Agriculture, Forestry and Fisheries
2014; 3(6-1): 1-5
Published online July 15, 2014 (http://www.sciencepublishinggroup.com/j/aff)
doi: 10.11648/j.aff.s.2014030601.11
ISSN: 2328-563X (Print); ISSN:2328-5648 (Online)

Risks in vegetables production from the perspective of smallholder farmers: The case of Kombolcha Woreda, Oromia region, Ethiopia

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To cite this article:
Kumilachew Alamerie, Mengistu Ketema, Fekadu Gelaw. Risks in Vegetables Production from the Perspective of Smallholder Farmers: The Case of Kombolcha Woreda, Oromia Region, Ethiopia. *Agriculture, Forestry and Fisheries.* Special Issue: Agriculture Ecosystems and Environment. Vol. 3, No. 6-1, 2014, pp. 1-5. doi: 10.11648/j.aff.s.2014030601.11

Abstract: In Ethiopia, vegetable crops are produced in different agro-ecological zones through commercial as well as smallholder farmers both as a source of income and food. However, due to perishable nature and biological nature of production process, vegetables productions are risky investment activities. In this context, risk perceptions play a key role in the production and investment behaviour of farmers in vegetable production decisions. However, in Kombolcha Woreda, only limited attention has been paid to understand the producers' risk perceptions in vegetable production. Therefore, in this study, analysis of the major sources of risks in vegetable production, on the basis of farmers' perceptions, was conducted. For the study, a two-stage sampling technique was used to select 130 sample households from six sample kebeles. Primary data collected through structured questionnaire and secondary data sources were used. A Likert scale, based on farmers' perception, was used to rank the various sources of vegetable production risks. The mean scores results, derived based on Likert scales, indicated that production and market risks were perceived to be the most important risk sources. Hence, price support mechanisms and inputs subsidy, education and training on formal risk management mechanisms (production contract, marketing contract, etc.); drought tolerant, and pest/disease resistant vegetable varieties and cultural and biological methods, and chemicals should be used to control such risks.

Keywords: Risk Perceptions, Vegetables Production, Likert Scale

1. Introduction

The economy of Ethiopia remains highly dependent on agriculture which contributes about 41 percent of GDP, 83 percent of employment and 90 percent of exports (EEA, 2012). However, the agricultural productivity is low due to use of low level of improved agricultural technologies, risks associated with weather conditions, diseases and pests, etc. Moreover, due to the ever increasing population pressure, the landholding per household is declining leading to low level of production to meet the consumption requirement of the households. As result, intensive production is becoming a means of promoting agro-enterprise development in order to increase the land productivity (Bezabih and Hadera, 2007). Vegetable production gives an opportunity for intensive production.

In the country, vegetable crops are produced in different agro-ecological zones through commercial as well as small farmers both as a source of income as well as food. However, the type is limited to few crops and production is concentrated to some pocket areas. In spite of this, the production of vegetables varies from cultivating a few plants in the backyards for home consumption up to a large-scale production for domestic and export markets (Dawit et al., 2004). Recently, despite of the ups and downs observed, the demand for vegetables especially for export is increasing (Tsegay, 2010). In fact, vegetables can generate high income for the farmers because of high market value and profitability. They also have high nutritive value compared to cereals (EARO, 2000). On the other hand, as vegetables are highly perishable, they start to lose their quality right after harvest and continued throughout the process until it is consumed (Kohl and Uhl, 1985). Hence, vegetables productions are risky investment activities.

Riskiness of vegetable production may be attributed to

several factors that are beyond the control of producers. Biological processes of plant growth and climatic conditions inherent in agricultural production cause random production shocks (Goodwin and Mishra, 2000; Holt and Chavas, 2002) such as harvest failure as a result of drought, frost, floods and other adverse climatic events; policy shocks (Dercon, 2002). Due to perishable nature and biological nature of production process there is a difficulty of scheduling the supply of vegetables to market demand. The crops are subjected to high price and quantity risks with changing consumer demands and production conditions. Unusual production or harvesting weather or a major crop disease can influence badly the marketing system. While food-marketing system demands stable price and supply, a number of marketing arrangements like contract farming provide stability (Kohl and Uhl, 1985). Hence, knowledge of small-scale crop producers' perception towards risk is important in designing strategies and formulating policies for agricultural development (Ayinde et al., 2008).

Perceptions steer decisions about the acceptability of risks and have a core influence on behaviours before, during and after a disaster (Rohrmann, 2008). To perceive risk includes evaluations of the probability as well as the consequences of a negative outcome (Weinstein, 1989). People normally evaluate risk and make decisions in relation to their whole life situation (Douglas and Wildavsky, 1982).

