# **Risk, risk information and eventual learning of smallholder farmers in eastern Ethiopia**

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## Abstract

This article explores sources of risk information, determinants of access to it, its reliability and determinants of learning in the farming systems of Eastern Ethiopia. Social learning and cultural theories are used to guide the investigation using a mixed methodology of quantitative analysis and qualitative interpretation of data from formal and informal surveys. Hypotheses that access information and learning and differ according to age, gender, education, religious faith and other characteristics of households are examined. Logit regression analyses are applied to test the hypotheses. Results of the informal survey showed that information is the key to judgment in the context of rural households. Results also show that the collection and use of early warning information is one of the on-farm risk management strategies in the Eastern Highlands of Ethiopia. Logit functions have mirrored that distance from markets and number of plots owned have significant associations with access to information. Differences in gender and marital status of household head, educational level, number of cattle owned and farm size were found to significantly affect self-evaluation of knowledge. Agro-ecological zone, experience in farming, family size, number of plots owned and access to information are associated with the use of externally supplied farm inputs. The findings strongly suggest that risk information is important in decision-making for farming households where substantial risks strike frequently.

# **1** Introduction

Risk is an issue of critical importance to smallholder farmers' decision-making and complex livelihoods in east Ethiopia [2,3,4]. For the farmers, the main issue

raised by variability of climate, price and other co-variate and idiosyncratic risks (biological, institutional, political) is how to respond and adapt systematically, contextually and dynamically to unfolding risks to minimize the possibility of losses and its downside consequences. In this context, risk information, the way it is communicated, reliability of the information and the eventual learning, i.e. knowing their way into the future, assumes importance to navigate in a complex and uncertain world. Because, information acquisition and learning would induce inertia to create correspondence with the context and to respond to various sources of risks, as they unfold. The point here is about change that might lead to an improved livelihood situation. In line with this, Noell and Odening [9, p. 153] argue that information collection and processing is, among other things, an important risk management activity. They contend that a decision-maker's learning can change his/her risk management behavior over time. Akin, Adesina and Ouattara [1], based on their work on small scale farmers in Côte d'Ivoire, argue that 'unless policy makers improve the availability of information that allows farmers to improve their managerial capacity for making more riskefficient cropping decisions it is unlikely that farmers will be able to cope with the pervasive risks that affect their welfare and livelihoods'. This argument uses the assumption that provision of information would enable farmers to make more informed decisions - whilst attributing communication of technical information to formal sources alone is debatable, as there are various informal sources of wisdom and information with varying contents and importance in the rural contexts. It is implied here that both 'top-down' and 'bottom-up' perspectives of risk communication are important.

From a social learning theory perspective, the increased emphasis on formal information sources produces higher levels of perceived risk [15]. Albeit, interpersonal sources such as friends and neighbors also play a significant role in risk perception by distributing information from formal and other informal sources more widely throughout the agricultural community. In line with this, Tucker and Napier [15, p. 221] argue that informal sources may also have access to information about specific local issues that formal sources do not. Therefore, increased communication with and/or with-in various farmers' groups are likely to be associated with risk perceptions and selection of risk management tools. In agreement with this, Belaineh and Drake [3] and Belaineh [4] claim that smallholder farmers in Eastern Ethiopia perceive risk subjectively, i.e. at individual and group levels, and respond accordingly. Perception of risk is subjective in the sense that it is susceptible to variations depending on the past contextual experiential learning, i.e. experiences of actors as primary sources of learning, provision of and/or access to information, trust in institutions and sources of information, farming and farmer's characteristics, interaction and status in the community and psychological mindset of the individual farmers and the groups.

The aim of this paper is to explore farmers' preference for information and its sources; to understand how risk information is communicated within the farming community; to identify the determinants of access to information and learning; and to assess how farmers' value different types of risk information in terms of



content and reliability. This paper looks at the following pertinent questions. What are the main sources of information? Might there be a difference in access to information? How do farmers evaluate different types of risk information in terms of credibility? Is there a difference in preferences of information among different social groups and contexts? What are the determinants of access to information and learning?

