

Abstract

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Many risks with severe consequences affect the rural society in Ethiopia. Hence, risk reduction and mitigation would be of paramount importance to the rural households whose livelihoods are threatened. This thesis investigates the relationship between various types of agricultural risks and socio-economic-cultural characteristics of households, opportunity variables and other pertinent factors. For a fuller understanding of the contextual risks, the study utilises both qualitative and quantitative methods of data collection and analysis. The qualitative methods are envisaged to grasp the varying insights, perspectives and complexities of rural livelihoods. The quantitative analyses are used to enrich and contextualize the qualitative information.

The results reveal that households in the Eastern Highlands of Ethiopia are vulnerable to a wide variety of risks that can materially disrupt different aspects of their livelihoods. In the first article, it is shown that the major risks are production risk, financial risk, health risk, institutional and political risk. These are both covariate risks that may take the form of widespread shocks such as drought, or idiosyncratic risks such as localised shocks or health problems. It emerges that risks are perceived by different local actors in varying ways depending on differences in asset endowments, locational settings and different dimensions of livelihood diversification strategies pursued by the farmers. Article II focuses on estimation and characterisation of perceived risks, mainly on income, price and yield variability. The analysis shows that drought, pests & diseases, higher prices of cereals at purchase, and drought coupled with pests & diseases are very frequent and distributionally neutral. Proximity to the market and the number of cattle owned by the households are found to be the strong determinants of household income during both 'good' and 'bad' years.

Article III analyses what determines access to risk information and learning that is vital in the risk reduction and mitigation process. The main messages are that distances from markets and number of plots owned by the farmers have significant associations with access to information. Self-evaluation of knowledge, a proxy for learning, is found to be significantly associated with differences in gender, marital statuses and educational level of household head as well as number of cattle owned and farm size.

Some important messages emerge from the fourth article. Firstly, farmers perceived that financial response; diversification and marketing responses are important management tools in risk mitigation and sustenance of their livelihoods. Secondly, responses to risks are differentiated across opportunity variables, wealth status, diversification and human capital-related variables. This dissertation argues that the trend of increased reliance on *ex post* responses to risks needs to be reversed as farmers would benefit more from invigorating *ex ante*, preventive, risk management instruments. The impetus of this study is that understanding varying perceptions of risks, risk information, learning and risk responses of farmers could serve as a solid basis in the efforts of articulating sensible grass-root level risk reduction strategies with the view of reducing various dimensions of poverty in the Eastern Highlands of Ethiopia.

Key words: risk perceptions, risk information, learning, risk estimation, risk responses, smallholder farmers, Ethiopian agriculture.

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Articles I - IV	

Articles appended to the thesis

The present thesis is based on the following articles, which will be referred to by their Roman numerals.

- I. Belaineh Legesse and Lars Drake, Determinants of Smallholder Farmers' Risk Perceptions in the Eastern Highlands of Ethiopia. *Journal of Risk Research*. Accepted.
- II. Belaineh Legesse, Estimation and Characterisation of Perceived risks: Insights from Eastern Highlands of Ethiopia. Submitted to *World Development*.
- III. Belaineh Legesse, Risk Information and Eventual Learning of Smallholder Farmers in the Eastern Highlands of Ethiopia. *Quarterly Journal of International Agriculture*. Accepted.
- IV. Belaineh Legesse, Risk Responses of Smallholder Farmers in the Eastern Highlands of Ethiopia. Submitted to the *Journal of Development Economics*.

Abbreviations

ADLI	Agricultural Development-Led Industrialisation
AU	Alemaya University, Ethiopia
CIA	Central Intelligence Authority of the United States of America
DAs	Development Agents
DPPD	Disaster Prevention and Preparedness Department
DRDS	Department of Rural Development Studies, Uppsala, Sweden
FAO	Food and Agriculture Organisation of the United Nations
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GIS	Geographic Information Systems
IDA	International Development Association
IMF	International Monetary Fund
MOA	Ministry of Agriculture
MOFED	Ministry of Finance and Economic Development
N	Number of farmers included in the survey
nd	no date
PA	Peasants' Association
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
SAREC	Swedish Agency for Research and Co-operation
Sida	Swedish International Development Agency
SDPRP	Sustainable Development and Poverty Reduction program
SSA	Sub-Saharan Africa
UN	United Nations
USAID	United States Agency for International Development
WFP	World Food Program

Glossary

The following words and concepts are commonly used in this thesis. Therefore, for a better understanding of how these words and concepts are used throughout the document, the following glossary is made for the reader's use.

- Adaptation - Refers to adjustment in ecological, social, or economic systems in response to actual or expected shocks and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damage or to benefit from opportunities associated with shocks.
- Calamity - A hazard experienced by individuals as doing great harm.
- Context - The environment or domain of existence with which the agent is structurally coupled (Röling, 2002).
- Crisis - Immediate event or period of great danger or difficulty with potential for longer term harm. Woodhill and Röling (1998) define a crisis as a time of danger and great difficulty, a time for immediate decisions.
- Disaster - A hazard experienced by society as doing great harm.
- Downside risk - If perceived risks materialise they become downside risks and cause a welfare loss.
- Epistemology - Comes from the Greek word *epistêmê*, their term for knowledge. In simple terms, epistemology is the philosophy of knowledge or of how we come to know.
- Hazard - Potential for harm to the economy, to health, to the environment, *etc.*
- Ontology - Claims about the nature of reality.
- Paradigm - A paradigm comprises epistemology, ontology and methodology (Guba & Lincoln, 1994 cited in Röling, 2002).
- Platforms - Are devices or procedures for social learning and negotiation about effective collective action (Röling & Maarleveld, 1999).
- Positivism - Believes in empiricism; the idea that observation and measurement was the core of the scientific endeavour. The key approach of the scientific method is the experiment, the attempt to discern natural laws through direct manipulation and observation.
- Realism - Concern for fact or reality and rejection of the impractical and visionary. Also the belief that objects of sense perception have real existence independent of the mind.
- Risk - The possibility that an undesirable state of reality (adverse effects) may occur as a result of natural events or human activities.
- Risk coping - Alleviating the impact of a downside risk once it has occurred (*ex post*).
- Risk mitigation - Lowering the impacts of potential downside risks (*ex ante*).
- Risk reduction - Lowering the probability of a downside risk (*ex ante*).
- Smallholders - Refers to farming households that are subsistence oriented, characterised by exclusive use of family labour, no/less integration into markets and operate on small farm size.
- Stress - A relatively small and predictable force that may have large cumulative effect.

- T'chat (*Catha edulis*) - A perennial bush that produces mild narcotic leaves. Recently, it is the second important agricultural export crop next to coffee.
- Uncertainty - Episode for which consequences are not known (imperfect knowledge of the future).
- Vulnerability - Propensity to experience harm during a crisis.
- Woreda - An administrative area that is equivalent to a district.

1. Introduction

1.1. Background

High risk is part of life in developing countries (Dercon, 2000). In Sub-Saharan Africa (SSA) human development has regressed in recent years (Table 1), and the lives of very poor people are getting worse (Human Development Report, 2002:13). SSA accounts for nearly one-fourth of the world's poor, where 19 of the 25 poorest countries in the world are found (Dixon *et al.*, 2001). In most sub-regions of SSA Gross Domestic Product (GDP) growth is low, and agricultural productivity and investments are declining. Factors contributing to increased poverty and food insecurity in these countries vary. Farmers in these countries face a multitude of risks of varying severity that originates from the natural, economic and socio-political environments. The common characteristic of these countries is that the various sources of risks can easily trigger acute food shortages, deteriorating nutritional situation and destitution. Consequently, it is estimated that out of the world's 800 million people that are food insecure, about 180 million of them live in SSA (Pinstrup-Anderson *et al.*, 2001).

Table 1. *The number of people living on less than \$1 a day in the 1990s*

Region	Share (percent)		Number (millions)	
	1990	1999	1990	1999
Sub-Saharan Africa	47.7	46.7	242	300
East Asia and the Pacific	27.6	14.2	452	260
Excluding China	18.5	7.9	92	46
South Asia	44.0	36.9	495	490
Latin America and the Caribbean	16.8	15.1	74	77
Eastern Europe and Central Asia	1.6	3.6	7	17
Middle East and North Africa	2.4	2.3	6	7
Total	29.0	22.7	1,276	1,151
Excluding China	28.1	24.5	916	936

Source: Human Development Report (2002:18) after World Bank (2002).

Ethiopia is one of the poorest nations in the world, where agriculture is the basis of livelihood for the majority of the population. Real income per capita is extremely low, currently estimated to be US\$110 per year. Poverty is widespread, with an estimated 44 percent of the total population living below the poverty line in 1999/2000 and poverty incidence is much higher in rural than urban areas (FDRE, 2002:1-5). The Human Development Report (2002:152) puts Ethiopia in 168th place out of 173 UN member countries covered in the main indicator tables, revealing the low human development. Driven by the weight of its population (65.8 million, 2001 estimate according to World Bank, 2002) in the absence of significant productivity growth in virtually all sectors, there is an extremely high prevalence of poverty in the country. Socio-economic indicators, such as food consumption levels per capita, nutritional adequacy levels of households and individuals, health and sanitation conditions, access to safe drinking water, housing conditions, development of infrastructure (schools, roads, hospitals, clinics, *etc.*), are at extremely low levels (Table 2).

Table 2. *Basic social and demographic indicators, 1970-75, 1980-85, 1990-97*

	1970-75	1980-85	1990-97
Total population (million)	33	43.4	59.9
Urban population (percentage of total)	9.5	11.7	16
Population growth rate (%)	2.6	2.8	2.2
Life expectancy (years)	41	41	43
Index of food production per capita (1987=100)	114.2	99.3	99.4
Population per physician (thousands)	86.1	78.9	-
Population per hospital bed (thousands)	3.5	3.4	4.1
<i>Labour force (%)</i>			
Agriculture	90	83	80
Industry	2	2	2
<i>Education: gross enrolment ratio (% of relevant age group)</i>			
Total primary	24	37	38
Total secondary	-	9	12
Total tertiary	-	1	1
<i>Of which: female</i>	-	13	19
<i>Pupil-teacher ratio</i>			
Primary	44	48	30
Secondary	34	43	32
Illiteracy ratio	-	-	65

Source: IMF (1999).

In Ethiopia, drought, famine and food insecurity have become real threats to society. Vulnerability to natural shocks such as drought situations has worsened. More than 14 million people were recently reported to be in desperate need of emergency relief in terms of food aid, and these are agricultural producers and members of their families (Abebe, 2003). These trends may accelerate and the rural poor may become even more vulnerable unless timely measures are taken. Given these challenges to rural livelihoods, there is a need to develop strategies to minimise risk, thwart possible damage to livelihoods and fight the poverty that is at the root of the problem. The underlying assumption is that, with the help of a carefully designed process and an in-depth understanding of the issues, the country can probably adopt beneficial *ex ante* policies that might help to deal with risks in a more effective way. It is believed also that the understanding generated would form the basis of programs for reducing risk and strengthening the ability to mitigate risk.

Generally speaking, the situation on the ground is bad; the causes are multifaceted and deep-seated. They are both structural and random and the trend indices (consumption, expenditure, food poverty, *etc.*) offer no promise of immediate relief and the future seems gloomy. In this situation, risk minimising and risk mitigation strategies assume special importance and particular characteristics. It is the purpose of this study to examine how farmers' perceive risk and also how they make use of risk information and select risk management (*ex ante*) tools. The risk behaviour and decision making of households in response to the environmental and institutional restraints have an impact on resource allocation patterns, resource productivity and food security.

