1   INTRODUCTION

1.1 General Background

Next to crude oil, coffee is the most extensively traded agricultural commodity in the world. Of the numerous botanical varieties of coffee, only two, namely, Arabica (*Coffea arabica*) and Robusta (*Coffea canephora*), are cultivated and utilized commercially to any large extent worldwide (ICO, 2004). Arabica coffee contributes about 70 percent to the total coffee production in the world.

In many coffee-producing countries, coffee accounts for at least 20 percent of the total export earnings, and in others like Burundi, Rwanda, Ethiopia and Uganda it usually contributes more than 50 percent to their foreign export earnings (Lewin *et al*., 2004). Coffee is also the key source of cash income and employment to about 25 million coffee farmers and their families in the developing countries of Latin America, Africa and Asia (Oxfam, 2002a). From an environmental point of view, coffee is currently grown in 13 of the world's 25 areas of high biodiversity importance and vulnerability, including Ethiopia (IISD, 2003; WCMC, 1994). Thus, coffee has a huge importance in consolidating the economic, environmental and social aspects of sustainable development as defined at the United Nations Conference on Environment and Development in Rio de Janeiro (ICO, 2004).

However, many coffee producing countries have been facing considerable economic difficulties since the last couple of years as a result of the dramatic decline in the price of green coffee beans on the world market and the rise in uncertainties surrounding coffee's economic return (Levin *et al*., 2004; IISD, 2003). Along with the global downturn in coffee price, natural factors and structural circumstance in every coffee producing country generate unique opportunities and risks[1] to livelihoods of people in these countries. In fact, rising coffee income risks have been recognized among economists, policy makers, international organizations and non-governmental organizations as having a direct bearing on poverty and food security positions of coffee farmers and their families in those countries. For instance, Oxfam (2002a) reports that coffee farmers the world over are caught in a vicious cycle of poverty and are experiencing severe economic difficulties in meeting their basic necessities. Beyond the coffee farmers, national income and foreign exchange earnings of coffee

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[1] Following Hardaker *et al*. (1997) risk is defined as "an uncertain event with a chance of a bad outcome". A related account of this definition is provided in Chapter 4.

producing countries have been hard-hit by the brunt of the crisis. In many of these countries, governments are forced either to cut-back on their public spending on education, health, and agricultural research and extension or to go further into debt (Oxfam, 2002a). More particularly, the downturns in coffee income and its rampant volatility contribute to increased poverty. This is a serious concern not only to individual coffee producing nations but also to the global community, because it inhibits achieving the United Nations Millennium Development Goals of reducing by half, between 1990 and 2015, the proportion of people whose income is less than one dollar a day (ICO, 2004).

To address the fore-mentioned socioeconomic crises and to rejuvenate development in the coffee sector, some initiatives are being undertaken, among others, by several global commodity institutions and financial organizations. For instance, the International Coffee Organization (ICO) has renewed its effort to assist its members in identifying appropriate risk management options and to strengthen already existing ones. The ICO's development strategy for coffee, among others, stipulates on improving producers' access to information, credit and other opportunities for livelihood diversification, and to encourage them to protect natural environment and to conserve biodiversity in and around coffee farms (ICO, 2004).

Furthermore, the World Bank is revising its development strategy, among others, to strengthen income risk management and diversification efforts of poor income farmers including coffee farmers in developing countries (ICO, 2001). However, lack of pertinent information or knowledge about coffee farmers' preferences and constraints across and within countries or regions/localities would likely hinder progress in reaching millions of coffee farmers in those countries with the appropriate instruments to deal with risk and uncertainty. In fact, the type and severity of risks facing farmers can vary with farming systems, climate, infrastructure, policy and institutional settings (Anderson, 2003). As Anderson further notes, few really general (and worthy) prescriptions for countering risks or dealing with its consequences are possible. Thus, research into the current state of affairs in coffee producing localities and regions is crucial to craft a mix of relevant risk management and risk coping policies when governments and international organizations assist people at risk.