# 2 The setting

Risk proneness, diversity, heterogeneity and complexity in many aspects of the farming systems characterizes Eastern Ethiopia [5]. It is a complex setting where multiple risks originating from stochastically fluctuating factor and product prices and physical and policy environment are recurrent in the absence of institutions for risk sharing. In response to unfolding events, farmers take a series of action [4] to better prepare for and cope with risky situations. In such circumstances, the key to survival is adaptive measures, i.e. response to a changing context, and subsequent adjustments. Such measures require a diversified, i.e. a combination of various on-farm, off-farm and non-farm, portfolio of survival and income earning activities [4,5] in which up-to-date risk information and learning is instrumental in terms of framing farmers' risk perceptions and responses. Some risk sharing occur in these areas even in times of shared hardships through the social networks and connectivity. Still, survival needs own active and critical engagement in learning and complemented with contribution from other members of the community. It is counterproductive not to learn and adapt to emerging and re-emerging risks in a system where dealing with unpredictable future is part of daily life.

It is important also to understand the socio-cultural context in which decisions are made in Ethiopia. Individual farmer acts alone but there are also many issues that need group decisions and actions. Multiple subjects characterize the sociocultural context in which decisions are made and executed jointly in Eastern Ethiopia. Elderly people, religious and village leaders, development agents, different gender and age groups bringing in different types of information that are area, time and context specific and at the same time with different values, beliefs and assumptions embedded in them. Despite this, synergistic interactions among various local actors give farmers an opportunity to share meaning and knowledge, experiences, learning through discussion and reflection and ultimately enables attainment of 'epistemic certainty' that is crucial in solving ill-defined, complex and emerging problems in the rural areas.

# 3 Methods

Questionnaire survey of 180 households was carried out following in-depth qualitative studies in two purposively selected districts (Meta and Fedis) in eastern Ethiopia.

The study was guided by social learning [12,13,14] and cultural [8,10,16] theoretical perspectives, as a single theoretical stance does not enable us to

understand complexities and diversities in view of variability in time and space. A mixed methodology of quantitative analysis and qualitative interpretation of data from formal and informal surveys were employed. From the preceding guiding theories and informal survey results the following central hypotheses were developed and tested. 1) That access to information differs among various social groups and contexts according to their background characteristics, including gender, age, education and religious faith on belief systems of individual smallholder farmers, and 2) that use of external inputs and self-evaluation in knowledge, i.e. proxy for learning, of farming differs among various social actors and contexts. Self-evaluation here refers to self-observation of reproduction (economic) and motivations for self-reinforcement, i.e. positive stimulation, in the face of recurrent risks.

Logit regression analyses were used to study the relationships of farm structure, socio-economic and demographic variables to access to information and learning and also to assess the merits of the theoretical perspectives used to guide this study.

## 4 Results and discussion

#### 4.1 Sources of information

The sources of information, with various contents, about various agricultural risks reported by the sample households are: i) media (radio and newspapers), ii) networks (relatives, friends/fellow farmers and neighbors, i.e. mostly ethnic based), iii) grass root administrative units (*Kebele*), iv) formal sources (development agents and health workers), and v) NGO staff and school teachers.

The most used sources of information were development agents, radio and other farmers. Use of radio, particularly, reflects the fact that multi-lingual nature of the farmers, daily t'chat (a mildly narcotic) chewing ceremonies, that serves as a forum for deliberations, and status of t'chat as major cash crop facilitates owning of the radio apparatus, switching to multiple local and international radio networks and information acquisition. 49.7% reported that they get information from radio and development agents, while 14.1% obtain from development agents alone. Combination of radio, development agents and fellow farmers i.e. 10.7%, were the next most used source, followed by radio, development agents and local administrative unit i.e. *Kebele*. The implication is that these channels should be used because they are effective, i.e. the farmers are reached.