In this context, if poverty and vulnerability reduction and attainment of food security are the core objectives of the Government as stipulated in various official documents (*e.g.*, Sustainable Development and Poverty Reduction Program Document) (SDPRP, 2002) and if agriculture is to play a leading role in this process, attention will need to be given to understanding the various facets of risks. The Poverty Reduction Strategy Paper (PRSP) is built on four pillars (building blocks). These are: Agricultural Development-Led Industrialisation (ADLI), justice system and civil service reform, decentralisation and empowerment, and capacity building in public and private sectors. The paper puts an appropriate emphasis on the importance of rural and agrarian development in the lives of the poor, with a recognition of the importance of private sector development to increase non-farm income and generate growth (IDA & IMF, 2002). Achieving the growth objectives, however, depends on sustainability of growth rate in agriculture. But, due attention is not given in the PRSP to sustainability analysis despite the fact that the targeted growth rate is dependent on weather, socio-economic and policy variables involving various types of downside risks. Furthermore, most of the issues in the strategy paper are discussed at the aggregate level and it does not deal with differentiation in livelihoods and livelihood strategies. In this regard, critiques from IDA and IMF (2002:4) hint also that future work should include an analysis of poverty incidence by sources of income and employment category. It should focus on poverty in its broadest and multi-dimensional sense. Ayalneh & Hagedorn (2003) criticise the PRSP along the same line.

The PRSP puts strong emphasis on agriculture, rural development and food security. This is appropriate in the context of Ethiopia. But, consideration of sustainability of agricultural growth and envisioned improvements in rural livelihoods is also equally important. For agriculture to continue serving as an engine of growth, in the medium and long term, policy at both national and regional levels must be redirected to incorporate planning for risk minimisation, and to strengthen risk mitigation ability and resilience of differentiated livelihoods in view of the recurring drought and other shocks. Some of the suggestions how this can be done are discussed in Paper IV. A pro-poor development strategy certainly must focus on these pertinent issues and requires a focussed rural development and poverty-reduction agenda, commitment and efforts.

1.2. Overview of the agricultural sector

Agriculture is the mainstay of the Ethiopian economy and of the people at large. It is the sector where the poor are overwhelmingly concentrated - depending on the natural resource base for their livelihoods and well-being. It is characterised by low productivity per unit of input and high risk. Farmers manage multiple crops, livestock species, and production practices so as to manage risks and to meet their multiple objectives. Yields and crop output are poor even in years of relatively good rainfall (Webb and von Braun, 1994) and as many as 4.6 million people need food assistance annually (CIA-The World Fact Book, 2002) as food production per head of population has lagged behind population growth. According to the same source, the contribution of agriculture to foreign earnings averaged 91

percent from 1985/86 to 1995/96 and accounted for 85% of exports in 2002. The contribution of agriculture to GDP (Table 3) also averages 49.7 percent from 1992/93 to 1998/99 (Bigsten *et al.* (2003:89) after IMF (1999)) and it averaged 52.3 percent during later years up to 2001 (FDRE, 2002). The sector also accounts for 80 percent of employment (CIA-The World Fact Book, 2002) and plays a crucial role in providing raw materials to the local small-scale industry which accounts for 11.1 percent (2000 estimate). Thus, in the absence of adequate exit options, agriculture is the main strategic sector in the Ethiopian economy and is necessary to spur meaningful economic growth and development. Consequently, the direct impact of changes in agriculture on Ethiopia's economic growth is expected to be high (Ayele, 2002:710). In contrast, a failure in this sector would lead to disturbances in major components of national income accounts in addition to food deficits, reduced private consumption, savings and investment levels, *etc.* (Zerihun, 2003:13).

Table 3. *Basic economic indicators, 1992-93 to 1998-99*

	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99
GDP at current market prices (in billions of Birr)	26.7	28.3	33.9	37.9	41.5	45.0	49.1
<i>Annual percent change</i>							
Real GDP	12.0	1.6	6.2	10.6	5.2	-0.5	6.7
Real per capita GDP	9.8	-0.6	4.0	8.4	3.0	-2.7	4.5
Consumer prices	10.0	1.2	13.4	0.9	-6.4	3.7	3.6
<i>Percentage of GDP</i>							
Agriculture	53.8	51.0	49.7	51.5	50.7	45.7	45.6
Industry	10.4	11.0	11.2	10.6	10.8	11.6	12.1
Distribution and other services	27.1	28.5	28.6	27.9	28.4	30.1	30.6
Public administration and defence	8.7	9.4	10.5	9.9	10.1	12.6	10.7
Consumption	97.9	94.6	92.0	95.3	91.4	93.7	95.5
Gross domestic investment	14.2	15.2	16.4	19.1	19.1	18.2	18.6
Resource balance	-12.1	-9.8	-8.5	-14.4	-10.5	-11.9	-14.1
External Debt	77.4	81.1	71.6	65.3	143.5	142.4	-
Government revenue	12.0	13.9	17.4	18.4	19.0	18.7	19.0
Grants	1.7	3.5	3.3	2.9	3.6	2.8	2.2

Source: Bigsten *et al.* (2003:89) after IMF (1999).

The agricultural sector is based on smallholder farming which accounts for more than 90 percent of the agricultural production and 95 percent of the total area under crops. Smallholder farmers produce 94 percent of cereals and 98 percent of coffee (MOA, 1995; OCFUCU, 1999). Overall export performance remains heavily tied to coffee exports, which are susceptible to domestic and external shocks (IMF, 1999:2). One of the important external shocks is the deterioration in terms-of-trade. IMF (1999) reports that annual percentage change in the terms-of-trade was -8.5, 8.2 and -4.3 for the physical years 1988/91, 1992/95, and 1996/99,

respectively. Other important export items from the sector include *t'chat*, live animals, pulses, oil seeds and hides and skins. Table 4 shows contributions of agricultural products in percent of total exports.

Table 4. *Ethiopia's exports of agricultural products in percent of total exports, 1996/97 through 2000/01*

Item	1996/97	1997/98	1998/99	1999/2000	2000/01
Coffee	59.3	69.8	58.1	53.9	39.6
<i>T'chat</i>	5.6	6.6	12.2	15.6	13.8
Leather and leather products	9.6	8.4	6.7	7.2	16.8
Oil seeds	1.9	7.6	7.5	6.5	7.0
Pulses	2.0	2.5	2.8	2.0	1.9

Source: IMF (2002).

The role of the smallholders is, thus, extremely significant and they have an overwhelming importance in the agricultural sector and economic progress of the country at large, *i.e.* in terms of food, labour and foreign exchange contributions. Subsistence oriented mixed farming prevails. It is predominantly rainfed, dependent on two rainy seasons with erratic intensity and duration and great year-to-year variability, making agriculture highly susceptible to drought shocks. There are two crop-growing seasons. The short rainy and crop season '*belg*' is from mid-February to the end of April, and contributes to 5 percent of the crop output. The long rainy season '*meher*' extends between the months of June to September, and accounts for 95 percent. For many years (1965-2000/01) crop production has shown a fluctuating trend with an average annual growth rate of 0.8 percent (Table 5). With the exception of the year 1995/96, comparison of these trends with the national population growth rate over these periods reveals that the Ethiopian agriculture is in a state of crisis. Abebe (2000:4) states that taking an estimate of 0.8 for income elasticity of demand for food (after CSA 1988 quoted in Pickett, 1991), a population growth rate of 3% per annum, and a targeted real income average growth rate of 6% per annum, the demand for food would grow by about 7 or 8% per annum.

Table 5. *Crop production trends in Ethiopia for the years 1965 through 2001*

Year (s)	Annual growth rate in percent
1965 –1973	+ 2
1974 – 1991	+ 0 to 3
1991/92	+ 0.5
1992/93	+6.2
1993/94	- 4.5
1994/95	+3.3
1995/96	+14.6
1992/93-2000/01*	+4.9

Sources: Ministry of Agriculture, 1995; FAO, homepage 1998 for the years 1994/95-1995/96. *For the range 1992/93-2000/01 (FDRE, 2002:2).

The crop-livestock integration and interaction is crucial in the farming systems. Regarding the livestock production, Gryseels (1988) and Web and von Braun (1994) state that there are more livestock per person in Ethiopia than in any other part of the continent of Africa. Livestock are raised for the purpose of milk, blood and meat, hides and skins, and for manure and draught purposes in the cultivation of crops. In addition, they are a source of risk mitigation in case of crop failures, of property security and of monetary saving and investment. They are not only a supplementary source of cash income but also serve as a measure of the wealth status of the rural poor. Animals also lend an element of stability to the production system by helping to buffer the fluctuations in crop yield or income from climatic variability. Even though the contribution of this sub-sector to the livelihoods of the rural poor is quite substantial, it is not risk free. Livestock production and productivity is highly sensitive to drought, diseases, pests and other sources of risks.

1.3. Risk - pervasive in the Ethiopian Highlands

Ethiopia consists of highlands and lowlands, but agricultural activities are very much concentrated in the former. The Highlands constitute 36 percent of the total land area and support 88 percent of the human and 70 percent of the livestock population (MOA, 1995). The balance form an integral part of the lowland farming systems that consists of 20 percent of the cattle, 17 percent of sheep, 27 percent of goats, 24 percent of equine and almost all camels (Badege, nd after Hoekstra *et. al*, 1990). In the Highlands, the combination of socio-political restrictions, land degradation and lack of adequate rainfall often causes crop failures and there is high vulnerability to vagaries of nature. The performance of the agricultural sector is poor and food production is low. In the Highlands, farm output is driven by episodal biological and climatic events over which producers have little control. According to the disaster database compiled by USAID Office of U.S. Foreign Disaster Assistance (USAID homepage, nd), 37 disasters were recorded in Ethiopia for the years 1965 through 1993 alone. Drought, pests (army worms, migratory locusts, *etc.*), storms, flooding, insect infestations, and disease outbreak, notably cholera, are the most frequent causes of hazards in the country and most of them have reportedly prevailed in the Highlands. A close scrutiny of this time series data reveals that the numbers of the human and livestock populations affected are quite significant. These hazards have resulted in lost crops or extremely low yields, loss of assets and death of animals and human beings. So, it is evident that the rural poor in the Highlands of Ethiopia are confronted with different types of risks in the absence of risk-sharing institutions. Dercon (2001:2) also gives details on the various shocks (idiosyncratic and covariate) and events causing serious hardship to rural households in Ethiopia during the last twenty years (Table 6).

Table 6. *Risk-related hardship faced by rural households in Ethiopia*

Events causing hardship	Percentage of households reported to have been seriously affected in the last 20 years (N=1450 for 1994-95 data)
Harvest failure (drought, flooding, frost, <i>etc.</i>)	78
Policy shock (taxation, forced labour, ban on migration, ...)	42
Labour problems (illness or deaths)	40
Oxen problems (diseases, deaths)	39
Other livestock (diseases, deaths)	35
Land problems (villagisation, land reform)	17
Asset losses (fire, loss)	16
War	7
Crime/banditry	3

Source: Dercon (2000:2) based on Ethiopian Rural Panel Data Survey (1994-1997).

Smallholder subsistence farming depends on rainfall, the pattern of which is unreliable (Storck *et al.*, 1997), making rainfed agriculture a hazardous operation. A bad year can result in large-scale crop failure, death of livestock, food shortages and famine. Crop yields range from 5 quintals to 10 quintals per hectare (Gryseels, 1988) and it “varies around a trend line by 10-15 percent and the coefficient of variation of cereal production has been estimated as 13.9 percent” (Griffin & Hay, 1985; FAO, 1986, cited in Gryseels, 1988). The high coefficient of variation mirrors the degree of yield variability. In response, diversified varieties of crops and different livestock species are managed by the smallholders so as to meet their diversified objectives (Gryseels, 1988), including risk minimisation (Storck *et al.*, 1991, 1997).