Risk perceptions play a key role in the production and investment behaviour of farmers in vegetable production decisions (Ali and Kapoor, 2008). Furthermore, better understanding of farmers' risk perceptions facilitates rational resource allocation decision in the farming system, rural financing and policy formulation. In this context, understanding risk is a key element in helping producers make better decisions in risky situations, and also provides useful information to policy makers in assessing the effectiveness of different types of risk protection tools.

Within the context of efforts to achieve safe, sound and sustainable production of vegetables, identification of risk sources plays a crucial role. So far, however, in Kombolcha Woreda, there are no significant studies that were conducted and documented based on farmers' indigenous knowledge about the sources of risks vegetable producers have been facing. In the absence of such type of studies the design and implementation of effective risk management strategies to increase farm productivity and ultimately to ensure food security in the area could be a problem. Therefore, this study has identified the major sources of risks in vegetable production based on farmers' perception and also the possible policy implications were forwarded.

2. Methodology

2.1. Description of the Study Area

The study area, Kombolcha Woreda, having an area of 446.61 km2, is found in the northern part of East Hararghe zone of Oromia National Regional State. It is located about 514kms south east of Addis Ababa and 14kms North West of Harar town. Komblocha Woreda bordered by Haramaya and Jarso woredas, Harari Regional State and Dire Dawa Administrative council. Altitudinally, it extends between 1200 and 2460 masl. Of the 19 Kebeles (peasant associations) in the woreda, 7 (37%) are located in the lowlands (Kola) and the remaining 12 (63%) are located in the Woina dega. The annual rainfall of Kombolcha Woreda ranges from 600 mm to 900 mm (KWP, 2011). The Woreda has a total population of about 140,769 and more than 90% of the population resides in rural areas (CSA, 2008).

The crop-livestock mixed farming system is practiced in the woreda. The woreda's farming economy is characterized by small and fragmented land holdings. The rain-fed production system is most dominant and is practiced by the majority of the farmers. However, horticultural crops are often produced using irrigation. Farmers produce different crops like sorghum, maize, wheat, haricot bean, and fruits and vegetables. The woreda is one of the major producers of vegetables including potato, onion, cabbage, beet root, tomato, and lettuce (Bezabih and Hadera, 2007).

2.2. Method of Sampling

In order to undertake this study, Kombolcha Woreda was selected purposively since it has vegetable dominated-mixed farming systems. Then, a two stage sampling technique was used to select sample producers. Firstly, in consultation with the Woreda Agriculture and Rural Development Office, the vegetable producing Kebeles in the woreda were identified and categorized into kola and woina dega climatic zones. Then, a total of 6 kebeles were selected based on probability proportional to the number of kebeles in the two categories. Secondly, a total of 130 sample households were selected randomly based on the proportion to the size of household population from the selected kebeles.

2.3. Method of Data Collection

Both primary and secondary data sources were used to conduct this research study. To collect primary data, structured questionnaire was prepared. Primary data related to vegetable production in the study area and the perception of farmers' on the main sources of risks that they have been facing were gathered from the sample farmers. Secondary data was collected from Woreda Agricultural and Rural Development Office. Besides, different published and unpublished materials, bulletins and websites were consulted to generate relevant secondary data.

2.4. Method of Data Analysis

This study used descriptive statistics like mean, standard deviation, frequencies and tabular analysis to examine and rank sources of risks based on farmers' perception. In

addition, a Likert scale (responses on a 1-5 scale (1=no/negligible risk, 2=low, 3=medium, 4=high and 5=very high risk) has also been used to rank risks. A Likert scale is a psychometric scale commonly used in questionnaires, and is the most widely used scale in survey research. When responding to a Likert questionnaire item, respondents specify their level of agreement to a statement. The scale is named after its inventor, Rensis Likert. To have a rank of the different sources of risks, the mean of the five Likert scales were used.

3. Results and Discussion

3.1. Types of Vegetables Produced in the Area

In Kombolcha Woreda, different types of vegetables are grown with different intensities in terms of land and other input allocation, purpose of production and marketability. The most commonly grown vegetables in terms of the number of growers are Irish potato (78.5%), cabbage (42.6%), onion (28.5%), carrot (20%) and beetroot (13.1%) (Table1).

