end of the season for the development of the local community. The social bonus is an important aspect of FT certificates.

'*Processing of coffee'* states in which stage of processing the coffee beans have to be sold to the buyer. In the study area the farmer is able to sell his coffee berries in three different forms: fresh berries, dried berries and fully washed berries. Fresh berries are berries that are handpicked and sold within hours of picking them. Dried berries are handpicked and then dried by the farmer without removing the outer skin. This allows the berries to be stored by the farmer and thus improves his market position but decreases the quality of the taste somewhat. Fully washed berries are berries from which the skin has been removed before drying them. These berries can then also be stored and are of higher quality. Each of these variants requires more effort and specific knowledge from the farmers.

The last attribute is the '*selling price'*, this attribute represents the price (in UGX) a farmer receives per kg of coffee under the presented profile. Because this price is dependent on how far the coffee already has been processed five price levels were converted to prices relevant to each level of processing. Prices of the same level for different processing stages should thus be valued equal by respondents. The status quo level for each processing stage was set at the market price for that type of berry at the beginning of the CE. The four other levels were chosen around this market price, with two levels above and two below, as shown in Table 2.

Table 1: Attributes and attribute levels of the choice experiment, with status-quo levels in bold

	Attribute	Attribute levels
1.	Chemical use and provision	No use allowed, not provided Exact dose allowed, not provided **Unlimited use allowed, not provided** Exact dose allowed, provided Unlimited use allowed, provided
2.	Extension services	**Not provided** Provided as group training once a year Provided as group training once a year + regular individual follow-up
3.	Child labour	Not allowed **Allowed**
4.	On farm requirements	**No requirements** Requirements
5.	Location of delivery	In Mbale Within 10 km range Within 3 km range **At farm gate**
6.	Selling agreement	**Exclusive contract** Side selling allowed
7.	Time of payment	**Cash on delivery** One month after delivery At the end of the season
8.	Bonus	**Not provided** Social premium Individual bonus Social premium + individual bonus
9.	Processing of coffee	**Fresh berries** Dried berries Fully washed berries
10.	Selling price	L1 – L2 – **L3** – L4 – L5

Table 2: Specification of price level for the different processing levels.

	L1	L2	L3	L4	L5
Fresh berries	600	800	1000	1200	1400
Dried berries	3100	3300	3500	3700	3900
Fully washed	5600	5800	6000	6200	6400

5.1.3. Creation of choice cards

Above 10 attributes were selected and thus a full factorial design would consist of 86 400 ($=5^2*4^2*3^3*2^3$) different combinations. It is unrealistic to expect a participant to answer this many cards. This problem is addressed by using logic and statistical software to generate a fractional factorial design with those choice cards that reveal the most information. This process is referred to as experimental design and reduces the number of choice cards to a manageable and relevant set that still give precise estimates. The statistical platform *JMP Pro 12* was used to generate a Bayesian D-optimal design consisting of 4 surveys with each 8 cards containing 2 options plus the status quo option. A Bayesian design optimizes under the assumption that not all model parameters are equal to zero, instead they are assumed equal to a certain value based on prior information about the relative size and sign of the parameter (Kessels et al., 2008). This improves statistical efficiency by making choices similar in expected utility, confronting the respondents with harder choices. The prior estimates used for the design are given in Appendix 1. On each card only 6 of the 10 attributes where allowed to vary. This creates 'partial profiles' and was done because 10 attributes is quite a lot for a respondent to consider, lowering the number that varies on a cards lowers the cognitive burden for the respondent. Also it means that if one of the attributes was dominant holding it constant in some choice sets means that respondents cannot always base their choice on this (Kessels et al., 2011).

Figure 8 shows an example of one of the choice cards created. Due to the possibility of poorly educated respondents and difficulties with English it was attempted to make understanding of the cards as intuitive as possible. The cards ware created as visual as possible: pictographs were designed for each attribute level, a gray background was used to indicate that an attribute remained constant in both options and a thick border was added around each option to emphasis that farmers had to choose not between attribute levels but between entire contracts.

5.1.4. Mitigating biases

Several steps were taken in an attempt to mitigate bias as much as possible. Firstly, the order in which the attributes were presented on the cards was varied for each of the four surveys (but not within). This should mitigate any effects caused from farmers focusing more on attributes at the top or bottom of the card. Next, each day the enumerators were given a list containing the names of the farmers' they should survey and a couple of replacement options. On this list each farmer had been randomly assigned a survey and start cart. Always starting with a different card should help counteract both the effect of the respondent getting better at answering the choice tasks the further in the interview he is and on the other side the effect of the respondent getting bored and more lax with his choices (Carson et al., 1994). Also each respondent was first presented with a warm-up task consisting of two example cards that were specifically designed to have a superior option allowing the enumerators to assess whether or not the responded had understood the task. Lastly a comment section was included to evaluate if certain comments were repeatedly given.

Before starting the survey two days where taken to train two enumerators. Both enumerators were from the Mbale area and thus very familiar with the nuances of the language and customs in the survey area. A pilot test was conducted to see if respondents understood the CE context, found the attributes and attribute levels relevant and the time required. The pilot revealed that while all the attributes and levels were relevant the respondents had some trouble understanding the concept of choosing between contracts and not between attribute levels. Due to this, several adjustments to

the lay-out of the choice cards were made to make the cards more intuitive resulting in Figure 8 (e.g. adding the thick border around each contract, white space between each of the three options). Also several adjustments to the lay-out of the answer sheet were made to insure the enumerators remembered to use the right survey and start card after doing the example cards. Figure 9 shows the final version of the used answer sheet.

When choosing the number of attributes and attribute levels there is a trade-off between selecting too few attributes, possibly omitting variable bias, and selecting too many, making the task of choosing a preferred option too complex for the farmer (Hoyos, 2010). Because ten attributes is considered as quite a lot, partial profiles where used to reduce the cognitive burden and lexicographic choice behavior. On top of this respondents were asked after the CE to rank the different attributes from most important to least important when making a choice. With this data it is possible to model attribute non-attendance (ANA), which allows us to assess whether or not farmers systematically undervalued or did not take into account certain attributes when making choices (Hoyos, 2010).

Criticism on CE states that it deals with hypothetical situations and consequently results are not representative. However, in this case we are asking farmers about a situation they are very familiar with and thus this problem should be minimal (Hoyos, 2010).