Farming in the Highlands is undertaken on fragile environments under constant threat of drought, famine, food insecurity and characterised by overgrazing and resource degradation (Gryseels, 1988; Dessalegn, 1991). Recurring cycles of climatic change and drought, coupled with temporal outbreaks of insects, pests and diseases, make agriculture more risky and life difficult. Droughts are not easily predicted and most of the Highlands have long dry spells every year. Drought periods are common, forcing people to depend on social welfare and external food-aid. Still worse, one of the salient features of Highland farming is that land is scarce to the extent that “households are forced to survive on starvation plots” (Dessalegn, 1994) with an increase in the number of landless rural youth. Landholdings are very small and fragmented, though in many cases the strategy may allow farmers to have access to plots in different locations to spread risk through environmental variation. The Poverty Reduction Strategy of Ethiopia (PRSP) (2002:34) states that about 64% of the households in Ethiopia has holding sizes less than 1 hectare in 1999/2000 and the figure has increased slightly compared to the 1995/96 data showing further fragmentation of the land. In Ethiopia, land is publicly owned but individual families are allocated usufruct right by local Peasant Associations (PA) on specific amounts of land. Previously subletting was illegal but more recently an informal land market has emerged in which new families or families with surplus labour may obtain land under

different arrangements from families having formal allocation (Ehui and Jabbar, 2002:16-17; Abebe, 2003). The existing precarious land tenure policy has an implication on patterns of resource use, land management, and resource conservation and on long-term livelihood strategies.

In sum, the relationship between society and nature in the Ethiopian Highlands is characterised by crisis rather than by a harmonious balance. Similar to the description given on the broader context of the Highlands of Ethiopia, smallholder farmers in the Eastern Highlands of Ethiopia live on a day-to-day basis with various sources of risk to human beings and ecosystems. In addition, it is the setting in which farmers lack the key information that bears on the decisions they have to make, or where markets for important kinds of transactions are imperfect or do not exist, or where other institutions that standard economic thinking takes for granted are absent or flawed.

1.4. Problem statement

As indicated in previous sections, farmers operating in the Ethiopian Highlands face a multitude of risks of varying types and severity that usually originate from the variability in their natural, economic and socio-political environments. Often, these risks arise from the inherently hazardous and risky natural environment (drought, pests, flooding, insect infestations, and disease). Furthermore, risks and uncertainties of the market context; the policy platform; and those emanating from various institutional and technological factors are also important. Depending on the household characteristics and variations in the physical environment they operate in, access to resources and prevailing institutional context, farmers adopt different self-insurance strategies (Dessalegn, 1991) to minimise risks to their food security and livelihoods. Hence, we see variability in how farming is organised and managed.

Farmers are experienced in dealing with risks originating from various sources and they have gradually developed time and area-specific risk management strategies (Anderson & Dillon, 1992). These strategies are searched out, tested and re-tested by the farmers through continuous experiential learning so that they suit their needs under varying contexts and niches through an experiential learning. This entails that those different farmers groups, depending on various characteristics and type of interaction between human and natural domains, may govern risk differently. But these differentiated strategies have become 'less effective' and long-term ability to mitigate risks is weakened as the severity and frequency of major downside risks, particularly drought, has increased recently. So, the different ways farmers' perceive and deal with risk under different socio-economic and environmental settings, and the possibilities of strengthening them, needs to be studied and properly understood.

The understanding might contribute to attempts to increase sustainable productivity of smallholder agriculture and to improve the risk mitigation ability by assisting farmers to better manage risks. Putting it another way, in order to better understand and facilitate change towards sustainable rural development, we

need to be based on a sound knowledge of the decision-making behaviour of the households. Unfortunately, major stresses of livelihoods, how they are perceived, and their local adaptive and adjustment strategies that have the capacity for becoming the solid basis of sustainable livelihood in the Eastern Highlands of Ethiopia have not been systematically studied and documented thus far.

So, in the dearth of research in this thematic area, from both practical and academic points-of-view we need to know why different farmer groups perceive and react to risks differently in the same locality and across varying contexts. This thesis attempts to fill this lacuna. The main motivation in this study is that an endeavour towards reducing the threat of hazards and creating enabling conditions for sustainable rural economic growth and development requires, among other things, thorough understanding of local perceptions, traditional risk management and adaptive strategies pursued by community under different local conditions and scenarios.

1.5. Objectives of the research, research questions and hypotheses

1.5.1. Objectives

The overarching objective of this study is to assess and understand the important sources of risks and risk information, how risks are perceived and managed by different farmer groups under varying socio-cultural and environmental contexts.

The specific objectives of this study are:

- To assess the most important potential risks (voluntary/involuntary) for smallholders under different agro-climatic zones,
- To explore what the smallholders' (various social actors') perceive as a risk from their own cultural and social perspective and to analyse the determinants of variations in risk perceptions,
- To categorise the types of risk and to determine the variability in space and time,
- To determine factors affecting access to information, learning and risk responses under different contexts, and
- To inform policymakers, if possible, on the possibilities of strengthening local risk mitigation capacities of small-scale farmers under varying contexts.

1.5.2. Research Questions

In this study, the following key questions are addressed.

- What are risks? For whom? How do the smallholders' perceive risks? Are there differences in perceptions and responses to risk among various social groups? What are the determining factors?
- What is the possibility that a given risk will actually occur? What is the perceived consequence of a given risk?
- Which sources of risk information are trustworthy to the farmers? What determines their access to it?

- What determines risk perceptions, access to information, learning and risk responses?

1.5.3. Hypotheses

The predictor variables used to explain variations included opportunity variables, wealth, cultural, environmental, diversification, human capital and other farm and farmer characteristics. The hypotheses that these factors may influence perceptions, access to information, learning and risk responses basically draw from a wide body of literature on risk and livelihood analysis (*e.g.* Wynne, 1992; Scoones *et al.*, 1996; Smith *et al.*, 2000; Ellis, 1993; Blais & Weber, 2001; Webb & von Braun, 1994; McPeak & Barrett, 2001; Palmer *et al.*, 2001; Weber *et al.*, 1998; Cornish & Stringer, 2000; *etc.*) and is also based on the results and learning from the informal survey.

The main hypotheses that are advanced in this study are: Firstly, household behaviour and risk perception, learning and risk-reducing strategies that they decide to undertake in order to overcome riskiness and vulnerability to various shocks, are expected to differ in various ways. Secondly, it is hypothesised that the various agro-ecological settings, opportunity variables, asset base, household characteristics and the socio-economic environment in which the rural livelihoods operate will mediate, shape and frame farmers' risk perceptions, learning and responses.

1.6. Outline of the thesis

Section 2 outlines the conceptual and theoretical perspectives that are pertinent in risk analysis, and argue that a good understanding of risks in rural settings requires an integrated theoretical stance. The need for integrated theoretical perspectives that have guided the research is presented. The limits of the conventional risk analysis are discussed. Section 3 describes the research methods employed, not as ends in themselves but in order to gain insight into important issues. Section 4 presents the main findings of the research work. In section 5, concluding remarks and implications of the study are examined and summarised. An attempt is made also to indicate the possible directions for future research in the area of risk analysis in relation to Ethiopian agriculture.

The first article is devoted to farmers' risk perceptions, which is the basic aspect of understanding risk management strategies. The article presents different types of risks to rural livelihoods, how they are perceived by differentiated local actors and attempts to answer what determines variations in perceptions in rural settings. The results clearly demonstrate that asset endowment, locational settings and livelihood diversification strategies, are the strong predictor variables influencing risk perceptions.

Article II deals with estimation and characterisation of perceived risks. It attempts to classify and describe risks that affect the livelihoods of the rural poor. It endeavours to determine the frequency of occurrence and magnitude of

consequences of various sources of perceived risk through understanding farmers' underlying construct of risks and its effect on their decisions and actions to sustain livelihoods. The paper explores also the extent of income, yield and price variability in the rural areas.

Article III presents risk information and eventual learning of smallholder farmers. The first part explores different sources of risk information, trust issues and reliability of sources. The second part focuses on determinants of access to information and learning of farmers. The paper reveals that farmers use different sources of information, communicate using various channels and learn in order to navigate in the turbulent environment.

Article IV provides the risk responses of the smallholder farmers. Here an attempt is made to show how a choice in selection of management tools, *i.e.* diversification, marketing and financial responses to risks arise from household and farm characteristics, information availability and other variables. It argues that diversification, marketing and financial responses are the most favoured *ex ante* risk reduction instruments used by the farmers that need to be strengthened.

1.7. Limitations of the study

Farmers construct their perceptions of the environment they operate in and the intrinsically embedded risks by drawing on an existing wide range of information and knowledge. The same holds true for constructing arguments about risk responses. Consequently, the effects of risks and uncertainties on resources and their productivity are profound, deserving careful attention and an in-depth analysis. Such an analysis would also have a theoretical, methodological and policy importance, and appraisal of the possibilities for risk mitigation requires a thorough understanding. Equally important, commitments to tackle prevailing issues that undermine the rural livelihoods need an in-depth understanding of risk they are exposed to, *i.e.* knowing their causes, frequency of occurrence and severity, should they occur.

A number of caveats remain. The first recognised limitation originates from the underpinning point that there are various physical, biological, socio-economic, cultural and institutional features that contribute to the differences among the farming systems of the Eastern Highlands of Ethiopia. For example, some of the features are religion, access to market, types of crops grown and livestock raised, and type of farm implements used. Other features which distinguish the systems could be degree of commercialisation, habits including food consumption, population density and pressure on resources, household structure and decision-making behaviours, role of women in decision-making, income sources and levels, saving behaviours, and non/off-farm activities. Despite this fact, this study is restricted to only two Woredas, namely Fedis and Meta. These two Woredas represent different farming systems of the Eastern Highlands. From the outset it has to be declared that the output of this study may not be widely applicable across the various cultures and farming systems of the Ethiopian Highlands.

The second limitation is an exclusion of a dynamic nature of risk perception and responses. Risk results in fluctuating living standard through its effect on income generation. Individuals and households move in and out of food insecurity and shocks and risk perceptions change over time. The different trajectories of shocks that individuals and households experience, *i.e.* the dynamics, over a time horizon in different agro-ecological settings are important in understanding the shifting perceptions in space and time. Also cognitive activity changes over time, influenced by personal experience, and these changes allow individuals to adopt 'new' ways of knowing. An evolving process in the context of individual and social action and the institutional dynamics from time to time, which is the basis for the decision-making process, need to be taken into account for improved understanding. But in this study, a one-shot cross sectional data is used. Hence, the results reveal perceptions and responses of the farmers at the particular time when the data is collected. Inter-temporal and spatial dimensions and institutional dynamics are missing in this work. Perception of risk is always situated within a context that may differ between individuals, but also over time of the same individual. Hence, risk study must be conducted in the context of changing time and environment. Panel data would have a clear advantage in this regard.

Thirdly, the vulnerability reducing potential of the identified major risk responses in the fourth article are not assessed. Examining the effects of various dimensions of livelihood diversification strategies, marketing and financial responses on poverty under different socio-cultural contexts and locational settings might be an important component of a policy framework to reduce poverty and vulnerability.

2. Conceptual and theoretical perspectives

This section presents the conceptual and theoretical frames of reference that have guided the research. If we want farmers to have improved livelihoods then we need to consider carefully the perceptions and risk reduction measures used by the farmers under different contexts. It means that contextual understanding is crucial. This awareness makes us challenge the existing ideas and conventional way of analysing risks. It is worth noting here that affected communities often have a comparative advantage in understanding the aetiology, consequences, and intensity of complex problems in their own contexts. Asking people what worries them, and which worry is greatest, seems also both practical and intuitive (Smith *et al.*, 2000:1947).

Scoones *et al.* (1996) write that taking risk seriously means using a variety of analytical approaches that increase the understanding of change and variability at various scales. To this end, to be sensitive to the perceptions, vulnerabilities and responses of different groups, an in-depth knowledge of the local area as well as a good understanding of the local conditions in different contexts is necessary. The ontological and epistemological penchant of this study evolves from this conceptualisation. Hence the use of an integrated theoretical stance is argued for in

this dissertation after shedding light on the limiting perspective of the conventional generic risk analysis.

2.1. Risk concepts and the need for risk consideration

Many authors, among others, Krinsky & Golding (1992), Otway (1992), and Pidgeon *et al.* (1992), argue that the concept of risk helps people to interpret and cope with dangers and uncertainties of life, including but not limited to the prospects of physical harm. To these authors, the concept of risk is shaped by human minds and cultures.