1.2 Problem Statement

A combination of at least two factors makes coffee profoundly relevant in Ethiopia. In the first place, Ethiopia is the origin and centre of genetic diversity for *Coffea arabica*. In this respect, Ethiopia is considered as the single most important source of coffee genetic material for the continued advancement in crop breeding, particularly in improving yield, raising pest and disease resistance as well as producing better quality beverage (Anthony *et al.*, 2001; Silvarolla *et al.*, 2004; Bertrand *et al.*, 1997 cited in Tadesse, 2003). In this respect, the presence of the wild relative of *Coffea arabica* in the remaining mountain forests in the southern and south-western Ethiopia is an added opportunity in meeting society's demand in future. Second, coffee has far-reaching socioeconomic importance in Ethiopia. For instance, nearly 25 percent of the total population in Ethiopia are estimated to depend directly or indirectly on coffee for their livelihoods (Tessema, 2002). Moreover, up to the recent past coffee contributed an average of 60 percent to total export income and 10 percent to gross domestic product.

A closer investigation of the structure of coffee production in Ethiopia also makes it clear that over 95 percent of the country's coffee production comes from an estimated 700,000 to 800,000 smallholder coffee farmers. These farmers, like non-coffee farmers in the country, use traditional methods of production and are exclusively reliant on natural factors.

At present the smallholder coffee farmers and national income in Ethiopia, as in other coffee producing countries, are deeply affected by the downturns in coffee income. For instance, according to the Ethiopian Export Promotion Agency (EEPA, 2003), Ethiopia's coffee export revenue drastically fell from US $255 million in 2000 to US $143 million in 2001- a 44 percent decline in just one year. Expressed in other words, the share of coffee export value declined from 52 percent in 2000 to nearly 30 percent in 2001. In the 2002 figures, it is estimated that this drop in income is more than twice the country's projected savings on servicing its debt, US $58 million (from initiatives of heavily indebted poor countries and other debt relief) (Oxfam, 2002a). Given the widespread poverty in Ethiopia, this loss in income puts serious restrictions on public spending and poses a stringent impediment to the country's attainment of food security and poverty reduction objectives.

In fact, the problem is further compounded when one takes into account the fact that households' access to credit, road infrastructure, information and training are limited and that

insurance contracts for handling risks do not exist in rural areas. In this respect, coffee farmers struggle not only with poverty but also with a series of risks influencing their income. Examples of the risks involved in coffee farming include extreme weather events, variations in prices of inputs and outputs, sudden and unfavourable changes in government policies and regulations, crop diseases and pests, and illness of the farm operator or his/her family.[2] It is then intuitive to expect that farmers would be engaged in various activities to deal with the risks they are confronted with. In fact, several theoretical and empirical studies reveal that poor households in rural areas of developing countries try to mitigate the effects of risk both *ex ante* and/or *ex post*[3] (Lamb, 2003; Dercon, 2002; Fafchamps, 1999; Morduch, 1995; Alderman and Paxson, 1992). *Ex ante* adjustments to risk include on-farm diversification (von Braun and Pandya-Lorch, 1992; Fafchamps, 1992), off-farm activities (Rose, 2001; Mishra and Goodwin, 1997), marketing strategies (Musser *et al.*, 1996; Goodwin and Kastens, 1996; Goodwin and Schroeder, 1994) and so on.

On the other hand, examples of *ex post* adjustments which enable a farmer to deal with the consequences of a realized state include, drawing upon previous savings (Deaton, 1992), selling livestock (Rosenzweig and Wolpin, 1993), borrowing in informal credit markets (Beseley, 1995), temporary labour market participation (Rose, 2001; Kochar, 1999), receiving remittances (Rozenzweig, 1988), and drawing on natural resources and forests (Takasaki, *et al.*, 2004; Fisher and Shively, 2003; Pattanayak and Sills, 2001). However as pointed out by Alderman and Paxson (1992) and Dercon (1996) the opportunities available for consumption smoothing *ex post* can be expected to influence household responses to income risk *ex ante*.