Table 1. *Proportion of households producing vegetables (2011/12 production year)*

Crops	No. of producers	Percent	Relative importance
Irish potato	102	78.5	1
Cabbage	55	42.6	2
Onion	37	28.5	3
Carrot	26	20.0	4
Beetroots	17	13.1	5
Sweet potatoes	11	8.5	6
Tomatoes	7	5.4	7
Pepper	2	1.5	8
Lettuce	1	0.8	9

Source: Own survey, 2012

The vegetables in the study area are produced as sole cropping and intercropping with other vegetables or other crops. Most farmers are practicing sole cropping vegetable production system. Intercropping is also practiced by farmers to grow two or more crops simultaneously on the same land. The crops may or may not be planted or harvested at one time. Farmers mostly produce Irish potato, sweet potato, and local cabbage together with cereals.

The findings of the study reveal that only 13.1% of vegetable producers intercropped vegetables with other crops during the last production year. This is due to the small area allocated to vegetable production, economic use of irrigation water and expected high yield for cash generation. On the other hand, different parcels of the same plot are allocated to different types of vegetables, which are intercropped with other vegetables.

3.2. Major Sources of Vegetable Production Risks

Generally speaking, agricultural risk is associated with negative outcomes stemming from imperfectly predictable biological, climatic, and price variables. These variables include natural adversities (for example, pests and diseases), climatic factors not within the control of agricultural producers, adverse changes in both input and output prices and financial losses. To set the stage for dealing with risks in vegetable production, the risk sources were classified into different groups. These sources of risks were categorized into technical, market, social, institutional and financial risk sources and analyzed to find out their order of importance in decision making. To determine their importance the mean scores and standard deviations (SD) in farmers' responses towards various drivers of risks in production of vegetables were analyzed. The perception of farmers on vegetable production risks was assessed using the five point Likert scale; 1 meaning no risk and 5 meaning very high risk. This method of analysis is consistent with other studies (e.g. Ali and Kapoor, 2008; Rees, 2009). The results of the study are presented in Table 2 below.

Table 2. *Mean scores and rank of major vegetable production risk sources*

Sources of risks	Percentage response					Mean	SD	Rank
	1^R	2^R	3^R	4^R	5^R			
Technical/production								
Drought	10.8	20.8	21.5	41.5	5.4	3.10	1.126	2
Pests/diseases	19.2	10.8	50.0	16.9	3.1	2.74	1.053	3
Termites/insect attack	26.9	18.5	37.7	15.4	1.5	2.46	1.094	4
Flood/high rainfall	34.6	30.8	22.3	7.7	4.6	2.17	1.128	6
Market/Price								
Output price fluctuation	10.0	21.5	23.1	26.2	19.2	3.23	1.267	1
High costs of inputs	30	22.3	31.5	13.1	3.1	2.37	1.135	5
Human /Causal/Social								
Illness/injury/death of operator/member	50.0	30.8	13.1	5.4	0.8	1.76	0.930	7
Changes in family relation	43.8	44.6	6.2	3.1	2.3	1.75	0.881	8
Theft	53.8	29.2	10.8	3.8	2.3	1.72	0.966	9
Conflict and violence	63.8	21.5	6.2	6.2	2.3	1.62	1.007	10
Institutional								
Changes in policy & rules	80.8	5.4	7.7	3.8	2.3	1.42	0.955	11
Financial								
High cost of credit	89.2	4.6	4.6	1.5	0	1.18	0.581	12

Source: Own survey, 2012
Note: 1^R=no risk, 2^R=low risk, 3^R=medium risk, 4^R=high risk, 5^R=very high risk

Farmers' perceptions about the technical/production sources of risks in vegetables production are presented in Table 2. An important characteristic of yield/production risk is that its level can be influenced by the level of input use: while some inputs increase the level of yield risk, others will reduce it (Tveterås and Wan, 2000). It is quite clear that farmers are vulnerable to natural conditions such as drought and high rainfall. Risks due to pests and diseases in vegetables have also emerged as an important concern in farmers' responses. According to Dinham, (2003) vegetables, generally, are susceptible to a wide range of pests and diseases, and require intensive pest management. Drought (mean 3.10) were found to be the top ranked sources of technical risks, followed by pests/diseases (mean 2.74), termites/insect attack (mean 2.46) and flood/high rainfall (mean 2.17). As it is seen in Table 2 about 5.4% of the respondents said that drought risk was very high.