The term risk denotes the possibility that an undesirable state of reality (adverse effects) may occur as a result of natural events or human activities (Renn, 1992). Undesirable events are confined to physical harm to humans or ecosystems. This definition implies that humans can and will make causal connections between actions (or events) and their effects, and that undesirable effects can be avoided or modified. Risk is therefore both a descriptive and a normative concept. It includes the analysis of perceived cause-effect relationships which may be scientific, anecdotal, or religious (Krinsky & Golding, 1992). Recognition of risk and uncertainty means that simplified and standardised approaches are inadequate. Rather, a more flexible approach, recognising variability and diversity, is required, suggesting 'new' approaches to research (Chambers *et al.*, 1989, Reijntes *et al.*, 1992, Okali *et al.*, 1994 cited in Scoones *et al.*, 1996).

Risk affects both individual producers and the overall performance of the agricultural sector. The presence of risk, and producers' reactions to it, also influences the formation, conduct and outcomes of agricultural policies (Fleisher, 1990). Thus, risk is a development issue. Poverty reduction in Ethiopia is to be achieved through agriculture-based growth as stipulated in various documents of the Ethiopian Government. In this vein, the Government has stated that "addressing the vulnerability of agriculture to climatic shocks and promoting sustained growth in this sector is crucial" (FDRE, 2002:23). Agricultural development, for its part, can only be successful if risk minimisation and risk mitigation is embedded in a comprehensive development plan and efforts. However, this important challenge is beyond the scope of this thesis.

The understanding of the individual smallholder's risk perception and his/her reaction to risk and selection of risk management strategies, may affect the functioning of the agricultural sector at local, regional and national levels. Thus, understanding the importance of risk, determining how different facets of risk and risk management interact to affect the agricultural sector and shaping agricultural policy choices, is certainly a relevant topic.

2.2. Shortcomings of conventional research on risk analysis

The literature on traditional risk analysis is quite diverse. Many ideas have blossomed and gone. Barry (1984) in his review of literature in this field writes: 'Von Neuman and Morgenstern (1947) have developed the expected utility

approach. Tobin (1958) & Markowitz (1959) developed portfolio theory. Markowitz (1959), Baumol (1963), Hanoch & Levy (1969), and Hadar & Rusell (1969) were pioneers in developing various risk efficiency criteria. Arrow & Pratt (1964) provided for interpersonal comparisons of risk aversion and contributed importantly to empirical analysis of risk attitudes. Dillon (1971) has also done extensive works on decision theory. Anderson, Dillon & Hardakar (1977) have further developed agricultural decision analysis under risk '.

According to Fleisher (1990), during the 1970s and 1980s significant advances were made in the development of analytic and computational models for examining the economics of a firm's allocation of resources under uncertainty. Also, by adding the possibility of randomness to standard economic models, the study of microeconomics under uncertainty has enabled analysts to predict a firm's response to risk. However, the individual models are not robust; the optimal solution depends heavily on the assumptions made about the types of uncertainty that are present, the shape of the probability distribution associated with the random variable, and the means through which it is entered into the model. And it may be doubted if subsistence farm households are really analogous to a firm.

Agricultural economics research on farm income risk has also been concerned with the behaviour of individual farms and with the aggregate effects at both micro and macro levels. Some research has sought to specify optimal behaviour (Musser *et al.*, 1984). In positivist aggregate research and in some of the positivist firm research, utility functions and individual probability distributions serve as theoretical constructs, which are used for hypotheses or conceptual frameworks for analysis without empirical measurement. In normative research and in some positivist firm research, empirical measurement of these theoretical constructs is essential (Renn, 1992). To this end, sequential efforts have been made to develop options suitable for measuring the influence of risk preferences on farmers' economic behaviour.

Agricultural economists and others have invested considerable resources in conceptualising, modelling and measuring the risk attitudes of decision-makers. Other researchers also have developed standard methodology for analysis of risk management strategies over recent years. But these models are criticised by many authors (*e.g.* Musser *et al.*, 1984). The main criticism is that the models are sensitive to data assumptions, constraints and other model specifications. They are also data-hungry (Krimsky & Golding, 1992). Young (1979), Sonka (1979) & Roumasset (1979) cited in Barry (1984), have suggested that approaches used to measure risk attitudes (*e.g.* elicited risk preferences and subjective probability distributions) are subject to severe limitations. They proposed that use of alternative procedures warrant consideration and claimed that a lot remains to be done.

The main argument here is that, the "conventional research paradigm rests on many 'trans-scientific assumptions' such as: the selection rules for identifying undesirable effects, the choice of a probability concept, and the equal weighting of probability and magnitude" (Renn, 1992). In addition, the expected value

maximisation approach relies on two conditions. First, enough statistical data must be available to make meaningful predictions. Second, the causal agents that are responsible for the negative effects must remain stable over the predicted time period (Häfle, Renn, & Erdmann, 1990, cited in Krinsky & Golding 1992). The resulting risk assessment is, therefore, reduced to a single dimension representing an average over space, time and context. In a similar vein, Röling (2002) based on Goldblatt (1996) states that a sustainable society can not be built on the aggregation of individual preferences.

The economics risk concept constitutes a consistent and coherent logical framework for situations in which decisions are being made by individual households and in which decisions are confined to the decision-maker. Normative decision theories also assume that households are rational economic actors and choice between options is based on the maximisation of utility, according to the assessment of expected utility outcomes from different options. In the risk area, both conditions are rarely met (Krinsky & Golding, 1992). First, most decisions on risks are collective decisions, which needs the aggregation of individual utilities. How to measure the welfare of society, however, remains a major problem since the subjective nature of utility does not provide a logically valid method to aggregate individual utilities into a single societal welfare function (Renn, 1992). An additional critique has been offered by feminist economists, who see estimations of individual utility as determined by the relations of gender, with a problematic homology between intra-household and public decision-making. New Household Economics, which deals with goods and services produced and consumed within the household, has not connected with the risk literature.

More recent economic work looks at Monte Carlo estimations, for example. While this has advantages (combinational analysis, more sophistication in handling uncertainties), it still 'misses the point' since the contextual and contingent nature of real world decisions are influenced by power and opportunity. Another major setback is that conventional risk analysis is also reactive in the sense that it is the final step in the process. Its role is to solve problems that have been perceived and made the subject of communication, either as a precursor or a management response, rather than to seek out issues for attention (Rayner, 1992). In addition, 'risk analysis has tended to focus on the analysis of simple probabilities, ignoring the more complex solutions suggested by considering sequential learning' (Scoones *et al.*, 1996). In complex situations, where problems are more loosely defined and where perceptions of hazards greatly influence action, probability based approaches to risk analysis have been found wanting (Krinsky & Golding, 1992). Above all, 'most of the models are too data-hungry for regular application, and despite their complexity they often fail to capture farming system dynamics' (Scoones *et al.*, 1996). Hence another approach to risk analysis needs to be sought and a great deal of risk analysis has to focus on turning uncertainties into probabilities.

2.3. The need for an integrated theoretical stance in risk research

Röling & Wagemakers (1998) argue that the realist-positivist epistemology is increasingly incompatible with the search for a sustainable society. They state that agriculture has multiple goals that are not mutually compatible. This could serve as an entry point here too, as the smallholders are not only concerned about risk minimisation. Farmers pursue multiple objectives. Farmers are willing to suffer harm if they feel it is justified or if it serves other goals. At the same time, they may reject even the slightest chance of being hurt if they feel the risk is imposed on them or violates their other attitudes and values (Otway & von Winterfeldt, 1982, cited in Krinsky & Golding, 1992). Contextual grasp of the realities matters. So does the procedure of decision-making independent of outcome. Risk management studies need to take these aspects into account. Thus, new domains of inquiry are required in the field of risk analysis. This requires critical rethinking. As well, there has to be an attempt to incorporate fresh approaches in epistemology to replace the conventional risk analysis that has hitherto focussed on *ex post* outcomes.

If risk is heeded as an objective property of an event or activity and measured as the probability and magnitude of harm, then it is 'rational' to allocate resources to reduce the greatest risks first. If, on the other hand, risk is seen as a cultural or social construction, risk management activities would be set according to different criteria, and priorities would reflect social values and lifestyle preferences (Renn, 1992). These two positions represent extremes in a spectrum of risk perspectives. An integrative theoretical framework somewhere between these two extremes should be able to provide a more adequate approach to explain farmers' responses to risk.

2.4. Theoretical perspectives guiding the research

This thesis takes a broad view of the subject matter of risk analysis. I consider risk management as a series of interrelated activities of risk identification, risk perception, risk estimation, communication, risk reduction and risk mitigation (see Figure 1). Understanding all the dimensions of risk management in a complex and diverse setting requires an integrative theoretical stance. Thus, the theoretical framework guiding this study is a wider sociocultural; the perspectives on cultural theory paradigm (Wildavsky, 1998; Krinsky & Golding, 1992; Renn, 1992; Rayner, 1992; Breakwell, 2001); cognitive/psychometric paradigm (Slovic, 1992, 1993, 2000, 2001; Krinsky & Golding, 1992; Pollak, 2001); social learning theory (Bandura, 1977; Cheung *et al.*, 1999; Maarleveld & Dangbégnon, 1999) and farm structure model (Tucker & Napier, 2001) were influential in setting research hypotheses and in selecting research methods to answer the questions.

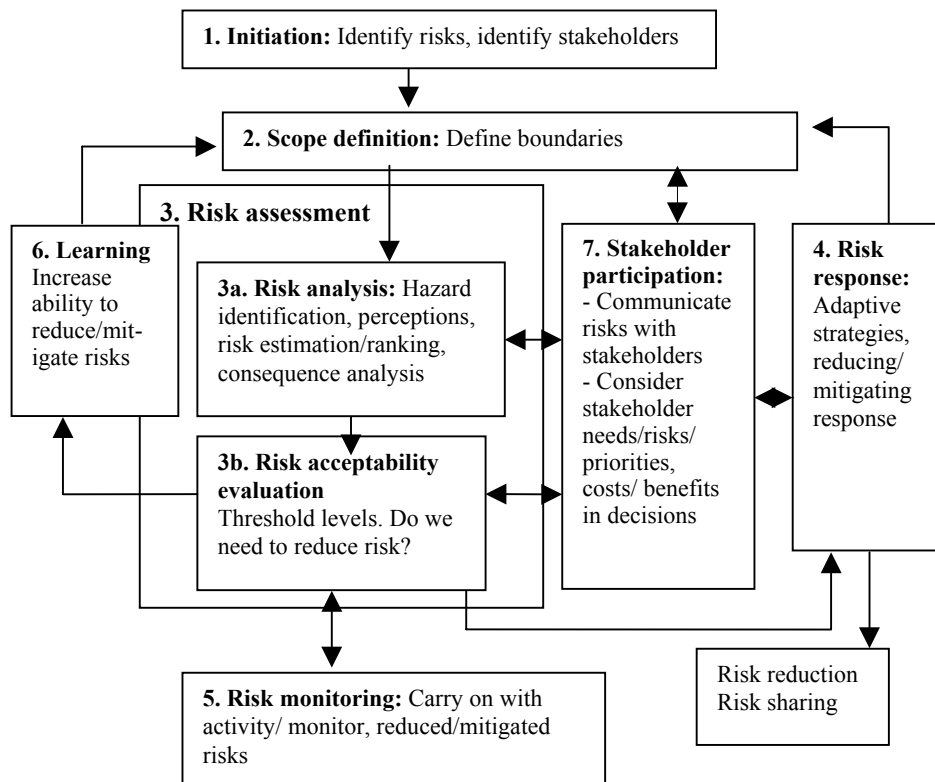


Figure 1. Schematic presentation of risk management (Source: Adapted from Høj & Kröger, 2002:340).