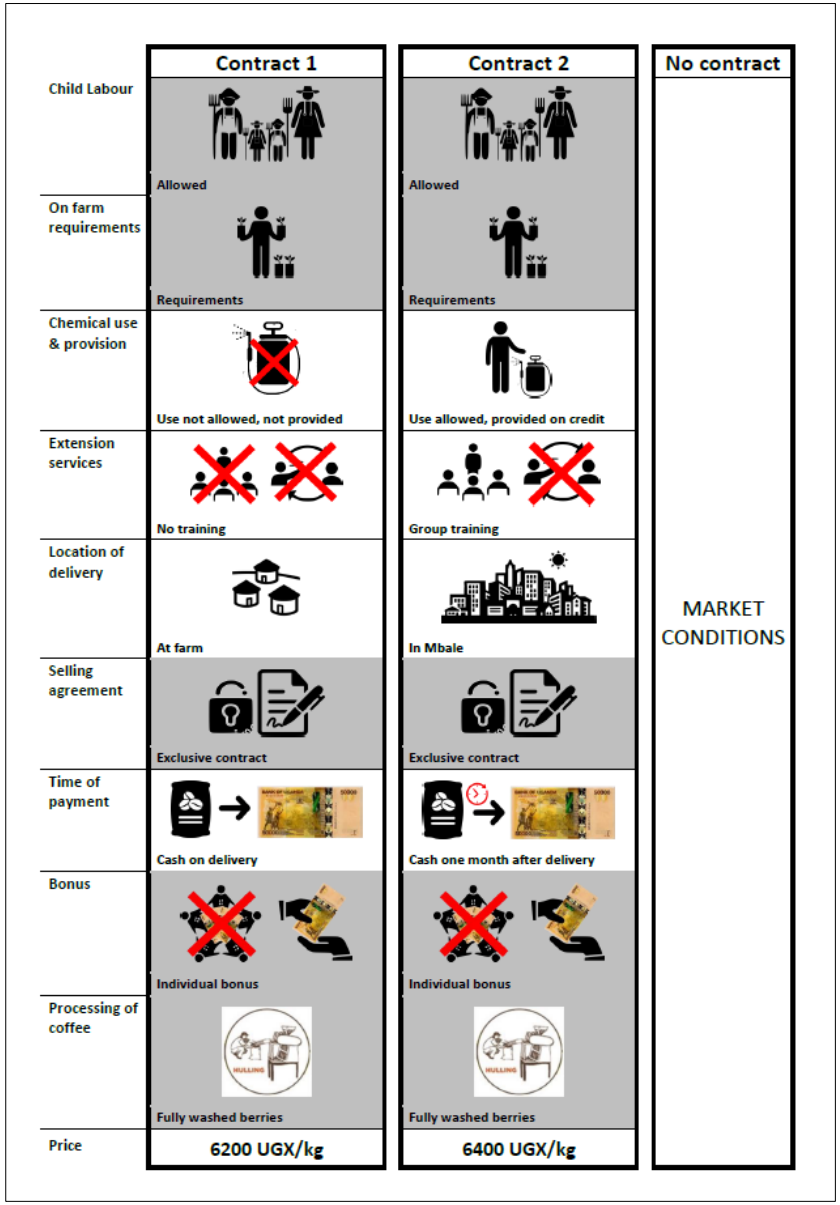

Figure 8: lay-out of choice card

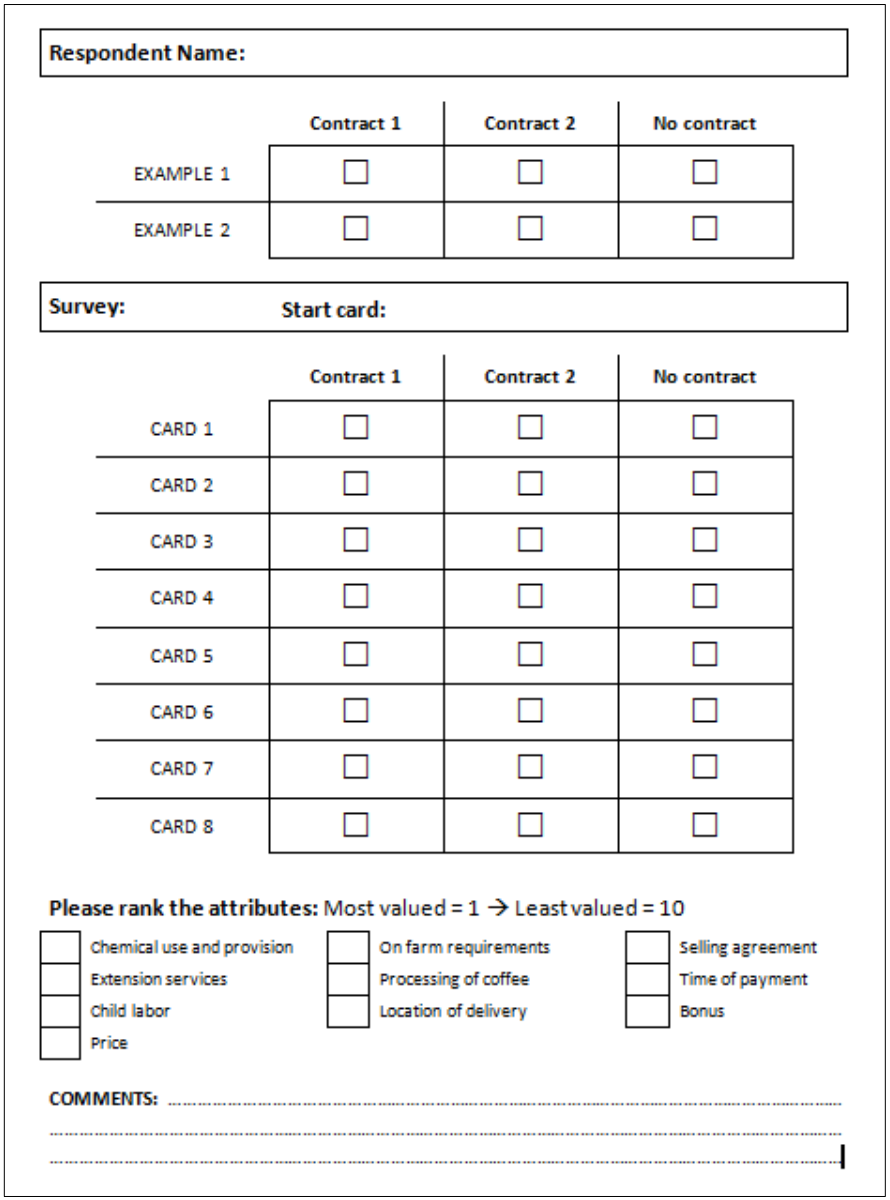

Figure 9: lay-out answer sheet

5.2. Implementation of a choice experiment

The CE was conducted on a sub-sample of 600 coffee farmers surveyed by Kevin Teopista Akoyi in 2014 and was done in collaboration with Busitema University. This was done because it would allow us to integrate the various socio-economic characteristics collected then in the analysis of the choice experiment. The original sampling selected 600 households in 5 districts through a multi-stage purposively stratified random sampling. These households were for each district spread over 4 sub-counties and within each sub-county over 3 villages. In each sub-county the focus lay on a specific group: one with FT_ORG certified, one with UTZ_RFA_BCC and two with non-certified farmers (Akoyi and Maertens, 2017).

Three out of the five original districts were selected for resampling: Bududa, Sironko and Bulambuli, see Figure 6. This choice was based on the accessibility, language spoken and diversity in farmers' participation in certification in the districts. Originally, the district of Manafwa had been selected instead of Bulambuli. However this was changed after GCCE employees informed us that farmers in that district would not be cooperative due to some negative experiences with coffee certification. Table 3 gives an overview of the sample design. In each district it was attempted to re-interview the same 120 households as in the 2014 survey. In every household preferably the household head was interviewed, if the household head was not present the interviewer asked if another member of the household was actively involved in the decisions made regarding coffee production and marketing (e.g. spouse, older children).

Over a period of 6 weeks, between 08/08/2016 and 16/09/2016, 352 households were interviewed. Of this 334 were also interviewed in the original survey, the other 18 households were randomly replaced because the original household could not be contacted. The main reasons for replacement were that the farmer had since moved or died. Eight households were not resampled due to time shortage. For 332 households data on household characteristics is available because two households from the original survey were dropped due to immature coffee trees at the time of the original survey.