Marketing of vegetables has become one of the critical areas where farmers are exploited (Ali and Kapoor, 2008). Market risks are the result of variations in supply and demand for crops that are not subjected to price controls and the inability of controlled markets to respond timely and efficiently to changes in the market conditions. Variations in the market price fetched by the farmers are a reflection of the market risk. Market risks may be due to factors affecting the timely delivery of produce to markets or quality of produce (e.g. poor feeder roads, non-existence of storage/transportation facilities, bulk and perishable nature of the produce). Consequently, farmers are forced to sell their produce to the traders at cheaper prices. The steep fall in market prices during the harvest season has been the most common grievance of the farmers. Therefore, output price fluctuation (mean 3.23) is the most important market risk followed by rising cost of inputs (mean 2.37).

Social/human risks in production of vegetables are associated with human resources. The major sources of social risks in production of vegetables are loss of family member, illness or health hazard and unemployment. Social risks can also be derived from human factors such as theft, strikes, accidents, conflicts and violence, etc that can lead to unexpected decline in yield or total loss of output. In addition, farmers face uncertainty about the economic consequences of their actions due to their limited ability to foresee factors like change in prices and biological responses to different farming practices. Based on the farmers' perceptions about the social sources of risks in vegetables production illness/injury/death of farm operator (mean 1.76) were found to be the top ranked sources of social risks, followed by changes in family relations (mean 1.75), theft (mean 1.72), and conflict and violence (mean 1.62).

According to Harwood et al., (1999) institutional risk results from changes in policies and regulations that affect agriculture. This type of risk is generally manifested as unanticipated production constraints or price changes for inputs or for output. For example, changes in government rules regarding the use of pesticides (for crops) may alter the cost of production or a foreign country's decision to limit imports of a certain crop may reduce that crop's price. Other institutional risks may arise from restrictions in conservation practices or land use, or changes in income tax policy or credit policy. The survey result indicates that a change in policy and rules (mean 1.42) in the study area is not common.

Borrowing to finance farm enterprises exposes farmers to financial risk. Financial risk occurs when enterprise profitability (rate of return) is less than the cost of using capital fund. It varies directly with financial leverage ratio (debt/equity ratio) and inversely with profitability. As Taiwo and Ayanwale, (2005) stated, level of profitability of an enterprise depends on yield and prices of output and, inputs (cost of capital inclusive), and thus financial risk is a by-product of business risk. However, in this study, high cost of credit, one type of financial risk, is found to be very low (mean 1.18).

Overall, the biggest challenge to farmers and the most important source of risk perceived by respondents is vegetable price fluctuations as it is reflected in its high ranking (mean 3.25 on a five point Likert-scale). The perishable nature and biological nature of production process may create imbalance between supply and market demand for vegetables. The second important source of risk identified by respondents is drought (mean 3.10). Pests/ disease and insect attack were ranked as the third and the forth important vegetable production risk sources with mean score of 2.74 and 2.46, respectively. The next most important sources of risks are high cost of inputs and flood, respectively. Therefore, production and marketing risks are the most important risks sources in the study area.

4. Summary, Conclusions and Recommendations

4.1. Summary and Conclusions

The agricultural production environment, in general and vegetable production, in particular is risky in Kombolcha Woreda and farmers rarely know the outcome from their farming each year. Therefore, to assist farmers to earn stable return from farming, it is necessary to know the risk sources and risk reducing strategies in the production of vegetables.

The objective of this study was to provide empirical findings of major sources of risks farmers are facing in vegetable production in Kombolcha Woreda. The results suggest that production and price risks were generally perceived as the most important sources of risks. Of all the risk sources, output price fluctuation, drought, pests/diseases, termites/insect attack, high costs of inputs, flood/high rainfall, illness/injury/death of operator/member, changes in family relations, theft, conflict and violence, changes in policy and rules, and high cost of credit were of important concerns in that order of importance.

4.2. Recommendations

The mean score results of farmers' perception on risk sources indicated that output price fluctuation, drought, pests/diseases, termites/insect attack and high costs of inputs are the most important sources of risks in vegetable production in the study area. Hence, to reduce such risks the following points are recommended.

1. Price support mechanisms and inputs subsidy should be provided to cope with the increasing input and output price volatility.
2. One strategy could be to support education and training initiatives which would enable farmers to use formal risk management mechanisms such as production contract, marketing contract and etc., to cope with downturns in commodity prices and price exploitations.
3. Vegetable varieties that are drought tolerant, and pest and disease resistant are needed to reduce yield variability due to drought, pests and diseases. So, research efforts should be focussed on disseminating such varieties.
4. Vegetable producers should use cultural and biological methods, and chemicals/pesticides to control pests and insects.

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