A fundamental tenet of such an integrated theoretical stance is that perceptual constructs, reconstructs and processes (individual and/or meta levels) originate in purposive social interactions among human beings within a human and physical environment in which cultural tools are present. In the rural context, learning and its outcome occurs through interactions within specific social, cultural, economic, environmental, and historical contexts. These are differentiated across the local actors; hence multiple learning and risk responses prevail. Thus the ontological point of departure of this study is the recognition of multiple perspectives, differentiated livelihoods and multiple realities. Reality is dependent on context. This thesis is concerned with such varied worldviews of risks. The focus is on diverse risk perceptions and risk responses. In turn, taking this ontological viewpoint as a point of departure raises a problem for epistemology and methodology. Multiplicity of perspectives and realities are epistemic challenges to prevailing standards in disciplines that kept faith with 'single true reality' and individualism, *i.e.* a solely individual perspective in which there is no role for social and cultural dynamics. One such challenge is to the 'frequentist' school of thought, presumably on the ground of defining probability as a relative frequency ratio based on large number of cases. It is challenged because smallholder farmers' understanding of risk is not entirely empirical. In this case the 'subjectivist' view type and epistemological position appears more appropriate as it is based on

subjective statements of farmers under varying contexts of their degrees of belief about risks. This entails that probabilities are subjective. In that context, use of combined theories and methods becomes sensible. In accord with these arguments, integrative theoretical perspectives that are brought together to explain risk perceptions, estimation, characterisation, learning and risk responses are briefly presented in the following four subsections.

Cultural theory paradigm

Rayner and Cantor (1998:93) argue that a broad interdisciplinary approach to risk management will incorporate ethical, political, legal, cultural and economic comparisons of various constituencies and their liability preferences. For example, these aspects may be integrated within an analytic framework based on the cultural hypothesis of risk perception. This paradigm states that for different institutional settings, each generates its own characteristic view of the world, variously referred to as cosmology or cultural bias. In this theoretical perspective, the concept of culture is central to explanations of why human beings are what they are, why they do what they do. Cultural theory argues that risks are defined, perceived, and managed according to principles that inhere in particular forms of social organisation (Rayner, 1992:84). Also, cultural theory holds that the characteristics of the perceiver are central to an understanding of risk perception and it attempts to quantify the ways and the degree to which people perceive risk. Krinsky & Golding (1992) after Rayner (1988), argue that risk communication in cultural theory emphasises creation of shared meaning and trust over the transfer of quantitative information. Cultural theory provides a more loosely structured interpretation of the institutional shaping factors, more centred on social relations than on organisational arrangements.

Psychometric paradigm

According to Slovic (1992), the psychometric paradigm appears to be important for several reasons: it elicits current preferences; it allows consideration of many aspects of risks and benefits besides money and body counts; and it permits data to be gathered for large numbers of activities and technologies, allowing the use of statistical methods to disentangle multiple influences on the results. Over the years, many studies of risk perception have been carried out using this approach (Slovic, 1987) through numerical rating scales and factor analytic representations (Slovic, 1998).

Within the psychometric paradigm, people make quantitative judgements about the current and desired riskiness of diverse hazards and the desired level of regulation of each. These judgements are then related to judgements about other properties, such as consequences in an average year and/or in a disastrous year (Slovic, 1998). The paradigm states also that attitudes towards risk are not homogeneous but vary according to cultural differences (attitudes and beliefs shared by a group). An individual's cultural orientation is linked to the group and the social interactions. The results achieved using this approach have invariably produced coherent and interesting results that have motivated further use of the paradigm.

Social learning theory

According to Cheung *et al.* (1999:133) based on Bandura (1986), the core principle of social learning theory suggests that one forms beliefs and attitudes by learning corresponding information. Learning can operate through observation, modelling and personal enactment. It passes through a process from exposure, attention, acceptance, retrieval of information, beliefs and attitudes to execution of behaviour. Social learning theory explains human behaviour in terms of continuous reciprocal interaction between cognitive, behavioural, and environmental influences.

Social learning theory predicts also effects of a number of background characteristics, including age, education and religious faith, on belief systems of individuals. For example, an elderly person is more favourable to public support; education can enhance one's knowledge and therefore form more favourable beliefs (Cheung *et al.*, 1999:135). Social learning suggests also that one who has religious faith will have more favourable beliefs about other people because religious teaching typically preaches benevolence to other people (Cheung *et al.*, 1999:135 after Bagley *et al.*, 1979).

Along the same vein, Julian Rotter's Social Learning Theory provides a broader insight and engagement in the thematic area. His main idea is that personality represents an interaction of the individual with his or her environment. One cannot speak of a personality, internal to the individual that is independent of the environment. Neither can one focus on behaviour as being an automatic response to an objective set of environmental stimuli. Rather, to understand behaviour one must take into account both the individual, *i.e.* his or her life history of learning and experiences, and the environment, *i.e.* those stimuli that the person is aware of and responding to. Rotter describes personality as a relatively stable set of potentials for responding to situations in a particular way.

According to Maarleveld & Dangbégnon (1999:268), the concept of learning has come to comprise a collection of phenomena that includes: learning by individuals through observation or interaction with their social context; learning pertaining to social issues; and learning that results in recognisable social entities such as collective decision-making procedures, culture, *etc.* Although these phenomena differ from each other, they share the interplay of individual and situational factors in generating human behaviour. Behaviour is certainly influenced by the environment, but people also play a role in creating this environment (Maarleveld & Dangbégnon, 1999:268). In a social learning perspective, communicative rationality (Maarleveld & Dangbégnon, 1999:269 after Habermas, 1984) is the guiding principle for such interaction. Through dialogue and deliberation, problems and questions are identified and alternatives explored. Social learning theory 'prescribes collective and collaborative learning that links biophysical to the social, cultural and political spheres, the local to the global arena, and action to reflection and research' (Maarleveld & Dangbégnon, 1999:269).

Farm structure model

Theoretical components of the farm structure model are also crucial to identify factors thought to predict perceived risk from various sources and responses to them. According to this component of the theoretical perspective, the size of the farming operation and other characteristics are important factors in explaining farm profitability and viability in the market place (Tucker & Napier, 2001:222). Napier *et al.* (2000) & Napier & Sommers (1996) cited in Tucker & Napier (2001), state also that larger operations are more likely to have greater access than smaller farmers to informational and educational resources covering all aspects of agriculture, including benefits and risks. Hence, this theoretical perspective is brought into the integrated framework with the view of understanding the characteristics of a farm that relates to management of risk. Farm and/or farmer characteristics are invaluable in the study of risk perceptions and responses, in their own right.

2.4. Justifications for the use of integrated theoretical perspectives

Many authors (*e.g.*, Bezabih, 1992; Chambers & Conway, 1992; Storck *et al.*, 1997; Ellis, 2000; Belaineh, 2002b) have written about diversity and complexity of rural livelihoods. Based on the diversity and complexity concerns of livelihoods, Scoones *et al.* (1996) argue that aggregated approaches that make generalisations about rural communities or rural households are inadequate. Instead, it is necessary to take a differentiated approach to risk analysis. Longhurst (1986) also states that in communities marked by income inequalities, household responses occur differently along the lines of wealth and access to resources.

So, as complexity of the issues cannot be accommodated within a single theory, the use of a wide theoretical framework is argued for. In fact, both theory and evidence provide support for the use of an integrated framework. Integrating these perspectives would appear necessary for the analysis of risk experience and prescription of more informed risk management policy. In agreement to this, Renn (1992:78-79) claims that 'it has become evident that an integrative framework is necessary to capture the full extent of the social experience of risk and to study the dynamic processing of risks by various participants'. Slovic (1992:149) states also that 'societal response to hazards is multidetermined and thus needs to be studied in a multidisciplinary perspective'. It is most certainly the case that information processing (cognition), personality, social factors, economic factors, and cultural factors interact to determine individual and societal risk perceptions and response to risk. These narratives suggest the use of the aforementioned theoretical perspectives that guided this study. It is argued that group and social context, not only individual cognition, play an important role in the selection and response to risk. So, risk analysis should include sociological and psychological characteristics.

3. Research methodology

A risk reduction strategy should emerge from reflective and well-informed multilogue of all stakeholders. Needless to say, farmers are the most important stakeholders in this process because rural communities will have to shoulder most of the burden of poverty-reducing development in the future. So, I believe that any attempt to reduce risk and its consequences should not be based on the perceptions and understandings of the technical personnel but should emerge from the understanding of rural livelihood, with their diversity and complexity. The inputs from the farmers whose livelihoods are under continuous threat from the vagaries of nature are crucial in the analysis of risks and policies.

Viewed from the normative perspective, the practice of risk minimisation implies a clear distinction between experts and lay persons. Risk reduction or mitigation is based on the assumption that risk should be reduced in proportion to the expected or modelled harm to humans or ecosystems (Krimsky & Golding, 1992). This assumption is highly contested: social actions to cope with risk are not confined to the simple goal of risk minimisation but include other objectives such as equity, fairness, flexibility, or resilience (Renn, 1990; Krimsky & Golding, 1992).

The inclusion of these complementary objectives requires participation by interest groups and the affected public (Renn, 1992). The understanding of social behaviour, as well as individual and group actions, calls for a participatory approach. Besides, a response that appears rational according to one perspective may be considered quite irrational from another. Expert knowledge and public knowledge are conditional - each reflects the underlying social relations and implicit assumptions of the various actors. To derive a complete picture of risk in the real world, it is therefore necessary to accommodate multiple sets of knowledge (Golding, 1992). So, undertaking a participation-oriented risk study is extremely crucial. What people perceive as an undesirable effect depends on their values and preferences. The interactions between human activities and consequences are more complex and unique than the average probabilities used in technical risk analyses are able to capture (Renn, 1992). Farmers also show distinct preferences for high-consequence/low probability and low consequence/high probability events, with identical expected values depending on farm and farmer characteristics. To this end, the thesis argues that the use of combined methods (qualitative and quantitative) is vital since the complexity of rural livelihoods cannot be fully captured using a single method and/or discipline.

It would not be possible to answer the research questions set in a rigorous way through a single approach. The combined use of the methods would enable us to come up with credible, realistic and scientifically balanced analysis in relation to research themes and a problem domain that is sensitive to subjective perceptions. Dercon (2000:30) recommends use of qualitative studies to get useful insights, about changes in welfare and vulnerability over time.

Use of participatory research methods helps to capture views and perspectives of different categories of farmers. Also, it allows us to understand trends of major factors overtime as perceived by the farmers themselves. The outcome is important to identify major types of risks and their perceived causes. A focused formal survey would complement participatory studies as it enables us to collect and analyse the quantitative data necessary to answer specific questions and/or empirical hypotheses arising from the qualitative studies and to crosscheck the information collected through various informal survey techniques. Thus, triangulation becomes possible and findings can be cross-checked through use of multiple methods. Qualitative and quantitative methods used, in this study, to facilitate the collection, presentation and analysis of information are presented in the annexed articles.

The procedure used to undertake this study has therefore included secondary data collection and analysis; preliminary survey and discussions and individual interviews with key informants at various levels; selection of two Woredas with contrasting features and farming systems; selection of Peasants Associations from each Woreda and identifying household typologies; community level studies using participatory methods; and administering a questionnaire based formal survey on randomly selected sample farmers. The latter was largely based on the learning outcome of the informal survey. Prior knowledge can be used to improve the sampling procedure (Lohr, 1999). The informal survey (focus/discussion groups, informal interviews and participatory analysis) has provided an in-depth understanding of differentiation in access to resources, local perceptions and livelihood strategies so that the multiple dimensions of risk are taken into account.

Meta and Fedis Woredas were randomly selected from the Eastern Highlands of Ethiopia. Criteria considered in stratifying the Woredas were mainly proneness to risk or vulnerability situations and types of farming systems. The villages (Table 7) were randomly selected from each stratum, *i.e.* agro-ecological zone, in respective Woredas. The sample farmers were randomly selected from each village with proportional allocation of gender and wealth groups. The study was carried out over a period of 18 months, from March 2000 to September 2001.