Table 3: Sample design

District	Sub-county	Certification	Farm household	Original sample	Resampled	Replaced
Bududa	Bududa	UTZ_RFA_BCC	2 597	30	29	2
	Bumayoka	FT_ORG	701	30	30	5
	Bukigai	None	2 000	30	30	2
	Bushiika	None	2 600	30	29	1
Sironko	Busulani	UTZ_RFA_BCC	1 251	30	30	3
	Buwalasi	FT_ORG	1 289	30	28	2
	Buyobo	None	2 100	30	30	0
	Buwasa	None	1 710	30	30	0
Bulambuli	Masiira	UTZ_RFA_BCC	1 215	30	30	2
	Namisuni	FT_ORG	359	30	30	0
	Sisiyi	none	2 480	30	28	0
	Bukibologoto/Simu	none	1 380	30	28	1
Total				**360**	**352**	**18**

Note: Based on sample design by Akoyi and Maertens, 2017.

5.3. Econometric methods

Using econometric tools the obtained DCE results can be analyzed. In this section the theoretical basis behind the three different models used is briefly given. It is attempted to highlight the specific advantages and weaknesses of each model and how they complement each other.

5.3.1. Conditional logit model

The conditional logit model (CLM) was developed by McFadden (1974), it uses maximum likelihood estimation (MLE) to estimate the coefficients of the attribute levels. It models the chosen alternative in function of the characteristics of the alternatives (Hoffman and Duncan, 1988). CLM is a multiple discrete choice model and is commonly used as the start model when analyzing DCE with more than two alternatives per choice set. This model assumes an independent and identical distribution of the random component (IID) (Kjær, 2005) which contains two key conditions: the independence of irrelevant alternatives (IIA) and an equally distributed error term (Kjær, 2005). The first condition implies that the error terms are independent, the presents or absents of an extra alternative on the choice card should not affect the chance of an alternative being chosen over another (Carson et al., 1994). The second condition says that household characteristics do not influence the respondent's choice and thus respondent's preferences should be homogeneous (Vlaeminck and Vranken, 2015). When this condition is met the probability of an alternative being chosen has a logistic distribution and MLE can be used.

Ben-Akiva and Lerman, (1985) combined theory of consumer choice with the probabilistic choice theory of random utility, which says that participants' decisions are latent and unobservable (McFadden, 1974), to develop equation 5.2.

(eq. 5.2) $$U_{ij} = U(Z_{ij}, S_i) = V_{ij}(Z_{ij}, S_i) + \varepsilon_{ij}(Z_{ij}, S_i)$$

In this equation latent utility depends on Z_{ij}, the attributes of good j presented to respondent i, and the S_i, the individual's socio-economic characteristics. This is further split up into two factors: V_{ij}, the systematic (observable) utility and ε_{ij} the random (unobservable) utility. The observable utility can be further divided into a generalized regression function that is linear-in-the-parameters. Equation 5.3 gives the general form of the CLM:

(eq. 5.3) $$V_{ij}(Z_{ij}, S_i) = \beta X_{ij}(Z_{ij}, S_i) + \varepsilon_{ij}(Z_{ij}, S_i)$$

With X_{ij} the various predictors, β the estimated parameters that indicate how a certain factor influences the observed willingness to get certified and ε_{ij}, the error term of the model, which is assumed to be Gumbel distributed. The 'opt-out' choice is included in the model through the alternative specific constant (ASC), which represents the utility respondent's get from producing without being certified (Schipmann and Qaim, 2011). The full model for the CE is given in equation 5.4 below:

(eq. 5.4)

$$\begin{aligned} V_{njt} = {} & ASC + \beta_1 CU\_NN_{njt} + \beta_2 CU\_EN_{njt} + \beta_3 CU\_EP_{njt} + \beta_4 CU\_UP_{njt} + \beta_5 ES\_G_{njt} + \beta_6 ES\_B_{njt} + \beta_7 CL\_NA_{njt} \\ & + \beta_8 MR\_R_{njt} + \beta_9 LD\_M_{njt} + \beta_{10} LD\_10_{njt} + \beta_{11} LD\_3_{njt} + \beta_{12} SA\_S_{njt} + \beta_{13} TP\_M_{njt} \\ & + \beta_{14} TP\_S_{njt} + \beta_{15} B\_S_{njt} + \beta_{16} B\_I_{njt} + \beta_{17} B\_SI_{njt} + \beta_{18} P\_BD_{njt} + \beta_{19} P\_FW_{njt} + \beta_{20} Price_{njt} \\ & + \beta_{21} P\_DB_{njt} * Price_{njt} + \beta_{22} P\_FW_{njt} * Price_{njt} + \varepsilon_{njt} \end{aligned}$$

With n the specific respondent, j the specific alternative and t the choice set.

However, it cannot be expected that respondent's preferences are homogeneous and thus the assumption of IID may not hold. Interviews in the field already revealed that some respondents had a preference towards 'child labour allowed' while others had a preference toward it being 'not allowed'. Due to this a mixed logit model is used to investigate if the suspected heterogeneity is present.

5.3.2. Mixed logit model

While McFadden's (1974) work still forms the basis of discrete choice modeling, over the years several alternative models have been proposed that use other assumptions (Manski, 2001). One such model is the mixed logit model (MXL), which can overcome some of the problems with CLM. The advantage of this model is that it allows for some unobserved preference heterogeneity, by including random effects (Blandon et al., 2009). The MXL model estimates the mean of the coefficient over a predefined statistical distribution rather than as point estimates (Hoyos, 2010). The significance of the standard deviation of the coefficient's distribution around the mean then indicates if preferences for attributes vary between respondents and thus if heterogeneity is present in the sample (Schipmann and Qaim, 2011). In MXL coefficients can thus vary between respondents.

(eq. 5.5) $$U_{ij} = (\beta + \gamma_i)X_{ij} + \varepsilon_{ij}$$

Here γ_i is a vector that contains the individual-specific standard deviation.

To use a MXL model one has to specify which parameters are considered random and what the distribution of these random parameters is (Hoyos, 2010). In our MXL model all attributes, except for price, are considered as random. Price preference can be considered as fixed, because it can be expected that a higher price is universally preferred. The ASC is also considered as fixed. The distribution of the random coefficients is assumed to be normal, this assumption is usual when using dummy variables for which the coefficients can be both positive and negative (Kjær, 2005).

While MXL can reveal heterogeneity it still gives coefficient estimates for an average respondent, next a latent class model is used to estimate preferences for specific groups within the data.

5.3.3. Latent class model

In a latent class model (LCM) estimates for the mean of the coefficients are considered discrete, instead of continuous (Hoyos, 2010). A LCM assumes that there are a specific number of different classes of farmers present within the data, with a class being a group that has homogeneous preferences. A LCM thus identifies systematic heterogeneity. Unlike MXL model, LCM does not require the specification of the distribution of parameters (Greene and Hensher, 2003). To run a LCM the number of classes should be prior specified. By running the LCM for a range of classes and then evaluating the statistical decision criteria (e.g. Akaike information criterion – AIC and Bayesian information criterion - BIC), the significance of estimates and the meaningfulness for each model a decision can be made. The number of classes is also influenced by the size of the sample, the number of respondents belonging to each class should still be large enough so that significant estimates can be made.

