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Onion Farmers Attitudes Towards Risks in West Shewa, Ethiopia. Application of Discriminant Analysis

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Abstract
Agricultural risk is changing with high frequency and severity due to climate change and market liberalization. Onion is one of the basic ingredients in the Ethiopian cuisine and thus an important crop. The study was carried out to identify risks involved in onion farming in West Shewa, Ethiopia. Specifically, the study examined the risk attitude of farmers, factors influencing risk attitude as well as farmer's perception on major sources of risks. The sample size was 300 farmers and data were collected using a semi-structured questionnaire. Both descriptive and econometrics analysis were employed in data analysis. Linear discriminant model showed that education status, household size, other sources of income, membership of association, proportion of farm income to total income, availability of storage facilities and gender affect the risk attitudes of onion farmers in the study area. The kruskal-wallis ranking analysis showed that weather dependency and damage by pest and disease were perceived as the highest ranked sources of production risk while low price for produce, poor product handling, and packaging were perceived as the highest sources of market risks as ranked by the onion respondents. For production and marketing risks, the result showed that the five sources of risks in the onion respondents were significant at 5% significance level and that they are statistically different from one another. Out of the total sample respondents about 65% of the onion farmers maintained good relationship with traders as an effective risk management strategy. Based on the study findings, it is recommended that introduction of a more comprehensive agricultural insurance scheme and improved technology can ameliorate the effect of risks on onion farmers. In addition, public intervention can facilitate better risk management through improved information system.
Keywords: Kruskal-wallis ranking, linear discriminant model, risk, Onion, farmers

Introduction and Justification

Risks in agricultural enterprises have been classified as business risk and financial risk (Hardaker *et. al.* 1997). Ali and Kapoor (2008) evaluated perceptions of farmers about risk face when producing fruits and vegetables. Farmers were asked to indicate perceptions of risks using a five point Liker scale where one meant strong disagreement and five meant strong agreement with a specific source of risk. Sources of risk were classified into five categories: 1) investment risks; 2) socio-economic risks; 3) environmental risks; 4) production risks; and 5) market risks. Ali and Kapoor presented means and standard deviation for all risk sources evaluated. Regardless of perceptions of risk sources among fruit and vegetable producers in this study, more than 50% of them indicated not using any risk management strategy.

According to Hardaker *et. al.* (1997) risk management means identifying a risk and a range of options, then evaluating, selecting and implementing an action. Business risk management means "knowing the business," and conducting it in a skillful manner. Classes of business risk include production risk; price or market risk; institutional risk; and human or personal risk. 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, 2016). However, the agricultural productivity is low due to use of low level of improved agricultural technologies, risks associated with weather conditions, diseases, 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 to increase the land productivity. Vegetable production gives an opportunity for intensive production (Emana and Gebremedhin, 2007).

The increasing vegetable production also contributes to commercialization of the rural economy and creates many off-farm jobs (Lumpkin *et al*., 2005). At present following tomato, onion (*Allium cepa*) is one of the most popular vegetables in the world. It is the recently introduced bulb crop in the agricultural community of Ethiopia in the early 1970s and it is rapidly becoming a popular vegetable among producer and consumer (Tadesse, 2008).

In Ethiopia, the existing income generating capacity of vegetable as compared to its immense potentials at the macro and micro level is not encouraging. Thus, in 2005/06, the volume of export of vegetable was 26.3 million kilogram. In 2010/11, however, it reached 54.8 million kilogram recording a 108.2 percent increment. The foreign exchange earnings, which was $ 11.1 million in 2005/06, is also surged up by 147.5 percent to reach $ 27.5 million in 2010/11.For the past 5 years ,the volume and value of export has been increasing ,on average ,by annualized growth rate of 8 and 6 percent respectively. On the other hand, in the year 2007/08 and 2008/09, Ethiopian's supply of vegetable to the international market reduced drastically. Indeed, the decline in the volume of export is directly reflected on the foreign exchange earning of the country. As a result, earning reduced from 14.3 million of $ in

2006/07 to 9.6 and 8.9 million of $ in 2007/08 and 2008/09 respectively. However, after 2008/09, the volume of vegetable export recovered and increased sharply by annual growth rate of 91.8 and 42.8 percent in 2009/10 and 2010/11, respectively (CSA, 2015).