The use of effective channels would help farmers to engage in active discussions and active learning. The resulting shared cognition, ascribed meaning, ideas, knowledge and learning might help in creating a common basis for collective response to complex and contextual problems on microcontext. Such shared meaning would help farmers to make sense of their situations, converge multiple perspectives towards a solution and facilitate enhanced learning. In the eastern Ethiopian context, the way out must be a collective endeavor and that has to be collectively negotiated, elaborated and learned.

## 4.1.1 Early warning techniques: what do farmers know traditionally?

In the rural areas of Eastern Ethiopia, communities have 'traditional experts' who learn from active experience, with asymmetry of impacts, and predict drought, disease and pest epidemic, excessive rains, etc. There are also 'local astronomers' who make predictions about the future depending on the positions of the stars. It is quite common to read entrails of sheep and goat at each household level to tell about the [type of] future, i.e. impending drought, health of household members and/or animals, birth of a child and/or an animal, conflicts and wars, etc. Information from time recalling experts who put hazards in an historical perspective is also used. In addition to these idiosyncratic practices, mysticism-believing, i.e. belief in fortune telling, also have some space in the early warning system. Consultation of witch doctors, consultation of coffee cups and roasted coffee beans are also used to determine the future of the rains, crop and livestock production activities, health situation, peace and stability. These signals are used as essential features of risk minimizing and management strategies of the rural livelihoods. These predictions are transmitted orally to the community through the social networks and information sharing continues. In sum, traditional early warning techniques known to and used by the farmers in Eastern Ethiopia are diverse, i.e. it comprises religious bound issues, natural phenomena related aspects like wind direction, onset time of rains, humidity, temperature, nature of clouds, various livestock indicators, etc. and it is 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. Most of the farmers (45.4%) believed that only God could determine what would happen 'tomorrow'. This is a point worth noting as it enables us to understand the intrinsic attitudes of such farmers toward risk and information. It appears that 45.4% of the farmers would prefer not to know what will happen next. Strategically, these farmers would like to remain 'ignorant' and/or they are information averse. This might imply that the farmers do not believe that they can predict the future. It is interesting to observe also that perceptions are religion bound and there are differences among different denominations. For instance, some differences are observed between the Christian and Muslim farming communities in their mythologies. For the Christians, variations in the characters of the four Gospels in their perfections, their true symbolic meaning and scope is pertinent, in forecasting what will happen next season. For the Muslims the lunar calendar has a great place in the early warning system. In Christian mythology Luke's year is associated with 'bad' harvest and famine while John's year is analogous with 'bumper' crop harvest and 'prosperity'. The visual local sighting of the new moon, position of the moon in the sky and other moon phases are used by the Muslims to predict the likelihood of disease and insect infestations and to decide the 'appropriate' times of crop and tree harvest.

The apparent implication is that, knowledge is acquired in a situated context and that 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 analyzed and individual mind evolves by interaction (e.g. Rizello and Turvani [11, p. 199]). Equally important, the question "what information is needed in the rural areas with the principal aim of risk reduction, rural growth and development?" should be anchored on the existing local understandings. It has to be underlined also that sharing information and involving local actors in developing solutions to risk problems may enhance creation and development of trust.

Another point worth noting is that farmers infer these early warning signals from actions and geo-referenced experiences. On that account, due weight needs to be given to the local 'knowledge'—hence mutual learning and understanding of the complexities. Sustainable response to risks would involve acknowledgment of such indigenous techniques and integration with formal system. This might increase community capacity to deal with risks through creating an environment for multilogue and sensitivity to the context. Bier [6, p. 144] after Rowan (1994:80) argues that one must begin by listening to the audience before giving the information. In sum, building mutually inclusive risk communication is crucial in mechanisms of designing adaptation strategies and in learning to live sustainably in a harsh environment.