In fact, a review of related literature on Ethiopia reveals that Ethiopian farmers generally use one or a combination of the above-mentioned strategies to manage the risks they face or to cope with them (Dercon, 2002; Belaineh, 2002; von Braun *et al.*, 1998). Clearly, it can be argued that failure do so would invalidate continued existence of their farms in the face of the changing risks they are often confronted with (Hazell *et al.*, undated). However, despite the afore-mentioned studies which clearly show the general importance of risk in the Ethiopian agriculture, specific micro-economic empirical studies on the importance of risk to coffee farming have not been found. As a consequence, knowledge about coffee farmers'

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[2] Detailed descriptions of these risks will be provided in later Chapters in the context of rural Ethiopia in particular and risk literature in general.
[3] *Ex ante* means the period before risk occurs and *ex post* means the period after it occurs.

perceptions of risk and risk management is largely missing and more importantly little is known about their risk-induced behaviour particularly in the use of forests and wild coffee in ecologically fragile areas.

On this point, a recent ecological study by Tadesse (2003) presents grounding empirical evidence that forest pressure in southwest Ethiopia has been pervasive. The study warns that if this trend continues unabated, it would lead to further forest degradation and depletion of important resources such as wild coffee trees. In fact, as Tadesse (2003) presents, heavy human pressure on the wild coffee populations and its habitat can negatively affect the gene pool of the coffee plant in the long-run. The main reasons for this are the following: first, collection of wild coffee berries leads to a lack of seed for regeneration of coffee trees in the forest. For instance, commercial or high-intensity extraction of low density populations may easily result in over-harvesting, which in turn leads to the depletion of the resource (FAO, 1998; Boot, 1997). Second, manipulation of forests leaves less suitable micro-climatic environment for regeneration of coffee from seeds (Tadesse, 2005). Indeed, a related observation on the state of Ethiopia's forest (Yonas, 2002) indicates that household forest extraction for firewood is one of the major causes of forest degradation even in the *de jure* state forests.

Indeed, the problems of forest degradation and loss of wild coffee genetic resources have continued to receive an increasing focus of attention in recent years in Ethiopia (Agrisystems Limited, 2001). For instance, the Ethiopian Government recently identified and designated three mountain forests; namely, Geba-Dogi, Boginda-Yeba, Kontir-Birhan, for wild coffee conservation. To succeed, this measure requires, among others, a better understanding of the current state of constraints and priorities of the local people living in the periphery of these forests.

As has already been mentioned, experiences from elsewhere in the developing countries provide important basis to hypothesize that poor households use forests to deal with risk *ex-ante* and shocks *ex post*. In this respect, forest extraction has become the major issue from a policy perspective due to a couple of reasons: firstly, restricting household or individual access to these forests reduces the welfare of the local people who often have limited or no other income sources (Fisher, 2004), at least in the short-run and, secondly, and on the other hand, uncontrolled forest extraction contributes to degradation of species and loss of biodiversity (Takasaki *et al*., 2004), in the long-run.

In this regard, some authors (e.g. Shively, 1997; Barrett and Arcese, 1998; Fisher and Shively, 2003; Takasaki *et al.*, 2004) vividly conclude that careful policy measures and public interventions are needed to jointly overcome these problems. Specifically, they suggest availing suitable economic opportunities for low income and vulnerable households to ease local pressures on critical habitats and protected species.

With the above points in mind, this study is motivated on one hand to explore economic importance of risk for smallholder coffee farmers and on the other hand to investigate household risk induced behaviour in extraction of forests for firewood and in gathering wild coffee berries. We will thus start with a general analysis of the factors influencing risk perceptions and risk management preferences of smallholder coffee farmers in Ethiopia. In this, participation in forest products extraction is just one option in the risk management portfolio. We then pay attention to examining the actual household efforts in firewood collection from state-owned forests in the study areas. Finally and specifically, this study gives close attention to household reliance on wild coffee in the face of risk. The study is carried out in south-western Ethiopia where coffee farming is the key source of livelihood and where the last remaining wild relative of *Coffea arabica* is found, that is in the montane forests.