After the groups are formed socio-economic variables are used to assess if the differences between the latent classes can be explained by certain respondent characteristics. While MXL can reveal heterogeneity it cannot explain where this heterogeneity comes from, through a LCM however some insight may be gained.

6. Results and discussion

This section states the results obtained by using the methods described in the previous section, these results are then further discussed. All estimates were obtained using *Stata 14*.

6.1. Descriptive statistics

Before modeling the data from the CE it is interesting to look at various descriptive statistics to gain some initial insight into the sample. This is done by looking at the household characteristics and decision making process of respondents.

6.1.1. Household characteristics

The socio-economic data of the original survey conducted in 2014 by Kevin Teopista Akoyi was matched with the households interviewed for the DCE. The main characteristics of the households interviewed in the DCE are summarized in Table 4. All variables are thus measurements for 2014, except for age which was adjusted to 2016.

Descriptive statistics are given for the full sample and for the three subsamples: non-certified (n=171), FT_ORG certified (n= 80) and UTZ_RFA_BCC certified farmers (n=81). On average a household head was 53 years old, had 8 years of education, lived 3.4 km from the market and cultivated an area of 1.33 ha of which about half was dedicated to coffee production, 0.70 ha.

Table 4: Overview of household characteristics for season 2013/14

Variable	Full sample N= 332	Non-certified N= 171	FT_ORG N=80		UTZ_RFA_BCC N= 81	
Age of HH head in 2016	53	52	55	***	53	
	(14.9)	*(14.5)*	*(14.8)*		*(16.0)*	
Fraction Female HH head (dummy)	0.09	0.05	0.19	**	0.07	
Education level of HH head	7.99	8.88	7.14		6.96	**
	(6.2)	*(6.84)*	*(5.8)*		*(4.9)*	
Adult equivalent HH size	3.44	3.50	3.23		3.49	
	(1.3)	*(1.3)*	*(1.2)*		*(1.4)*	
Distance from homestead to market (in km)	3.38	2.91	3.20		4.57	***
	(1.9)	*(1.6)*	*(1.4)*		*(2.5)*	
Fraction of HH below poverty line of 1.9$ (dummy)	0.35	0.43	0.34		0.20	***
Total area cultivated (in ha)	1.33	1.27	1.26		1.52	
	(1.2)	*(1.4)*	*(0.9)*		*(1.2)*	
Area for coffee (in ha)	0.70	0.67	0.71		0.78	
	(0.5)	*(0.6)*	*(0.4)*		*(0.5)*	
Total coffee harvest (in kg)	2848.60	2585.27	2328.76		3917.92	***
	(2291.5)	*(2361.4)*	*(1350.6)*		*(2549.2)*	
Total income from coffee (in Ush)	2234797	1923984	1918624		3203228	***
	(2202024)	*(2227505)*	*(1450804)*		*(2498421)*	
Share of HH income from coffee	0 .55	0.50	0.55		0.66	***
	(0.3)	*(0.3)*	*(0.2)*		*(0.3)*	
Input cost per ha of coffee (in UGX)	*204963.40*	*248704.89*	*49558.20*	***	*280456.96*	
	(430118.5)	*(348252.0)*	*(146151.3)*		*(696516.8)*	

*Note: mean values are shown and for continuous variables and the standard deviation in parentheses. Significant differences in means between each certified category and non-certified are indicated by * p < 0.1, ** p < 0.05, *** p < 0.01.*
Source: derived from survey data by Akoyi and Maertens (2017)

A series of t-tests were performed to assess whether the sample of non-certified farmers is different from the FT_ORG and UTZ_RFA_BCC samples respectively. FT_ORG certified households are significantly older, more often female headed and use less chemicals. UTZ_RFA_BCC certified households are significantly less educated, live further from the market, are less poor, harvest more coffee, have a higher income from coffee and have a higher share of income from coffee. While it is impossible to say from descriptive statistics whether these observations are due to the effect of certification or other factors, they do seem to suggest that FT_ORG farmers see no increase in income from coffee and have a decrease in yield, while UTZ_RFA_BCC farmers are better off with higher yields, income and less poverty. This assessment is mostly in line with the results of Akoyi and Maertens, (2017) on the sample of 600 farmers.

6.1.2. Choice experiment

Choice data was collected from 352 households, each household completed one survey of eight choice sets, and thus 2816 observation should have been collected. Yet, on three occasions an enumerator forgot to fill in one of the choice tasks during an interview and thus only 2813 observations are available. Figure 10 gives the distribution of these observations per choice for each survey. Survey one was done 85 times, survey two 93 times, survey three 85 times and survey four 89 times. The opt-out option was never a dominant option and chosen only 481 times. This is an indicator that respondents in general did not fall back on the 'opt-out' option as an easy choice, to avoid the cognitive burden of choosing between the two certificate options (Carson et al., 1994).