#### 4.2 Information source credibility and trust

Analysis of data reveals that about 65.6% of rural households have rated information they receive from formal sources, i.e. development agents and health workers, as their first choice. In fact, this is the most used source of information in these areas, 47% of the respondents have good confidence in informal sources i.e. bond-friendship of fellow farmers and kin members, Kebelle, NGO staff, school teachers as they have selected as their first invaluable source, and 26.4% expressed confidence in the media, i.e. radio and newspapers. Confidence revealed in the informal sources is an interesting point worth pursuing. It 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 the society that is often based on achievement, i.e. relative wealth differentiation could explain this. It is implied here that, current status in the society matters and it determines the acceptance or rejection of an information source despite its content and/or relevance. In these areas, the trend is that information forwarded from the poorer is considered as less reliable while the poorer 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 quite common before considering an information from certain source as trustworthy.

## 4.3 Determinants of access to information

Access to information is expected to be affected by many factors. A logit regression function is estimated to understand the nature of these relationships. Regression results, i.e. estimates after collinearity diagnostics with varianceinflating factor, concerning determinants of access to information are examined. Among the 22 variables considered, i.e. continuous and binary, distances to markets and number of plots owned have significant coefficients. It appears that distance from markets has a negative effect on access to information. This suggests the importance of markets and market infrastructural elements in provision and communication of risk information. Market places in the rural areas are multifunctional as they provide opportunity for information sharing and interactions in addition to transactional function. Increased distance from markets lead to less access to information in these areas. Negative effects of 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 [4] 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. capitalizing on available opportunities, might provide more information with higher returns. The results have partly confirmed the hypotheses. Differences in broader structuring factors such as gender, age, religion, location, education and income levels are not found to significantly affect access to information in these areas.

## 4.4 Determinants of learning

In order to identify the effects of various explanatory variables on learning, logit models in which the dependent variables are 1) use of external inputs and 2) self-evaluation of knowledge, i.e. initially rated using five-point likert-type scales and later re-coded to 0-1 dummy, are assessed separately.

Several important results have been obtained from the analyses. First, considerable differences are observed in the results obtained from the two models. It is noted also that there are no common variables in the two equations. The first logit model with use of external inputs as a dependent variable suggested that agro-ecological zone (Kola - semi-arid land), experience in farming, family size, number of plots owned and access to information are associated with the use of external inputs. This result supports the thesis of social learning theory that posits human behaviors are affected by observation and by direct experience, e.g. as cited in Chih-Hsiung Tu [7]. Location and experience in farming are significantly and negatively associated with the use of external inputs. This may be explained by the fact that the Kola agro-ecological zone is the more drought and risk prone area characterized by rainfall variability, i.e. erratic and irregular in distribution. It is true also that there are no appropriate agricultural technologies delivered by the extension service for such marginal areas in the periphery. Even if the technologies are available their ultimate use is normally perceived as more risky. According to Walther (1992) cited in Chih-

Hsiung Tu [7, p. 30] the social learning theory emphasizes that behaviors result from both the social interaction of people and their environments. The environment in which farmers operate and make their living has an influence on farmers' thinking and learning. It is found also that access to information is significantly and positively associated with the use of external inputs. Hence there is evidence that access to information account for adoption of new techniques of farming and eventual learning.

The second logit model revealed that gender and marital status of household head, educational level, number of cattle owned and farm size significantly affects self-evaluation of knowledge. This result appears to hint that farmers are self-construal in evaluating their own knowledge in farming in relation to their fellow farmers as their assessments are basically based on own asset endowments. Inclusion of marital status in the model revealed that acceptance in the society as a responsible person to deal with has an implication on selfassessment. These findings are partially consistent with the hypotheses set forth.