Onion is valued for its distinct pungency or mild flavour and form of essential ingredients of many dishes. It is consumed universally in small quantities and used in many home almost daily, primarily as a seasoning for flavouring of dishes, sauces, soup, and sandwiches in many countries of the world. Onion also contains Vitamin B, Vitamin C, carbohydrate, and small percent of proteins (Lemma *et al*., 2004). It contributes substantially to the national economy apart from overcoming local demand. According to marketing report (ETFRUIT, 2005) the average annual sale of onion was estimated about 2.0 million birr. This indicates that Ethiopia has high potential to benefit from onion crop. It is one of the most important cash generating crops for farmers especially around East Shewa Zone (CSA, 2011/12).

The sustainability of onion production depends on efficient marketing system. The qualitative and quantitative analysis of onion production and marketing determines the level and extent of production efficiency and market perfection. Even though onion is largely grown in Ethiopia, the national average yield in general and district located in West Shewa in particular is low ranging from 0.5 to 0.8 tons per hectare, which is far below the corresponding yield recorded at research site (2.5 to 3 tonnes per hectare) using improved varieties (Sisay, 2004). The low national mean yield observed for onion could be attributed to various constraints related to low marketing facilities, lack of access to improved varieties of seed and poor cultural practices (Rehima, and Dawit *et al.,* 2012).

The production of horticultural crops using irrigation is a major element of the farming system in the West Shewa Zone of Ethiopia. In the areas where irrigation water is available and farmers have better agricultural marketing networks, horticulture production is a major source of cash income for the households and one of the major sources of livelihood for a large number of transporters, intermediaries, and traders in the area. Vegetable production in West Shewa Zone is mainly constrained by seasonality where surplus at harvest is the main characteristics of the product (mainly Tomato and Onion). The nature of the product on one hand and lack of organized marketing system on the other often resulted in low producers' price. The lack of a shift from subsistence to commercial farming in spite of such comparative advantage may have different reasons like high risks, high transaction costs, limited food markets, limited insurance options and limited access to credit (ZOoARD, 2016).

The past studies in Ethiopia (Edossa, 2014; Emana and Gebremedhin, 2007, Emana *et.al.* 2015) have looked at value chain analysis of vegetable and vegetable production and marketing literature on risk analysis that captures the sources of risks is scarce. Further, despite the fact that vegetable production are spreading rapidly in both developed and developing countries, the share of smallholder farmers in developing countries affected by them is still small (Van der Meer, 2006). Onion is economically and socially important, onion marketing and production risks and producers perception towards different sources of risks have not yet been studied where great potential of onion production exists. Therefore, this study has the purpose of investigating onion production and marketing risks and factors affecting onion producers' attitudes towards risks on a variety of sources would be discussed. The general objective of the study is analysis of risks in onion farming in West Shewa, Ethiopia. The specific objectives of the study are to determining onion farmer's attitudes toward risk, analysis factors influencing the farmer's attitude towards the risks in onion farming and Assess farmer's perception on major sources of risk in onion farming

Methodology

West Shewa (Afaan Oromo: *Shawaa Lixaa/Dhihaa*) is one of the zones of the Oromia Region in Ethiopia. This zone takes its name from the Kingdom or former province of Shewa. West Shewa is bordered on the south by the Southwest Shewa Zone and the Southern Nations, Nationalities and Peoples Region, on the southwest by Jimma, on the west by East Welega, on the northwest by Horo Gudru Welega, on the north by the Amhara Region, on the northeast by North Shewa, and on the east by Oromia Special Zone Surrounding Finfinne. Its highest point is Mount Wanchi (3386 meters); other notable peaks include Mount Menagesha and Mount Wachacha. Towns and cities in West Shewa include Ambo.

The study was conducted in West Shewa Oromia Regional State, Ethiopia. To address the objectives of the study three districts were selected purposively based on actual production amounts of onion in 2015/16 production periods. Then, 12 villages were selected based on probability proportional to the number of kebeles. About 300 sample households were selected randomly based on the proportion to the size of household population from the selected kebeles and respondents from the selected villages were interviewed in the 2016/17, to find their risk perception on the cultivation of vegetables. The data related to farmers' perception on various sources of risks in vegetables production and marketing was collected using a pre-tested structured questionnaire. In addition to socio-demographical information about the onion farmers, a variety of questions asked to gather responses on risk perception on a five-point Likert scale ranging from 1-5, where 1 meant strong disagreement and 5 meant strong agreement with a particular risk source (WP, 2016).