Table 7. *Selected, number of sample households in each Woreda and Peasants Association*

Woreda/ Peasants Association	No. of sample households	completed questionnaire
I. Fedis		
Yisehakoy	30	30
Dhebine	30	30
Hassene	30	28 ¹
II. Meta		
Wayber	30	30
Chelenko Lola	30	30
Bekelcha Oromia	30	30
Total	180	178

¹ Two questionnaires, one from each of the poor and medium farmers' groups, were discarded since they consisted of many missing values.

In line with the conceptual and theoretical discussions, research objectives, questions and hypotheses put forth and methodology used, the following conceptual model relating field contexts to the research paradigm is shown in Figure 2. The Figure depicts the complexity of the inquiry processes used to understand farmers' risk management strategies. This model involves the contextual sphere; philosophy as a set of all possible beliefs about risks; broader theories within the contextual set up; semantics and semiotics; research ethics; ontological; epistemological and methodological issues to address risks in a real world situation.

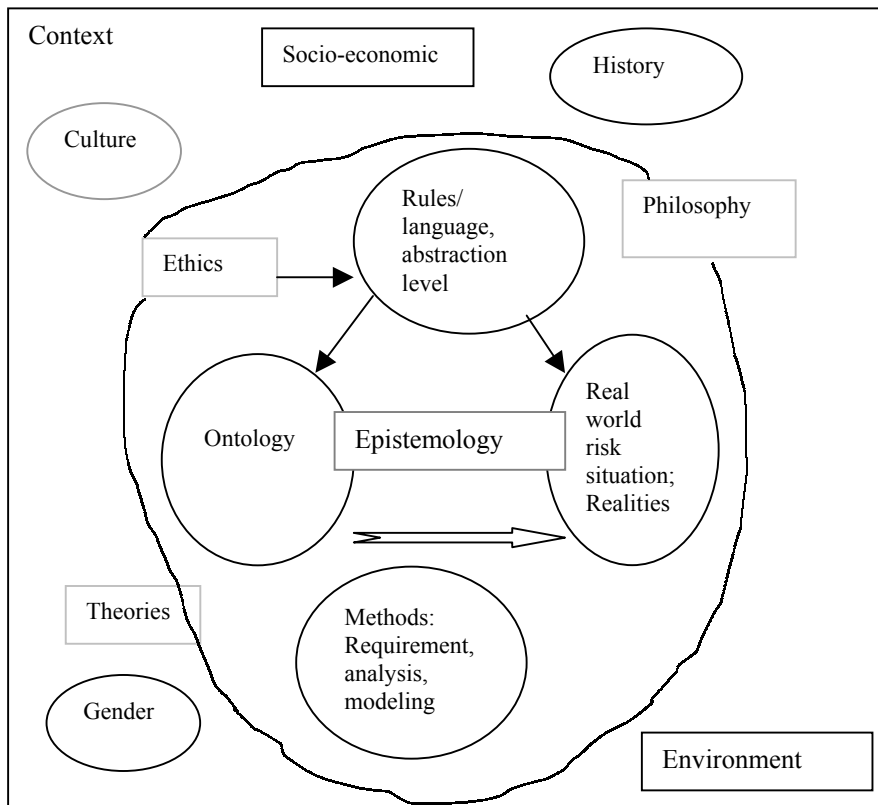


Figure 2. An interface between the context and research paradigm.

4. Results and discussion

4.1. Results

This study proceeded by problematizing the relationships between risk perception, eventual learning, risk responses and various structuring factors that are drawn from literature and preliminary fieldwork. The findings of this study vividly demonstrate the complexity of the issues in the rural context. Detailed results and discussions are provided in the annexed articles. I will briefly recount the results in the following subsections.

4.1.1. Perceptions of risks (Paper I)

Various PRA exercises conducted with different social groups and actors investigated the local perceptions of sources of risks to human beings and ecosystems. Different actors in the study areas perceive that they are exposed to different types of substantial risks from different sources. On the basis of the results obtained from the informal and the questionnaire based formal surveys, three major sources of agricultural risks were identified and classified. Crop and livestock production risks; human (health) risks and institutional risks make the rural households vulnerable to serious hardship. Different farmers' groups (poor, medium, less poor farmers), women, the youth, and experts working in the rural areas have differentiated views and multiple perceptions about the sources of risks, their perceived causes, and possible consequences of these risks. This clearly shows existence of multiple perceptions among different stakeholders and social groups.

This study has also shown that perception depends on various predictors, particularly on the number of the socio-economic variables that are assumed to be important in risk perceptions. These predictors are the asset base of the households, access to infrastructures, locational settings and human capital, *i.e.* experience that individual farmers accumulate during their life time, the ability (cognitive) of individual farmers to interpret the external world, livelihood diversification, retained output, access to information, health status of family members and religion. These factor structures have accounted for variations in risk perceptions in different degrees. Connections between various farm and farmer characteristics and risk perception casts light on their role in mediating and shaping farmer behaviour.

The logit regression results presented in this article provide some evidence to support the hypothesis set forth: that risk perception is associated with wealth; that risk perception is locationally bound; that risk perception is related to opportunity variables (access to infrastructure, information and the like); and that livelihood strategies pursued by the farmers influence perceptions. On the other hand, in contrary to the hypothesis set, it is found that risk perceptions are not shaped by gender, religious or human capital differences.

Two important points emerge. Firstly, there are multiple perceptions among rural actors that might lead to differentiated risk reduction and mitigation strategies with a bearing on resource use decision and productivity. Hence there is a need to recognise the complexity of risk perceptions and livelihood differentiation. Secondly, risk perception is mediated and shaped by a multitude of predictor variables. The analysis here reveals, depending on the percent of variance accounted for, that the asset base, locational setting and livelihood diversification strategies appear to be crucial factors in framing risk perceptions of the farmers in the Eastern Highlands of Ethiopia. Encouraging livelihood diversification strategies and provision of access to assets could be useful in this context. Differentiated treatments and micro-finance operations could be of help.

Constraints on entering into risk-reducing diversification strategies and enhancing the ability of households to store wealth need attention.

4.1.2. Estimation and characterisation of perceived risks (Paper II)

Based on informal survey results and subjective risk ratings, this article attempts to examine how farmers categorise risks depending on their assessment of potential consequences and probability of occurrence. Mean ratings revealed that there are low-probability high-consequence, low-probability low-consequence and high-probability high-consequence risks. Interestingly enough, there is no risk that farmers classify as high-probability low-consequence *per se* in their construction of risks. Perceptual differentiation with regard to the above three risk variables, *i.e.* known and involuntary risks, were found to be very low as the computed standard deviations were below unity. Based on their cognisance of the risk variables, farmers classify the various sources of risks they are acquainted with as risk unknown - voluntary and risk unknown - involuntary. This article depicts that smallholder farmers know most of the risks they are facing; but risks known to them are of both voluntary and involuntary nature when it comes to decisions and actions. It was learned also that there are no unknown risks that the farmers will be willing in considering. Also, there are no risks that farmers are not aware of and that are involuntarily imposed upon them. Coverage based classification mirrors that farmers classify risks into those that are idiosyncratic and covariate with varying levels of frequency.

Results indicate that frequency of drought, pests and diseases, higher prices of cereals at purchase, and drought coupled with pests and diseases are distributionally neutral. In contrast, frequency of risk variables such as increased pressure on land resources, weeds, heavy wind, and drought, coupled with weeds and lower prices of products at sale, are spatially bound. The magnitude of consequences of drought and weeds emerge to be very severe in both Woredas. The frequency of occurrence of various risks is found to be area specific, whereas the damage they inflict on households is covariate. The findings in the present study reveal that: income flows, yields and prices are highly variable in space and time, that income-locational and socio-economic relationships change over time. Proximity to market, and number of cattle owned by the households, are strong determinants of household income during both 'good' and 'bad' years.

4.1.3. Risk information and eventual learning (Paper III)

This article focuses on showing how access to information and learning is affected by various socio-economic and sociocultural factors. Inherent in risk perceptions and selection of management tools is how the individual farmer and fellow farmers' cognition and trust affect individual and/or group learning. For the farmers, who are making their livelihoods in harsh environments, operating decisions and actions are sequential with temporal and spatial variations. In such a setting, contextual and comprehensive information is needed as a basis for positive re-enforcement of the existing tested and re-tested local knowledge. Farmers contextualize information they receive and the local wisdom they develop is

communicated with one another for shared learning and understanding. But this process is limited by many constraints.

Ingold (2000:158) emphasises that if people are to share their experiences they must talk about them, and to do that these experiences must be represented by means of concepts, which may in turn be expressed in words whose meanings are established within a community of speakers by verbal convention. Thus collective representations serve as a kind of bridge between individual consciousness that is otherwise closed in personal interactions, thereby furnishing them with the means of mutual understanding. Trust, credibility and relevance of the information becomes important for critical engagement in learning that might lead to solutions for ill-defined contextual problems. In agreement with this, Maarleveld & Dangbégnon (1999:268), after Lee (1993) and Röling & Wagemakers (1998), write also that a social learning perspective aims to convey the manner in which people learn and need to learn how to gain insight into, predict, and control the way their actions affect the natural and human domains to ensure a sustainable future.

Informal survey results reveal that there is a differentiation among farmers in knowing and using various types of information. Differences often depend on ways of looking at the world as shaped by communication, religion, culturally ascribed values, and patterns of status and association in the community. This paper endeavours to pinpoint sources of information, factors influencing access to information and eventual learning of farmers. Results show that the most used sources of information were development agents, radio and other farmers. Use of radio, particularly, reflects the fact that the multi-lingual nature of the farmers and the daily *t'chat* (a mild narcotic) chewing ceremonies, that serve as a forum for deliberations, and the status of *t'chat* as a major cash crop facilitates ownership of the radio, switching to multiple local and international radio networks and information acquisition. This could be important, as selection of sound communication channels would help farmers to engage in discussions and learning.

There are various early warning signals (inferred from actions and geo-referenced experiences) used by the farmers as essential features of risk minimising and risk management strategies. These predictions are transmitted orally to the community through the social networks, and information sharing continues. Also, the traditional early warning techniques known to and used by the farmers are diverse, *i.e.* comprising religious bound issues, aspects related to natural phenomena, like wind direction, onset time of rains, humidity, temperature, nature of clouds, various livestock indicators, *etc.* and are context specific.

There is differentiation among farmers in knowing and using various traditional early warning signals and techniques. There are multiple views and perspectives. Differences often depend on ways of looking at the world as shaped by communication, religion, culturally ascribed values, and patterns of status and association in the community. The apparent implication is that knowledge is acquired in a situated context and that the locational setting, religious and cultural

inclination of particular communities shape perceptions and responses to risks. This is in line with theories of 'cognition in context' where the social, local character, of individual learning is analysed and individual minds evolve by interaction (e.g. Rizello & Turvani, 2002:199).

Regarding the trust and credibility issues, the majority of rural households have rated information they receive from formal sources, *i.e.* development agents and health workers, as most credible. In fact, this is the most used source of information in the study areas. Confidence revealed in the informal sources is an interesting point that surfaced in this study. Information from fellow farmers, peer groups and neighbours is rated as most reliable, *i.e.* top, or somewhat less reliable, *i.e.* bottom. Household reputations and records of experiences with each other in society that are often based on achievement, *i.e.* relative wealth differentiation, could explain this and determine the reliability of information from certain sources. It implies that current status in society matters and governs the acceptance or rejection of an information source despite its content and/or relevance. The trend is that information forwarded from the poor is considered less reliable, while the poor rely on the information coming from the opposite direction. Reputation and conception of each other matters. Looking back, the status, reputation and role of predecessors in the community is also found to be common before considering whatever information from a certain source is trustworthy or not.