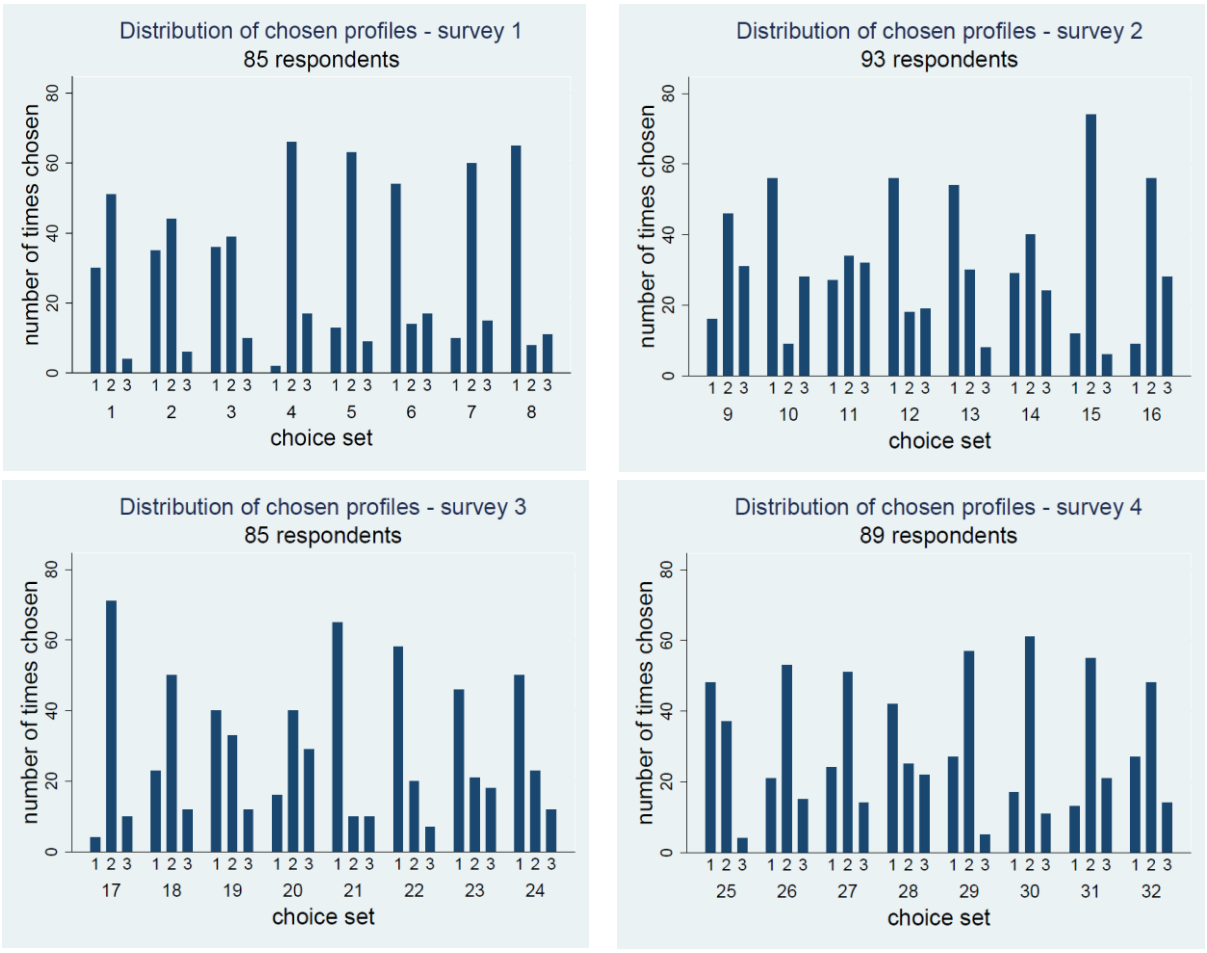

Figure 10: Distribution of observed choices per survey

6.1.3. Follow-up questions

Respondents were asked in a follow-up section to rank attributes from most important to least important when making a choice. Table 5 gives the distribution of the answers to these questions. *Extension services* were chosen in 111 (32%) of interviews as most important and *Bonus* 153 (43%) times as least important. If the first three ranks are summed, *Requirements* becomes the attribute most often stated as important. And when summing the lowest three ranks *Bonus* remains the least important, but *Time of payment* is a close second. The fact that *Extension services* and *Requirements* were ranked so often as important indicates that respondents attach great value to which level of these attributes is presented. The low level of interest shown towards *Bonus* and *Time of* payment indicates the opposite.

Table 5: Distribution of ranking of attributes in follow-up questions

	Most important								Least important	
	1	2	3	4	5	6	7	8	9	10
Extension	111	32	35	47	34	23	13	16	17	24
Requirements	70	99	53	24	31	25	18	14	11	7
Price	62	37	33	21	40	47	51	29	16	16
Processing	34	31	29	49	58	37	34	40	20	20
Chemical use & provision	18	52	66	69	31	39	28	18	13	18
Time	15	19	17	25	21	24	39	54	121	17
Child labour	11	19	38	49	36	18	36	29	45	71
Location of delivery	13	20	28	29	48	66	57	44	33	14
Bonus	11	30	34	15	12	16	19	34	28	153
Selling agreement	7	13	18	24	42	58	57	73	44	16

6.2. Econometric results

This section details the results of the three econometric models described in section 5.3. Please note that the reported coefficient estimates are interpreted by their sign and significance, and not their size which does not represent the marginal effect.

6.2.1. Conditional logit model

Table 6 summarizes the coefficient estimates obtained from running a CLM. The sign of the coefficient estimates indicates whether a given attribute level increases or decreases a respondent's utility in respect to the status quo. While the odds ratio gives the probability of an alternative being chosen compared to the status quo option. Most of the obtained values are in line with the expectations after pilot testing.

The alternative specific constant (ASC) represents the status quo option of producing under market conditions, without a certificate, and was fully defined in section 5.1.2. The estimate for the ASC is not significant indicating that farmers are indifferent between being certified and non-certified.

Of the five different levels of the first attribute *Chemical use and provision* only one significant (1%) coefficient is found. The level 'Use not allowed, not provided' has a negative sign, meaning that farmers dislike this restriction being present in certificates. This is in line with previous findings that prohibition of chemical use is a significant constraint toward farmers participation (Valkila, 2009). It was expected that farmers would prefer the levels with chemical provision to overcome constraints in the input market, as found by Abebe et al. (2013), Schipmann and Qaim (2011) and Vlaeminck et

al. (2015). However, current chemical use in the area is low which may explain the present disinterest towards the other levels of this attribute. Also the fact that the chemicals are provided on credit may deter some farmers, due to the risk of debt when a bad harvest occurs (Ibnu et al., 2015) or a distrust that they are not offered a good deal. Yet farmers still want to retain the option of using inorganic chemicals when needed.

Table 6: model estimates for the CLM

Attribute	Coef.		se	Odds ratio
ASC	-0.0907		(0.197)	0.91
Chemical_NoUse	-0.4284	***	(0.120)	0.65
Chemical_Exact	-0.0529		(0.150)	0.95
Chemical_Exact_Prov	0.0262		(0.160)	1.03
Chemical_Allowed_Prov	-0.1666		(0.124)	0.85
Chemical_Allowed	-		-	-
Extension_Both	0.7981	***	(0.125)	2.22
Extension_Group	0.5704	***	(0.125)	1.77
Extension_Non	-		-	-
Child_NotAllowed	-0.1833	**	(0.074)	0.83
Child_Allowed	-		-	-
Requirem_Yes	0.7608	***	(0.100)	2.14
Requirem_No	-		-	-
Location_Mbale	-0.6285	***	(0.151)	0.53
Location_10km	0.0100		(0.137)	1.01
Location_3km	-0.0884		(0.126)	0.92
Location_Farm	-		-	-
Selling_Exclu	-0.3309	***	(0.097)	0.72
Selling_Side	-		-	-
Pay_season	-0.7668	***	(0.115)	0.46
Pay_month	-0.3686	***	(0.118)	0.70
Pay_delivery	-		-	-
Bonus_Social	0.3923	***	(0.128)	1.48
Bonus_Indiv	0.8713	***	(0.131)	2.39
Bonus_Both	1.2016	***	(0.124)	3.33
Bonus_No	-		-	-
Processing_Dried	-0.3183	***	(0.117)	0.73
Processing_FullyW	0.9687	***	(0.141)	2.63
Processing_Fresh	-		-	-
Price	-0.0086	**	(0.003)	0.99
Price_Dried	-0.0097		(0.011)	0.99
Price_FullyW	0.0576	***	(0.013)	1.06
Observations	8439			

Note: Significance shown at *** p<0.01, ** p<0.05, * p<0.1

For the attribute *Extension services* there is a clear preference for certificates where extension is provided. Both the coefficient of 'group training' and 'group training with individual follow-up' are positive and significant (1%), with a stronger preference for the latter. These estimates are in line with our expectations and previous findings (e.g. Meemken et al. 2016).

The coefficient for 'child labour, not allowed' is negative and significant (5%), respondents thus prefer not to have this restriction imposed. Coffee production has labour peeks and during these times farmers probably see their children as a necessary addition to the household labour force. A restriction on child labour is nevertheless present in most certificates, because it is among the

highest causes for concern among consumers. Thus when designing certificates firm should keep in mind that producers value this loss of labour and compensation is required.