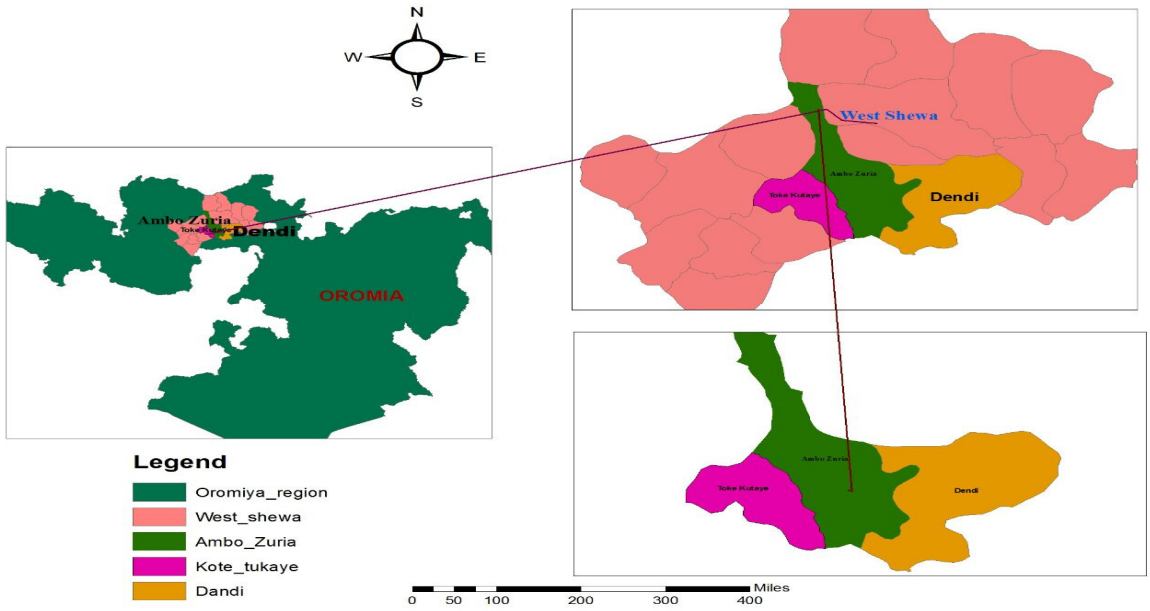

Figure 1: Map of study area.

Finally, 300 sample households were interviewed from each sample kebeles randomly and proportionately. The sample size was determined by random likelihood sampling method (Cochran, 1977). Both primary and secondary data sources were collected to conduct this research study. To collect primary data, structured questionnaire was prepared. Primary data related to onion production in the study area and the perception of farmers' on the main sources of risks that they have been facing was gathered from the sample farmers. Secondary data was collected from Districts Agricultural and irrigation Office. Besides, different published and unpublished materials, bulletins, and websites were consulted to generate relevant secondary data on the vegetables production and marketing risks in study area.

The following tools was employed in the analysis of the data collected; Descriptive Statistical Analysis, Linear Discriminant Analysis and Kruskal–wallis One Way Analysis of Variance (ANOVA) by Ranks. Descriptive statistical analysis was used to examine the socio-economic characteristics of onion farmer, determine the production resources in onion farming and assess farmer's perception on major sources of risk in onion farming. The descriptive statistical tool that was employed includes; percentages, frequency distribution, mean, t-test and chi-square. These tools were used to analyze the socio-economic onion grown, their production practices, cropping patterns and income distribution. These tools were also used to profile farmers' strategies at combating risks in onion farming. 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) was 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 was used (Holt and Chavas, 2002).