Logistic regression results indicated that distances to markets and the number of plots owned influence access to information through their significant coefficients. It appears that distance from markets has a negative effect on access to information. This indicates the importance of markets and market infrastructural elements in provision and communication of risk information. Market places in rural areas are multifunctional as they provide opportunities for information sharing and interactions in addition to transactional function. Increased distance from markets leads to less access to information. Negative effects of the number of plots owned hint that those farmers who are entitled to more plots do not need much information. This could be explained partly by the fact that spatial diversification is one of the risk management strategies in these areas and it gives an opportunity for enterprise diversification in space and time leading to better livelihoods. Also, for such farmers, perhaps working hard, *i.e.* capitalising on available opportunities, might provide more information with higher returns. Differences in broader structuring factors such as gender, age, religion, location, education and income levels are not found to significantly affect access to information.

One further point. Use of external inputs and self-evaluation of knowledge were used as a proxy for learning and consequently the results are presented in two stages. With the use of external inputs as an explained variable, the model reflected that locational setting, experience in farming, family size, number of plots owned and access to information are associated with this potent variable. The model with self-evaluation of knowledge as a dependent variable revealed that gender and marital status of household head, educational level, number of cattle owned and farm size are the differentiating variables.

4.1.4. Risk responses (Paper IV)

Farmers learn from experience through generations how to respond to the myriads of risks and ultimately how to survive in harsh environments. Interpretations of the risky situations, however, relate to value systems leading to multiple perspectives and realities. Since risk perceptions are believed to guide responses, 37 sources of risk identified during several informal surveys and included in the questionnaire were analysed in order to understand how farmers perceive them. Rating of various sources of agricultural risks for their perceived importance have elicited that the highest mean scores were given to health risk (health of household members); production risk (drought, current food availability situation, lack of drought resistant varieties and yield levels of enterprises); biological risk (soil fertility decline, insect pests and diseases) and risks related to institutions (land scarcity and lack of bargaining power).

Results of the quantitative study are presented under three major categories. These are results of the descriptive statistics that have yielded mean ratings of the Likert-type rating scales; the factor structures that are obtained from the factor analysis; and predictors of importance of perceived risks and responses that are obtained from the multivariate regression analyses.

Rating of various sources of agricultural risks for their perceived importance has elicited that the highest mean scores were given to health risk, production risk, biological risk, and risk related to institutions. After varimax rotation the factor analysis resulted in eight factor structures that are important to the smallholder farmers. In partial agreement with what Dercon (2001) has reported (see Table 6), production risk that originates from drought, flooding, frost, *etc.* coupled with risk related to markets explains the highest variation in households perceived risk. The factor structures and percent of total variance explained by each factor are provided in Table 8.

Table 8. *Factor structures and percent of variance explained (Total=73.80%)*

Factor structures	% of total variance explained
1. production and market risk	28.77
2. working capital related risk	14.68
3. health and food security related risk	10.55
4. biological and intervention risk	6.35
5. climatic variability	4.98
6. household security risk	3.39
7. precarious tenure risk	2.57
8. livestock production risk	2.51

Source: Belaineh (2002a)

Factor analysis on importance of risk responses reveals that 1) promotion of various livelihood diversification strategies, 2) marketing, and 3) financial responses are important risk mitigation instruments (Table 9). Farmers endeavour to reduce the downside risks through use of various dimensions of livelihood diversification strategies, *i.e.* spatial, temporal and vertical (the three realms also

interact with each other), involving on-farm, non-farm and off-farm activities even if access to productive resources, public assets and the better-paying non-farm employment are some of the deterrent factors.

Table 9. Responses to risks and percent of variance explained (Total=62.81%)

Factor structures	% of total variance explained
1. diversification response	37.34
2. financial response	15.88
3. marketing response	9.59

Source: Belaineh (2002a)

Multivariate regression analyses gave some important insights on the relationships between risk responses to various explanatory variables. The types of statistical relationships that are found between the constructed factor structures and the independent variables are provided in Tables 10 and 11.

Table 10. Relationships between perceived important sources of risk and predictors

Sources of risk	Predictor variables
1. production and market risk	farm size (+) proximity to markets & roads (+) agroecological zone (dummy 1) (-)
2. working capital related risk	farm size (-) proximity to markets & roads (+) district dummy (Meta) (+)
3. health and food security related risk	farm size (-) proximity to markets & roads (+)
4. biological and intervention risk	agroecological zone (dummy 1) (-) proximity to markets & roads (-) religion (+)
5. climatic variability	livelihood diversification (+) income (bad year) (+) livelihood diversification (+) number of small ruminants (+)
6. household security risk	agroecological zone (dummy 1) (+) education (+) proximity to markets & roads (+) farm size (+)
7. precarious tenure risk	external input use (-) health situation (-) income (bad year) (+) agro-ecological zone (dummy 2) (+)
8. livestock production risk	education (-) agro-ecological zone (dummy 2) (-) livelihood diversification (+)

Source: Belaineh (2002a)

Note: (+) and (-) signs indicate positive and inverse relationships, respectively.

Table 10 depicts that farm size, proximity to services and location, income levels and livelihood diversification strategies pursued are the variables that appeared frequently in the models explaining various sources of risks. In contrast, the health situation of household members is found only to significantly affect the land tenure related risk.

Table 11. *Relationships between perceived risk responses and predictors*

Risk responses	Predictor variables
Financial response	location (both study areas and agro-ecological zones)(+) farm size (+) information (+) education (+) external inputs use (+) own wealth perception (+)
Livelihood diversification	proximity to roads (+) off-farm diversification strategies (+) intercropping and multiple cropping (+)
Marketing response	off/non-farm activities (+) small ruminants (+)

Source: Belaineh (2002a)

Note: (+) signs indicate positive relationships.

Table 11 exhibits the three most important risk management tools that are explained by a wide range and differing list of predictor variables. Human capital endowments as indicated by education and access to information, and access to productive resources like land holding and farm inputs and its derivative own wealth perception appeared to be associated with financial response. As expected, livelihood diversification strategy is explained by proximity to services and multiple dimensions of diversification. Exposure to off/non-farm opportunities to generate cash and ownership of assets that can be easily liquidated is found to explain the marketing response.

4.2. Discussion of the major findings of the thesis

Risk conceptualisation of farmers - not a taken-for-granted phenomenon

Risk is not a neutral term for the farmers. Fox (1999:17) writes that risks are value-laden judgements of human beings concerning natural events or possibilities. In agreement with his thoughts, this work reveals also that farmers construct the notions of risk depending on power differentials and their situated experiences of their everyday lives. It is complex, dynamic, cumulative and seldom impossible to contain. In paper I, the farmers' risk conception is shown to be the combination of consequence (should it occur) and the frequency that a single or a combination of risky situations occur. Conceptualisations of the consequence(s) and frequency of occurrence(s) of risks by the farmers are deeply

grounded in the vulnerability situation of the different groups. To some groups, the consequence component of risk is conceived in terms of food insecurity and its subsequent outcome whereas for the other groups it is a loss of assets. Frequencies are also conceptualised in various ways. To the better-off groups, frequency would mean repeated occurrences, whereas for the poorer households, whose livelihoods are always on the knife-edge, a single-year incident would describe frequency. It has divergent meanings in different contexts. Beck (1995:76) proposes that events that are considered to be risks are conceptualised differently in different contexts. There are complex conceptions. The way it is conceptualised has an implication on dealing with risks. In this vein, Heymann & Wals (2002:246) consider that people act based on the meaning they attach to reality.

Varying frames of risk perceptions

Risk as a concept derives its meaning in broader social, cultural and historical contexts (Lupton, 1999). In the rural setting, risk perceptions emerge from complex local dynamics. Farmers perceive different risks in terms of from where they are thought to originate and whom they affect. Perceptions of different types and sources of risks differ across the structuring determinants. Findings are in line with the reports of Casal *et al.* (1997:170), who claim also that the perception of risk by a group of people depends on a number of factors. Paper I establishes that there are multiple perceptions of risks. Different farmer groups perceive that they are exposed to different types of risks. Risks that are not considered as important by some are crucial to other groups in the same locality. Interestingly, a single source of risk would mean different things to different rural actors. For instance, market risk is about higher purchase prices for the poor; it is about lower price at sales for the better-off; it is both higher price at purchase and lower price at sale for the women; and it is about profit margin for the landless youth whose livelihood is based on non-farm activities. Experts of the Ministry of Agriculture view risk in terms of volatility of both output and input (externally supplied yield enhancing farm inputs) prices. Situated experience matters. So do constraints and opportunities faced by different groups of farmers in shaping and mediating perceptions of risks.

Livelihood diversification - a common thread in shaping risk perceptions and responses

In paper I, it is argued that various dimensions of livelihood diversification strategies influence risk perceptions. Paper IV reveals that diversification strategies pursued by households is a latent management tool in risk response. Important points emerge from these results. The clear message is that income smoothing is attained via diversification strategy by farming households in these areas. The income smoothing function thus mediates farmers' perceptions of and responses to risks. But, entwined with the common thread is livelihood differentiation that might lead to various forms of livelihood diversification.

Thus it has to be underscored that different farmer groups enter into different risk-reducing diversification activities. Diversification is diverse, as there are differentiated niches for different farmer groups. Differentiation is mainly based

on entry constraints (start-up capital, access and entitlement to assets, exchange and networks, acquaintances and graduation requirements for non-farm activities, *etc.*), and opportunities available. Some households could enter into lucrative activities whereas others have to dwindle into activities with lower entry costs. In all, people show distinct preferences to different strategies depending on their situational context. Dercon (2000:29) argues that self-insurance is limited by access to assets and poor functioning of asset markets when a crisis hits the household. Depending on the asset base of households and other socio-economic circumstances, the times at which diversification strategies are invoked (particularly non-farm and off-farm) with a view of reducing risks also differ. Yet, diversification strategies remain central in rural livelihoods. So, it becomes an important factor in shaping risk perceptions and risk responses of farmers.

Recurrence of risks: towards self-management and privatisation of risks

During 'bad' times, commonly, poor households try to protect income shortfalls through receiving loans and/or transfers from a wider network of relatives and neighbours. But recurrence of natural hazards has put pressure on informal institutions and arrangements, making risk sharing anomalous in these areas. One cannot depend even on family networks for risk sharing. This development led to co-existence of covariate and idiosyncratic responses to risks. Dercon (2000:29) contends that informal insurance arrangements are affected by sustainability constraints, often excluding the poor from these arrangements. Paper IV illustrates that a very low value of the coefficient of determination is observed for marketing response that is explained by the number of small ruminants, *i.e.* the asset base of the poor. A possible interpretation of this result is an association between the farmer's specificity and responses to risk through marketing strategy. A clear implication here is that marketing response to risk is idiosyncratic, *i.e.* household specific. Indeed, this might hinge on the household specific assessment of terms-of-trade between assets for sale and income smoothing. In sum, covariate movements in risk management through diversification strategies and financial responses and household specific actions related to marketing, *i.e.* as a protection against idiosyncratic shocks, prevail in the Eastern Highlands of Ethiopia. The other point is that social relation and cohesion will be undermined when hazards recur.

Recognition of context in risk discourse

It has been recognised in this study (papers I, III & IV) that gender, ethnicity/religion, wealth, social status, knowledge, values, opportunity variables, farm and farmer characteristics and local power milieux are important determinants. Different farmer groups have different data and therefore different perspectives are constructed under different contexts where the risk experience is located. Thus it is argued that differences in understanding of risks underpin variations in perceptions and responses. These variations need to be understood and seriously considered. Perception of risk is contested among different local actors as risk means different things to different social and power groups. These broader structuring factors are central because variability in meaning construction in different contexts has an implication on learning, risk communication and risk

management. Reversing in top-down risk management approaches that is often used to persuade people to adopt self-protective measures is therefore suggested. This entails a bottom-up approach that is cognisant of enormous contextual differences in perceptions of and responses to risks. In this regard, Handmer (1995:90-1) quoted in Tulloch (1999:39) contends that ignoring the different meanings stakeholders ascribe to risk guarantees the failure of risk communication. In conventional risk analysis, statements about risk and subjectivity tend to discount differences, presenting the subject as universal (Lupton, 1999:123). In short, the thesis claims that non-contextual generic approaches to risk analysis have to be re-examined, as there are embedded background assumptions in risk perceptions and risk responses of farmers in distinct contexts. Meanings are context bound since meaning cannot be determined out of context. Recognition of context-specificity underpins rejection of unitary ontology. Ideas and perceptions in context vary, so do contexts.