For the attribute O*n farm requirements* a significant (1%) and positive coefficient is found for requirements to be present in contracts. The initial expectation was that farmers would have a negative preference for this attribute because it is timely and costly to comply with. However, farmers may realize the long term benefits of these practices, seeing this restriction as an additional push to implement them. Similarly Meemken et al. (2016) found that farmers have a preference toward safety and quality requirements. They may also see these guidelines as an additional way of training, receiving additional clear instruction. The research area is very hilly and prone to landslides, farmers may thus understand very well the importance of implementing practices like erosion control. Thus the positive estimation found is plausible. Note that it is also possible farmers are just saying they would do it because they feel this is the expected answer. This type of behavior was hopefully avoided by clearly stating to farmers that the research was independent from the certification companies and that their answers were confidential.

For *Location of delivery* one significant (1%) and negative effect is found for 'delivery in Mbale'. The further coffee has to be brought, the higher the costs for the farmer, both in terms of time losses as for transport costs. In this case farmers do seem indifferent towards going distances up to 10 km. This result is consistent with previous findings (e.g. Blandon et al. 2009).

As expected for *Selling agreement* is the coefficient estimate for 'exclusive contract' negative and significant (1%). Meaning that farmers dislike exclusive contracts and value the possibility to sell to other traders.

For *Time of payment* both delayed payment options were found to be significant (1%) and negative, with a stronger dislike for 'payment at the end of the season' then for 'payment at the end of the month'. This is in line with expectations, farmers do not want a delay between selling and payment. This has to do with the need for money but also the risk of not receiving payment. This is in line with previous findings that farmers prefer immediate payments (Blandon et al., 2009).

For the attribute *Bonus* all levels providing a bonus are significant (1%) and positive, with the strongest preference towards 'social and individual bonus', then 'individual bonus' and lastly 'social premium'. This is in line with expectations and previous studies (e.g. Ibnu et al. 2015, Vlaeminck et al. 2015). The strong preference for all levels is in contradiction with the low level of interest shown towards this attribute in the follow-up questions, see section 6.1.3. Still, the result there may have been due to past bad experiences with receiving a bonus, rather than a disinterest towards receiving one.

Due to the way *Processing of coffee* is defined within the full model (see eq.5.4) the estimate for processing is divided as follows:

$$\frac{dV_{njt}}{dP\_FB} = 0$$

$$\frac{dV_{njt}}{dP\_BD} = \beta_{P\_BD} + \beta_{(P\_DB*Price)} Price_{njt}$$

$$\frac{dV_{njt}}{dP\_FW} = \beta_{P\_FW} + \beta_{(P\_FW*Price)} Price_{njt}$$

Thus the effect of processing is dependent on the price given. In general respondents show a negative preference towards producing dried berries and a positive towards fully washed berries.

For the effect of *Selling price* the model gives:

$$\frac{dV_{njt}}{dPrice} = \beta_{Price} + \beta_{(P\_DB\_Price)} * P\_DB_{njt} + \beta_{(P\_FW\_Price)} * P\_FW_{njt}$$

Thus the estimated coefficient for the price of fresh berries is -0.00857, for dried berries -0.01824 and for fully washed berries 0.04901. Based upon Wald tests the estimated coefficient for dried berries is only significant at 10% and for fully washed at 1%.

These price estimates for fresh and dried berries are somewhat unexpected, because they would mean that the farmers prefer a lower price. One explanation could be that a lower price signals that lower quality berries are also accepted. A farmer may prefer to sell at a lower price if this means he has to be less selective when picking, saving time and effort. However, the findings might be due to a certain correlation between the attribute level of 'selling price' and 'processing of coffee'. Farmers may not have fully comprehended that the higher prices for fully washed berries did entail a lot more effort and thus failed to value the 'same' price levels for the different processing types as equal. For example the 1000 UGX/kg price level for fresh berries and the 6000 UGX/kg level for fully washed berries are both L3 levels (see Table 2) and should thus have been valued equally. Similarly, the 1200 UGX/kg for fresh berries (L4) should have been more valued than the 5800 UGX/kg for fully washed berries (L2). Still, it seems the higher price category for fully washed blinded farmers to the additional processing requirements. The problem is thus that both the causal attribute (processing) and the effect attribute are present (price) which led to a level range for price which was to wide (Kjær, 2005). If for some respondents the high price for fully washed was dominating, those respondents would not have been willing to make trade-offs, thus resulting in non-trading behavior.

In retrospect the price level should have been expressed as an extra amount on top of an unspecified market price, as demonstrated in Table 7. By illustrating the *Selling price* this way the attribute of price is decoupled from P*rocessing of coffee*, the scale effect of the higher price for fully washed berries is negated and the absolute price difference a lot more clear. This method was successfully used by Meemken et al. (2016). Another option would have been to define the processing level required during the introduction of the choice task, limiting the experiment to only one type (e.g. fresh berries) (Kjær, 2005). Doing this would nevertheless have meant losing information in regard to which type of berries respondents prefer to sell.

Table 7: alternative specification of the price attribute

Attribute	Attribute level
Selling price	Market price + 400 UGX/kg
	Market price + 200 UGX/kg
	Market price
	Market price - 200 UGX/kg
	Market price - 400 UGX/kg

The main shortcoming of this research is thus the misspecification of the price attribute, due to this it became difficult to correctly interpret the price attribute. Normally in a choice experiment with a price attribute a WTP is calculated, putting a monetary value on the various attribute levels. This study could be repeated with a correct specification of price providing this information.

6.2.2. Mixed logit model

Table 8 shows the estimates from running the MXL. When the standard deviation (sd) of an attributes' level is significant there is heterogeneity present within. The coefficient estimate given are for an average respondent and will thus not hold for every respondent. The second part of the IID assumption in the CLM is hence not met for almost all the attribute levels.

Most of the estimates have the same sign and significance as the CLM. However, the estimate for the ASC has become significant (10%), with the negative sign meaning that farmers prefer to get away from the status quo and hence work under a certificate. Child labour is no longer significant, there is a negative preference for delivery location within 3 km (10%) and selling under an exclusive contract less significant (5%).

Table 8: model estimates for MXL

Variable	Coef.		se	sd		se
ASC	-0.518	*	(0.287)	-		-
Chemical_NoUse	-0.992	***	(0.203)	-0.583		(0.382)
Chemical_Exact	-0.324		(0.236)	-0.965	***	(0.265)
Chemical_Exact_Prov	-0.121		(0.256)	1.148	***	(0.300)
Chemical_Allowed_Prov	-0.300		(0.222)	0.831	**	(0.379)
Chemical_Allowed	-		-	-		-
Extension_Both	1.394	***	(0.195)	1.435	***	(0.187)
Extension_Group	0.818	***	(0.205)	0.479		(0.374)
Extension_Non	-		-	-		-
Child_NotAllowed	-0.141		(0.134)	-0.839	***	(0.178)
Child_Allowed	-		-	-		-
Requirem_Yes	1.513	***	(0.205)	1.495	***	(0.216)
Requirem_No	-		-	-		-
Location_Mbale	-1.142	***	(0.243)	1.613	***	(0.210)
Location_10km	-0.174		(0.228)	-0.0478		(0.261)
Location_3km	-0.351	*	(0.211)	-0.393		(0.383)
Location_Farm	-		-	-		-
Selling_Exclu	-0.349	**	(0.175)	1.188	***	(0.183)
Selling_Side	-		-	-		-
Pay_season	-1.370	***	(0.192)	1.462	***	(0.213)
Pay_month	-0.532	***	(0.172)	0.941	***	(0.234)
Pay_delivery	-		-	-		-
Bonus_Social	0.692	***	(0.232)	-0.735	***	(0.212)
Bonus_Indiv	1.529	***	(0.243)	0.386		(0.263)
Bonus_Both	2.147	***	(0.240)	1.034	***	(0.218)
Bonus_No	-		-	-		-
Processing_Dried	-0.582	***	(0.223)	2.209	***	(0.235)
Processing_FullyW	1.886	***	(0.255)	1.951	***	(0.217)
Processing_Fresh	-		-	-		-
Price	-0.0152	**	(0.00597)	-		-
Price_Dried	0.00690		(0.0187)	-		-
Price_FullyW	0.106	***	(0.0241)	-		-
Observations	8439					