The farmer's rating of the items was summed up to yield an average score of farmers, which was a method of measuring farmer's attitude. A lower average score for an individual's indicates to correspond to a high degree of risk aversion. An average score of three corresponds to risk neutrality. While strong agreement average score of five corresponds a risk-seeking attitude. The method of data analysis for the development of the risk attitudinal scale was implemented by employing reliability test on the risk management statements. Reliability testing is defined as the proportion of variance attribute to the true score of the latent variable (DeVellis, 1991). The most frequently used in measuring the reliability is Cronbach's coefficient alpha. Cronbach's coefficient alpha was used to evaluate the degree of communal variation of risk attitudinal scale (Bard and Barry, 2000; Lagerkvist and Carl, 2005). It is measure as:

$$\alpha = \frac{k(1-\sum \alpha_i^2)}{(k-1)\alpha y^2}$$

Where α is the Cronbach's coefficient alpha, k is the number of statements (items) in the scale, α_i is the variance of the i^{th} statements and αy is the total variance of the k-item scale. The Cronbach's coefficient alpha is ranged from 0 to 1 and the acceptable level of the Cronbach's Alpha coefficient is between 0.70 and 0.80 (DeVellis, 1991; Nunally and Bernstein, 1994).

The reliability test aim to attain highest alpha. The reliability of attitudinal scale can improve the Cronbach's coefficient alpha by deleting and removing items from the range of original scale. The Corrected Item Score Correlation (CISC), which have negative, and very low item scale correlation were deleted to generate an improved alpha. Both scales were then optimized by deleting statements with a negative or low-item scale correlation. This iterative procedure proceeds until the total alpha value cannot be increased any further. Continuing to delete statements would reduce the total alpha value. This was done to obtain a refined set of statements for each farm type that reliably measures farmer's risk attitudes. It is represented as:

$$r_{i(y-i)} = \frac{r_{yi}\sigma_y - \sigma_i}{\sqrt{\alpha_i^2 + \alpha_y^2 + 2\sigma_i\sigma_y r_{yi}}}$$

Where r_{yi} is the correlation of statements (items) i with total score y, σ_y is the standard deviation of the total score of y, σ_i is the standard deviation of item i, and $r_{i(y-i)}$ is the correlation of item i with the sum of scores of all statements (items), excluding of item i (Bard and Barry, 2000 and Lagerkvist and Carl, 2005). If further deleting the statements reduced the overall coefficient alpha, the reliability scale cannot be increased to any further extent and thus, the scale of statements has been optimized in explaining the risk attitudes.

Linear Discriminant analysis

Linear Discriminant Analysis (LDA) was used to determine the risk attitude of vegetable farmer and examine the factors influencing the farmer's attitude towards the risks in vegetable farming. Discriminant analysis is a statistical technique to classify objects or individuals into mutually exclusive and exhaustive groups based on a set of measurable features that describe the objects or individuals. In general, we assign an object to one of a number of pre-determine groups based on observations made on the object (Teknomo, 2006). Discriminant analysis requires a nominal dependent variable and independent variables that could be nominal, ordinal, interval, or ratio (Klecka, 1980). Therefore, discriminant analysis was conducted to explore quantitatively the relationship between farmer's attitude towards risk and factors influencing this attitude in vegetable farming. Salau (2009) used discriminant analysis to determine the factors influencing the risk attitude of farmers in maize farming. For the nominal dependent variables, farmers were classified into three groups as follows:

- ✓ Group 1 – Risk Averse
- ✓ Group 2 – Risk Neutral
- ✓ Group 3 – Risk Taker

The independent variables, which consist of socio-economic and farm characteristics included in the model were the following; experience, education status, household size, total area of land cultivated, other sources of income, membership of association, total estimated expenditure per month, proportion of farm income to total income and Gender.

Definition and Hypothesis of Variables

Age was hypothesized as inversely related to farmers risk attitude. This implies that the lower the age of the farmer, the more risk averse he/she was. According to Aye and Oji (2007), older farmers are more likely to have accumulated more wealth than younger farmers. In addition, older farmers are more likely to have greater social capital and incentives, which can serve as some form of traditional insurance or fallback strategies in the process of decision-making.

Previous studies have found mixed results in terms of the effect of age on farmer's attitudes towards risk (Mishra and El-Osta, 2002). Farmers with low experience generally lack some farming skills. The lack of skill then increases their fear of the risks inherent to agricultural production and consequently their needs to resort to risk management strategies. Therefore, the studies hypothesize a negative relationship between experience and the farmers' adoption decision.