Optimistic bias and otherness in smallholder farmers' risk management

In the Eastern Highlands of Ethiopia, it appears that some households, particularly the youth, perceive that they pursue different types of strategies to other fellow farmers. Differentiation is involved here. Paper IV reveals that there is differentiation in selection of risk management tools due to differences in educational levels and factor endowment. Information gained through schooling and asset holding has an impact on risk response patterns. Paper III records that selfhood and relating self to other fellow farmers is mainly asset base bound. Better-off farmers in these areas understand that their success in farming is due to their better knowledge and farming skills. Access and entitlement to various productive resources they possess, which are crucial in defining the underlying differences, are undermined in this self-inspection. This achievement context led such farmers to optimistic-bias, making them believe that they will be exempted from future risks. The paper depicts also that the other groups perceive younger and single farmers as risk takers with excessive optimism. Paper II hinted also at the same result. Findings in Paper I suggest that household asset base is highly related to their perception of risks. Consequently, some actors perceive some risks as benign whereas to other groups they are of great importance to varying degrees.

Hence it is worth pursuing these points, as notions of *otherness* and self-awareness are important to ways of thinking about risks and responses. *Otherness* is constructed through the lens of these factors, *i.e.* formal education, geographical and agro-ecological location and previous achievements. Spatial and anonymous metaphors such as certain types of risks and/or food insecurity is a lowlander's problem, and/or some other group's concerns (usually the poorer looked down upon) are related to their own future risk exposure assessment. These are feelings of certain farmer groups in their own success. Self-evaluation in education and age is another point as there is a tendency for younger and educated farmers to place themselves better than other farmers. For example, the youth claim that they are less likely to be affected than their fellow farmers are. The elicitors of those kinds of self-perceptions are many. There is a web of beliefs and multiple meanings. But it can be accounted for by differences in the following three points. One,

dissociation of the educated youth from the farming activity, *i.e.* that is commonly perceived as a risky business mostly due to shortage of arable land, encourages them to engage in non-farm activities that are more paying and less volatile. Two, it might also elicit the level of responsibility the young farmers shoulder due to their relatively smaller family size. Three, exposure to formal education and its impact on the way of reasoning might enable them to downplay some risks depending on their interpretations.

The other dimension of optimistic bias is religion bound. This bias has at its core the assumption that 'next season would be better' - a heuristic maxim that has a far-reaching implication in rural livelihoods. The intention here is not to blame that it is irrational. The point is that such farmers always exempt themselves from future risk through religious faith, hoping for a better future. This issue is important to pursue because such self-manifestation might hinder risk-reducing behaviours, *i.e.* may keep such groups from making changes. This could as well entail negative externalities from the risk reduction perspective as it might discourage some individual-based self-insurance strategies such as build-up of assets and risk-sharing arrangements.

In sum, optimistic-bias and *otherness* incorporates conditions such as the achievement domain, education and wealth differentiation perceptions, which are the sources of bias and other-oriented context thinking. Such stereotypes are context dependent and in a proper understanding of *otherness* and optimistic-bias it is important to understand human behaviours within contexts and to alter their trajectories as they might influence risk-reducing practices and strategies.

Broadening the theoretical base to understand complexity and diversity

The breadth and the width of the issues discussed in the preceding sections lead to a further assault on a realist unitary ontology and its epistemology. Conventional generic approach to risk analysis does not enable us to capture the richness, depth and complexity of the issues studied in this thesis. In view of complexities and diversities of perceptions of and responses to risk, the conventional doctrines appear inadequate.

Further, attempts to ground perceptions in contexts (shown in Figure 2) and to explain the complexity, a single disciplinary approach would not be adequate. A belief that a single method can be used to investigate any domain of reality does not hold. This has to be an impetus for shifting to another ontology, epistemology and methodology. The focus is on reiterating the importance of an integrative theoretical stance that has to mesh with multiple realities and truth on the ground. The main reason for a double emphasis is that a holistic perspective focussed on multiple and collective perceptions and visions of farmers would enable us to understand the subjective and intersubjective meanings that the farmers share and use in the everyday decision-making process. This might serve as a basis on which to pin sound risk-reducing and risk-mitigation strategies that are more suited to the different groups of farmers in rural areas.

5. Conclusion and implications

5.1. Concluding remarks

The main goal of risk reduction and mitigation in the Eastern Highlands of Ethiopian context is not about the farming business survival *per se* which lies in the heart of conventional economics. It is about the daily survival of livelihoods that motivate farmers to reduce risk in a limited natural resource arena and boisterous environment. Probably, family sustenance is the longstanding concern. It is about a struggle for their very existence and self-perpetuation. Unfortunately, at the moment the conventional risk analysis is locked in *ex post* analysis with limited insights concerning the future. However, reducing risks (*ex ante*) in a harsh environmental setting calls for platforms for stakeholder's participation and continued learning and adaptation. Such a platform needs a system of analysis that can be flexibly adapted to changing environmental situations, a system that is capable of learning from the current situation and diverse social context. This requires sensitivity to farmers' multiple views, perspectives and opinions.

While the results presented in this study are based on data from two Woredas in the Eastern Highlands of Ethiopia, they nonetheless provide a good basis to enhance understanding about sources of risks, multiple perceptions and differentiated responses of farmers. The results illustrate that the conjunction of risks from natural, economic and socio-political sources constitute a major challenge to livelihoods. It has become also evident that there are highly complex and differentiated natures of risk perceptions and risk responses. The findings vividly show that there are numerous perspectives, visions and insights among farmers from which one can identify the inherent lacunae in the area of perceptions of risks, 'learning' and risk responses both by farmers and also by experts.

Important insights were gained regarding the *ex ante* measures taken by rural households to protect themselves from drought-induced income shocks. These insights might direct policies at reducing vulnerability, *i.e.* risk of future poverty. It has been shown in this thesis that some household characteristics, human capital and opportunity variables are significant in explaining differences in perceptions of risks, access to information, 'learning' and risk responses of farmers. This thesis has demonstrated use of a broader and integrative framework to encourage future research in risk analysis in relation to smallholder subsistence oriented agriculture. Drawing on an integrated theoretical stance, the thesis suggests an epistemological and methodological framework for understanding multiple risk perceptions, responses and learning. It is, therefore, concluded that use of integrative theoretical perspectives is necessary to get deeper insights of complex issues and multiple perspectives of rural communities in relation to risk perceptions and responses.

5.2. Implications

Some methodological, theoretical and policy implications are outlined under the following major headings.

5.2.1. Methodological implications

The following methodological implications derive from this study regarding perceptions, responses and social learning from the perspective of agricultural risks.

- Specific qualitative methods, such as in-depth interviews and focus group discussions, are indispensable in risk study to understand the different meanings farmers ascribe to risks. To illuminate complex issues, the use of a qualitative research methods that combines various types of inquiries, with follow-up of a formal survey, proves useful to capture the societal and idiosyncratic worldviews of farmers on risk perceptions and responses. This is because empirically grounded methodology is needed to probe, understand and explain the complex issues.
- Plurality of methods would enable us to uncover contextual issues (gender, environment, culture, history, socio-economic), complexity and diversity. Use of well integrated qualitative and quantitative research methods make triangulation of information possible and it enhances the methodological merits. Dercon (2000:29) writes that integrating qualitative data collection into quantitative household surveys is bound to yield less contradictory evidence than presently seems to be found by the different approaches, for example on the effects on vulnerability and poverty from economic policies.

5.2.2. Theoretical implications

The following theoretical implications emerge from this work.

- Marketing responses are highly idiosyncratic in the Eastern Highlands of Ethiopia. The point is that farmers respond individually to risks according to their own way of analysis or frames of perception in relation to marketing based strategy.
- Risk perceptions and risk responses are differentiated and complex. Consequently, holistic perspectives are needed to understand the different dimensions of risk. A shift in the centres of gravity of the analyses away from conventional single theoretical doctrine seems necessary.
- Variables that emerged from the psychometric paradigm and farm structure theoretical component are found as significant precursors of both perceptions of sources of risk and risk responses, suggesting the use of an integrated theoretical stance. Variables that are selected based on the cultural theory paradigm did not enter into many models.

5.2.3. Policy implications: the way forward

The findings of this study suggest the following implications for policies. It is presented with the view that the results might enable the policy makers to better understand the contextual issues and that awareness might contribute to risk reduction and mitigation at local level.

- Enhancement of the provision of infrastructural services, such as roads and other transport facilities giving improved market access for farmers in remote areas might reduce risk in most cases through reduction of transaction costs. Also, access to assets, capital, land and natural resources are found to be very important in households risk reduction and risk mitigation capabilities.
- Rural non-farm and off-farm activities need to be encouraged. Small and medium enterprise development contributes to risk reduction by creating opportunities for the farmers. Skill development and improving access to micro-finance might encourage rural non-farm development that would benefit the poor. Toward this end, designing and implementing policies supporting rural livelihood diversification strategies such as non-farm activities are important. Investment in diversification of portfolio of activities would enable the farmers to diffuse the shocks and reduce future vulnerability to risks.
- The rural poor are a heterogeneous group whose deprivation can originate from many varying factors. Diversity and differentiation in rural livelihoods imply that needs and priorities will vary over time and space depending on local capability, endowments, constraints and opportunities. Differentiated treatment of farmer groups is suggested.
- Sources of risks to rural livelihoods are many and varied. Hence cross-sectoral policy linkages are required to address risks ranging from natural vagaries and health problems to the policy processes in order to attain sustainable rural development. In the context of sustainable agriculture and rural development it is important to ensure that those all-relevant stakeholders can make their complementary contribution to development (integration principle). In other words, there are crosscutting issues that need co-ordinated efforts.

5.3. Suggestions for future research

Based on the limitations of this study and the learning outcome in the research process it is warranted to suggest areas requiring further research. A follow-up research is suggested to address the following issues.

- To obtain a full understanding of risks it is imperative to complement the findings of this study with an in-depth analysis of the nature and degree of vulnerability of rural livelihoods over time and in space. Undertaking study

on risk perception and traditional risk management strategies in a wider area may enable us to understand the differences (such as ecosystems, religion, and culture) and the underlying reasons for the differences. Panel data collection and analysis would be crucial. Put more starkly, the interplay between temporal, spatial and cross-cultural dimensions with various facets of risks might open a window of opportunity towards better understanding of risks.

- Use of Geographic Information Systems (GIS) might also help us to compare and contrast 'objective data' with farmers' perceptions of different sources of risks in different localities. It would be also important to see the effect of the environment, *i.e.* biophysical, social, political, policy and economic, on the livelihoods, vulnerability and risk management strategies of farmers.
- The relationships between risk reducing and mitigation enhancing strategies and poverty-reducing potentials need to be undertaken under varying contexts. This is because it is useful to know the eventual impact of risk reduction on various dimensions of rural poverty, *i.e.* welfare impacts, as it enables us to construct a policy narrative to reduce vulnerability and strengthen the ability of communities, households and individuals to avoid consumption shortfalls due to risks. This will provide a basis for formulating policy that supports risk reduction.
- Farmers have different propensities to take risks, which vary from one individual to another depending on various characteristics including risk perceptions. So, tolerance threshold levels to crop and livestock losses and other risk factors might vary across different segments of rural households. Thus, it would be essential to explore empirical threshold limits for different actors under varying contexts.
- The study areas have a long history of reliance on relief assistance and life-saving measures. Habituation to rely on relief-food-aid might have an impact on self-reliance and self-image construction through instilled sense of dependency among the vast community of risk-prone communities. Continued dependency might also affect farmers' ability and willingness to search for sustainable problem-solving solutions for the complex problems they are facing. Hence, there is scope for research on the impacts of food-aid on households risk perceptions, eventual learning and risk responses.

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