1.3 Significance of the Study

The results of this study may provide useful information to formulate and implement appropriate policies to improve the welfare of the local people on one hand and to slow-down human pressure on the natural resources in ecologically fragile areas like the mountain forests in southwest Ethiopia on the other hand. More importantly, the relevance of this study can be stated as follows:

1. Knowledge of perceived risks and risk management strategies across the smallholder coffee farmers helps to fine-tune risk management policy intervention in the coffee sector in particular and in the agricultural sector in general. It also enhances the satisfaction that farmers may get from external support in the sphere of risk management in coffee farming in particular and in rural development in general. Furthermore, information of this sort provides enhanced risk communication among all concerned parties (e.g. policy makers, donors, governmental and non-governmental organizations, international agencies, researchers and local extension workers).

2. Redirecting human labour away from forest degrading activities such as collection of firewood and other non-timber forest products (NTFPs) requires knowledge on underlying factors contributing to farmers' choice of these activities. By examining the role of forest extraction as insurance at the microeconomic (household) level, the study contributes to devising appropriate risk management and risk coping policies in agriculture with due recognition of its consequences on the environment. As such, this increases our understanding of the driving forces of local household pressure on forests under rising risk and uncertainties facing agricultural income sources. In so doing, the results of this study would contribute to the formulation and implementation of locally feasible and sustainable forest protection strategies at the study sites.

3. Once again, identifying the impact of risk on households' reliance on wild coffee provides specific insight into the prospects facing conservation of wild populations of *Coffea arabica* under conditions of increasing risk and uncertainty involved in coffee farming. In other words, this study contributes to appropriate policy making and its implementation that takes into consideration the welfare contributions of the resources to be protected.

1.4 Objectives of the Study

The main purpose of this study is to assess the structure of farmers' perceptions of risk and risk management in coffee farming, and to explain risk-induced household behaviours in the use of forests for firewood and other NTFPs, and of wild coffee in southwest Ethiopia.

The specific objectives of this study are as follows:

1. to examine farmers' perceptions of risk and risk management strategies;

2. to investigate the role of forest extraction as a safety net and to look at the potential influences of poverty and other household characteristics on this effect; and

3. to examine the effect of risk and other factors on farmers' reliance on wild coffee gathering.

1.5 Outline of the Dissertation

This dissertation is organized into seven Chapters. In Chapter 2 an overview of the smallholder coffee farming in Ethiopia is presented with a particular emphasis to its

socioeconomic and ecological relevance. The Chapter also highlights the risks that may affect rural households in Ethiopia with a particular focus on the smallholder coffee farmers.

Chapter 3 presents the survey procedures, descriptive insights into the study sites and a summary of household survey dataset. In this chapter it is of particular interest to disclose differences and patterns in the demographic, socioeconomic, institutional and biophysical attributes of the smallholder coffee farmers on one hand and their perceptions of risk and risk management on the other. The importance of forest extraction as insurance or safety net is discussed in the context of the survey households. Furthermore, the pattern of household reliance on income generated from wild coffee gathering at the study sites is described.

Based on the theoretical and empirical analyses, Chapters 4 through 6 present the main results of the study. In each Chapter, relevant research objectives are re-stated, theoretical and empirical applications are illustrated and the corresponding survey results are discussed and summaries are made. Chapter 4 analyses household perceptions of risk and risk management associated with coffee farming using factor analyses. The factor analyses are carried out using a principal component factor method and a varimax technique. The analyses identify and describe the underlying structures of both risk perceptions and risk management preferences across the survey households. This is followed by econometric analyses whereby a series of multiple linear regression analyses are carried out to explain inter-household variations in risk perceptions and risk management strategies, using factor scores as dependent variables.

In Chapter 5, risk-induced household behaviour is assumed and empirically tested using forest extraction as safety nets. A basic forest extraction model is developed following a non-separable farm-household model. This is followed by the empirical section where a zero-inflated negative binomial data model is specified to estimate the link between forest extraction and coffee income risk using household labour as the major input. The effect other factors such as household resource endowments, location and demographics on forest extraction are also estimated together with the variables which measure risk to avoid biased parameter estimates on the regression coefficients.

Chapter 6 deals with household reliance on income from wild coffee berry. More specifically, it examines the influences of coffee berry disease (CBD) risk incidence in coffee farms, perception of coffee price risk and other household attributes on a farmer's reliance on wild