Note: Significance shown at *** p<0.01, ** p<0.05, * p<0.1,
(500 halton draws)

6.2.3. Latent class model

While the CLM and MXL show what attributes are most relevant to the entire sample, the LCM tells what attributes are most relevant to each group (Gelaw et al., 2016). Thus a latent class model is used to deal with individual heterogeneity by dividing the sample in different groups with homogeneous preferences. Normally the number of classes to use is decided based upon the values of the CAIC and BIC, see Table 9, yet in this case little guidance can be obtain from the criteria.

Table 9: Information criteria for the different LCM

# classes	LL	parameters	AIC	BIC
2	-2307.111	65	4744.223	4995.359
3	-2242.384	98	4680.768	5059.404
4	-2198.869	131	4659.739	5165.874
5	-2156.637	164	4641.275	5274.91

Thus it was decided to use a latent class model with three classes based upon the significance and interpretability of this model. The results of the LCM give the coefficient estimates of the class and the probability of belonging to a segment, as shown in Table 10.

Table 10: Result of LCM

	Class I			Class II			Class III		
	Coef.		se	Coef.		se	Coef.		se
ASC3	-2.742	***	(0.416)	1.571	***	(0.361)	0.679		(1.386)
Chemical_NoUse	-0.673	***	(0.185)	-0.295		(0.239)	1.716	**	(0.830)
Chemical_Exact	0.009		(0.273)	0.153		(0.226)	1.969	*	(1.104)
Chemical_Exact_prov	0.321		(0.282)	-0.203		(0.259)	3.715	***	(1.424)
Chemical_Allowed_Prov	0.165		(0.221)	-0.385		(0.254)	-0.774		(0.768)
Chemical_Allowed	-		-	-		-	-		-
Extension_Both	1.139	***	(0.177)	0.741	***	(0.219)	-1.389		(1.021)
Extension_Group	0.751	***	(0.241)	0.462	*	(0.238)	-0.421		(0.966)
Extension_Non	-		-	-		-	-		-
Child_NotAllowed	-0.457	***	(0.140)	-0.151		(0.154)	-0.068		(0.414)
Child_Allowed	-		-	-		-	-		-
Requirem_Yes	0.612	***	(0.184)	1.289	***	(0.180)	2.156	***	(0.815)
Requirem_No	-		-	-		-	-		-
Location_Mbale	-0.671	***	(0.237)	-0.508	*	(0.273)	1.950		(1.339)
Location_10km	-0.130		(0.250)	0.769	***	(0.275)	1.493		(1.139)
Location_3km	-0.178		(0.266)	0.334		(0.252)	3.027	**	(1.500)
Location_Farm	-		-	-		-	-		-
Selling_Exclu	-0.617	***	(0.183)	-0.363	*	(0.189)	-0.591		(0.647)
Selling_Side	-		-	-		-	-		-
Pay_season	-1.329	***	(0.187)	-1.038	***	(0.196)	3.248	***	(1.107)
Pay_month	-0.645	***	(0.180)	-0.665	***	(0.195)	3.645	***	(1.055)
Pay_delivery	-		-	-		-	-		-
Bonus_Social	0.266		(0.280)	0.296		(0.256)	-0.688		(1.008)
Bonus_Indiv	0.977	***	(0.272)	0.913	***	(0.259)	-1.012		(1.107)
Bonus_Both	1.473	***	(0.260)	0.786	***	(0.251)	2.078	**	(0.899)
Bonus_No	-		-	-		-	-		-
Processing_Dried	-0.031		(0.208)	-0.432	**	(0.219)	-7.475	***	(1.632)
Processing_FullyW	1.331	***	(0.222)	0.859	***	(0.215)	-1.497	*	(0.875)
Processing_Fresh	-		-	-		-	-		-
Price	-0.000		(0.008)	-0.018	***	(0.007)	0.013		(0.022)
Price_Dried	0.003		(0.020)	-0.035		(0.025)	-0.028		(0.070)
Price_FullyW	0.050	*	(0.027)	0.041		(0.026)	0.100		(0.105)
Probability	0.59			0.32			0.09		

Note: Significance shown at *** p<0.01, ** p<0.05, * p<0.1

T-tests are used to assess whether or not there are significant differences in socio-economic characteristics between the classes, see Table 11. Class II and III are compared to the largest class, Class I. The farmers of Class I are for almost every characteristic average, we call this class the '*average farmers'*. Class II consists of small and poor female headed households that are more often certified and have better access to the road, this class is called '*poor certified farmers'*. Class III has less poor and cultivate a larger area, this class is classified as '*well-off farmers'*. Current welfare thus seems an important determinant of class.

Table 11: Socio-economic characteristics of latent classes

	Class I *Average farmers*		Class II *Poor certified coffee farmers*			Class III *Well-off farmers*		
Human capital								
Age HH head in 2016	52	(15.08)	55	*	(15.33)	51		(12.42)
Share female HH head (dummy)	0.08		0.14	*		0.03		
Education HH head (in yrs.)	8.32	(6.66)	7.08		(5.52)	8.88		(5.43)
Number of HH members <14yrs old	2.80	(1.82)	2.18	***	(1.93)	2.71		(1.83)
share below poverty line (1.90$)	0.34	(0.47)	0.44	*	(0.50)	0.18	*	(0.39)
Physical assets								
Total area cultivated	1.25	(1.18)	1.34		(1.20)	1.76	**	(1.46)
Area coffee (in ha²)	0.72	(1.22)	0.76		(1.21)	1.21	**	(1.90)
Input cost (in ha)	244501.2	(529240)	137421.2	*	(233608)	213853.3		(298070)
Coffee revenue (in UGX)	2.68e+06	(2.26e+06)	2.83e+06		(2.55e+06)	3.16e+06		(2.20e+06)
Share coffee income	0.54	(0.27)	0.57		(0.27)	0.53		(0.27)
Share off farm income	0.06	(0.14)	0.03	*	(0.08)	0.04		(0.09)
Certification								
Share certified (dummy)	0.42		0.61	***		0.47		
Share UTZ_RFA_BCC certified (dummy)	0.21		0.33	**		0.18		
Location								
All year access trCentre (dummy)	0.64		0.70			0.44	**	
Access all weather road (dummy)	0.44		0.66	***		0.53		
Observations	196		102			34		

Note: mean values are shown and for continuous variables the standard deviation in parentheses.
Significant differences in means between each certified category and non-certified are indicated by * p < 0.1, ** p < 0.05, *** p < 0.01.
source: derived from survey data by Akoyi and Maertens (2017)

The ASC in Table 10 shows that farmers of Class I prefer the most to work under a certificate. They prefer chemical use to be allowed, extension training, on farm requirements, bonuses and dislike the restrictions of child labour, coffee delivery in Mbale, delayed payment. In general these farmers seem very interested in the benefits of certification but also very deterred by the requirements of certification. This may thus present a potential pool of farmers willing to work under fair certificates to overcome the limitations they face.