Results also showed that gender of household head has a highly significant and positive association with assessment of own knowledge. Male household heads have assigned higher self-knowledge ratings than the female household heads. This difference stems from the notion that farming is mainly a 'man thing' under normal circumstances in these areas. Women get involved in farming activities mostly in response to force majeure, i.e. divorce, death of husband, and the like. Marital status and educational level of household head are found to have significantly inverse relationship with self-knowledge assessment. The reason why marital status has a negative and significant association with self-knowledge rating needs attention. Depending on the outcomes of various group discussions, this might be attributed to the perception of the married and elder farmers about the younger and single fellow farmers. The former understands that the latter are better-off in exposure to information, analytical competence and interpretive understanding, i.e. self-reprimand. It is interesting to note also that, the younger and single farmers are perceived as risk-takers with excessive optimism as they are not carers of the family and they have less to worry about. Regarding education farmers believe that they find their way by a continued process of trialand-error adjustments through time in different localities, and learning will proceed. To them, knowledge in farming is not a matter of prose literacy. Rather, it is a matter of pertinent information acquisition through role models and social interaction - the key for vicarious learning. Rizzello and Turvani [11:204] define vicarious learning as a change in behavior due to the experience of observing a model. To them, it is a re-enforcement learning. This has an implication on designing a means for delivering information to the farming community in these areas.

Farm size and number of cattle owned are positively and significantly associated with self-evaluation of knowledge. This reflects the underlying belief of the farmers about how knowledge and better asset base are acquired. Farmers who have access to bigger farm sizes and those who own more heads of cattle perceived that their success in farming is due to their better-off knowledge and skills in farming. Farmers who belong to such a group believe that they engage appropriately in the farming activity and learning because they perceive they work harder and get greater incentive. Most notably, the better-off farmers understand that the incentives are critical to make oneself aware of risks, motivate learning and act to diminish the impact of risk. Informal survey results have mirrored also that this attitude is the major source of optimistic-bias, i.e. hoping conditions will be better and they will not be affected by the future risks.

# **5** Conclusions

Access to information and its reliability, communication, subsequent learning and participation in decision-making are parts of the contemporary sustainable rural development discourse. In light of this, the paper points to the following aspects that influence information acquisition and learning in the rural context.

First, descriptive statistics results revealed that development agents; radio and informal peers are the main sources of information. Information received from formal sources is rated as most trustworthy. Ironically, issues raised during various group discussions mirrored that mechanisms for helping the rural communities to deal with risks should depend on local perceptions, conceptions and information at disposal. In this context metacognition and shared perceptual experience of the farmers and other stakeholders are pertinent. Because the extent to which farmers take on board the early warning and other technology related communicated information depend on how local cognitions, perceptions and conceptions are understood by the 'providers' of information and technology. A bottom-up perspective of information communication needs to be seriously considered implying that mutual learning and understanding are vital to bring about sustainable changes and to strengthen the local dynamics. Imposed communications are less desirable to the farmers, as they do not leave space for them to investigate their situations, to decide and act within their own sociocultural context. Hence, commitments to tackle actual issues that undermine the rural livelihoods need the spirit of co-learning and pluralism. This might lead to long-run learning outcome, i.e. better and sustainable rural livelihoods.

Second, regression analyses offered many important insights. First of all, this study clearly records that differences in self-evaluation of knowledge reflect differences in asset base of the households. Selfhood and relating the self to others is mainly asset endowment bound. To a lesser extent, it reflects also differences in structuring factors like gender, marital status and educational level of household head. It is instructive also to note the heterogeneity of farmers, as farmers understand the same information in different ways with different meanings and uses depending on the location and asset base, i.e. asymmetric learning. The way farmers viewed formal education is also worthy of pursuit. Farmers believed that they learn from experience and networking about various natural and human induced risks and how to engage in the future and survive in harsh environments. This view links anticipation and learning with everyday life decisions and actions, i.e. 'purposeful action is guided by expectations, not only by information' [11, p. 202].

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