Table 10 shows that Class II is the most averse to working under a certificate, while Table 11 shows that the majority of this group is certified. They spent the least on inputs and are indifferent towards all levels of chemical use. They prefer extensions services, farm requirements, are less averse to going further to deliver their coffee and exclusive contracts, and are indifferent towards child labour. All this may be due to more experience with working under certificates. Even so, they are very adverse to delayed payment and have a stronger preference toward only an individual bonus offered than both bonuses, this may be caused by bad experience with these aspects. Also the fact that they belong to the poor group may mean they are in more direct need of money and thus less interested in social bonuses. This group could represent the farmers that are dissatisfied with the

current certification system, no longer believing that PSS can help with increasing household welfare.

Class III is the smallest group, only 34 members, they show indifference between working under certification or under market conditions. These farmers are the most educated, well-off farmers, they cultivate the most land and have the highest income. This class shows a preference towards all restricted levels of chemical use, farm requirements, are willing to accept delayed payment, prefer to delivery within 3 km and the combined bonus. Some of these preferences may stem from the fact that these farmers are better off, meaning they have better knowledge on how to use and generate organic inputs and are able to enforce payment. They are the only class that shows a preference towards producing fresh berries. Fresh berries have to be delivered shortly after picking to the traders, which could explain their preference towards delivery within 3 km.

7. Conclusion

Despite a growing use of private sustainability standards (PSS), there is still an ongoing debate on the benefits of these standards for producers. This thesis contributes to the literature by examining small-scale farmers' preferences for coffee certification in Uganda. A choice experiment was used to study the preferences of small-scale farmers for aspects of certificates. The sample was stratified between three groups: Fairtrade-organic double certified farmers, UTZ- Rainforest alliance-Baseline Common Code triple certified farmers and non-certified farmers and 352 respondents were interviewed. Unlike much of the previous research, which is mainly focused on the welfare effects, we argue that farmer preferences are also important in improving the design and implementation of PSS leading to better outcomes.

By using a conditional logit model (CLM) we find that farmers have strong inclinations towards and against certain aspects of certificates. This is in line with our hypothesis that a correct balance between benefits and requirements is needed for successful certificate design. The DCE revealed strong negative preferences for coffee yield or labour productivity decreasing restrictions and positive preferences for aspects enhancing this. The provision of a bonus and extension were found to be important aspects in ensuring participation, while delayed payments, a distant location of delivery, and prohibition of the use of synthetic chemicals were considered to be deterring factors. Notably, farmers did prefer a set of on farm requirements (e.g. mulching, erosion control) to be present, indicating some realization of the benefits of these practices. The mixed logit (MXL) model revealed that significant heterogeneity is present between farmers. Thus even within a small region, there are significant differences in preferences. By using a latent class model (LCM), this heterogeneity was divided into three different groups, which were partly explained by household characteristics regarding human and physical capital and their location. It seems the current welfare level of the household mainly determined their preferences. The findings for the largest class were in line with those of the CLM and showed a general preference towards certification. The second largest group consisted of farmers that were poorer than others, had a negative preference towards participation in certification schemes. This may be due to negative experiences with certification, yet this group still showed interest in receiving extension and a bonus. The last and smallest group consisted out of farmers that had a higher living standard, this group was indifferent towards certification and may see certification as a useful, but not necessary tool.

In the Mount Elgon area yields are still far below potential, and well-designed certificates could help encourage farmers to invest and help them overcome market failures and increase yields. Two different types of certified farmers were interviewed. The first group are those farmers that are certified though KCL under a UTZ_RFA_BCC triple certificate. These farmers gain access to chemicals and other inputs (e.g. seedlings) on credit, provision of extension services with regular village based advice, get paid cash on delivery to washing station and receive a bonus at the end of the season. In return they are required to follow the certification standards set, like following a set of good agricultural practices, no use of child labour and deliver high quality fresh berries. From our findings it seems like this certificate is well balanced. Even though it seems like the service of chemical provision is currently not highly valued, it could become more valued once chemical use becomes more common. The farmers that are FT_ORG certified through GCCE are prohibited to use inorganic chemicals, get extension services, receive a fixed price but not at time of delivery, only after their coffee is delivered to Mbale and receive a bonus at the end of the season. The main compensations given in this certificate are financial, through a fixed minimum price and bonus. This may nevertheless not be sufficient to compensate for the dislike farmers show towards a full restriction on chemical inputs and delayed payment.

Firms wanting to implement PSS should thus take into account farmer preferences to improve the scope and efficiency of PSS. Especially when combining the restrictions of multiple certificates. They can play an important role in improving household welfare by helping overcome input market restrictions, reducing risk and providing training. While consumers of certified products have strong specific preferences for products produced in a save and ethical manner it could be argued that offering farmers contracts adapted to their (economic) needs is also an ethical way of consuming. Raising consumer awareness on this issue may thus be necessary for companies who sincerely want to improve small-holder welfare. While typical consumer concerns such as implementing restrictions on chemical use and child labour may be more easily implemented once a basic level of household welfare has been obtained.

It is certain that conducting a choice experiment provides valuable information on the feasibility of PSS. This study is hence relevant because the Ugandan government, like many other developing countries, see expanding the use of PSS in their countries as a way to increase foreign income earnings and improve the livelihood of small-scale farmers through this. Taking into account farmers preferences will be crucial to design a sustainable system. Those contracts that are adopted to farmers' specific situation will perform best. With the increasing market share of certified products in the world market, this type of research could help further expand the use of PSS. Taking into account the weaknesses of this study, similar research should be continued in other countries and for other certified products, providing further insights into the preferences of small-scale farmers.

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Appendix I - Bayesian design

			Prior mean	Prior variance
Chemical use and provision	1	No use allowed, not provided	-1	-0.25
	2	Exact dose allowed, not provided	-0.5	
	3	Use allowed, not provided	0	
	4	Exact dose allowed, provided	0.5	
	5	Use allowed, provided	1	
Extension services	1	Not provided	-1	-0.5
	2	Group trainings	0	
	3	Group training & individual follow up	1	
Child labour	1	Not allowed	0	
	2	Allowed	0	
On farm requirements	1	Requirements	-1	
	2	No requirements	1	
Processing	1	Fully washed berries	0	-0.5
	2	Fresh berries	0	
	3	Dried berries	0	
Selling options	1	Exclusive contract	-1	
	2	Side selling allowed	1	
Location of delivery	1	In Mbale	-1	-0.33
	2	Within 10 km range	-0.333	
	3	Within 3 km range	0.333	
	4	At farm gate	1	
Time of payment	1	At the end of the season	-1	-0.5
	2	One month after delivery	0	
	3	Cash on delivery	1	
Premium	1	Not provided	-1	-0.33
	2	Social premium	0	
	3	Individual end of season bonus	0	
	4	Social premium + individual end of season bonus	1	
Selling price	1	L1	-1	-0.25
	2	L2	-0.5	
	3	L3	0	
	4	L4	0.5	
	5	L5	1	