Whether the farmer owns the farm or is actually in a sharecropping system may have different effects on the farmer's adoption decision. The relationship between land ownership system and farmers attitudes towards risk appears ambiguous (and depends on the particular strategy). The larger the household size, the greater was the total consumption needs of the farm family and hence, the more risk-averse behavior a food crop farmer would put up. The study hypothesized a negative relationship between household size and farmers risk attitude. This implies that majority of the households might get household members assisting on the farm by supplementing its labor supply especially during peak periods (e.g. weeding and harvest times) of labor requirement. Farm size is hypothesized to have a negative effect on the farmer's attitudes towards risk. The larger farm size is related to a larger asset base from which to draw resources. Consequently, a higher farm size signals a larger capacity for bearing risk and a lesser need for risk management instruments (Velandia *et al,* 2009).

Level of education was an inverse relationship with farmer risk. This expectation is that the more educated respondents would be more willing to bear risk than the less educated ones. This buttresses the findings that at low

game levels education variable had little influence on risk attitudes, but at higher game levels, it generally reduced the level of risk and was often statistically significant (Binswanger, 1980). The result is consistent with that report that schooling has a positive impact on risk taking (Moscardi and de Janvry, 1977). Furthermore, it was hypothesized that producers with more education tend to adopt more sophisticated risk management tools.

Access to micro-credit was hypothesized as inversely related to farmers risk attitudes. This stands to imply that the more microcredit support is given to farmers, the less risk averse the farmers was become. This is because the financial support was enhance farmers' access to technological learning and improved production inputs that were lead to increased productivity. Thus, depriving farmers of access to micro financial services was make them prone to being more risk averse. Access to credit is a wealth indicator, which tends to improve farmer ability to bear risk. Nevertheless, increase in wealth can also favor the use of risk reducing strategies like diversification and precautionary saving.

The income status of the farmer was hypothesized as positive relationship with farmer's attitude towards risk. This stands to reason that the lower a household's income or poorer the household, the more risk averse it was. Hence, all other things being equal, households whose incomes fall below the poverty line would be less willing to take risk than those whose incomes are higher. Consistent with the findings that poorer farmers are more risk averse than wealthy ones and as such avoid prospects in which the probability of failure looms large (Mosley and Verschoor, 2003; and Lamb 2003).

Finally, study includes farmers' access to information captured by radio and/or TV ownership. Access to information may lower farmers' attitudes towards risk and therefore negatively affect the farmer's attitudes towards risk. Two location dummies represented by the two zones considered in the study area are also incorporate to take into account the geographical heterogeneity of the sample.

Kruskal-Wallis one-way analysis of variance (ANOVA) by ranks

Kruskal-Wallis ranking analysis was used to assess farmer's perception on major sources of risk in vegetable farming. This tool was used to measure the responses gathered from farmer's perception on sources of risks associated with vegetable farming. Fakayode *et al,* (2009) used Kruskal-Wallis One Way Analysis of Variance (ANOVA) by Ranks to assign priorities to identified constraints to Apiculture. The equation for estimating the ranks is outlined thus:

$$H = \frac{12}{N+1}\sum_{i=1}^{ni}\frac{1}{ni}\left(\frac{Ri - ni(N+1)^2}{2}\right)$$

Where R_i, is the sum of the ranks assigned to observation in the i^{th} sample and $\frac{ni(N+1)}{2}$, the expected sum of ranks for the i^{th} treatment (Wayne, 1990).

RESULTS AND DISCUSSION

In this parts descriptives statistics and econometrics analysis, conducted using was presented in two separated parts. The results revealed that farmers' characteristics between the three districts mean and proportion Table 1. The average farmland of the overall farms was 1.46 ha. Farmer's diversification of farm activity showed a high percentage (62.5%) in comparison to that for crop diversification (22.4%) of the sample of the onion farms. The highest share of crop diversification was noticed in Dandi district (88.5%). The distribution of crop diversification between the operators in three districts was significantly different from each other's at 5% significance level. Cereal crop and animal husbandry were the most frequently implemented diversification activities adopted in the study area; in Onion farms together with intercropping cabbage because the livelihood of farmers in the study area involved in cereal crops and husbandry activities.

Table 1: Demographic characteristics of the onion farmers, (n=300)

Item		Ambo	Dandi	Toke Kutaye
Farm land (ha)		1.8	1.3	1.29
Diversification of crops types (%)		22.4	13.5	18.9
Activity diversification (%)		62.5	88.5	58.5
Yield (Kg/ha)		1.37	1.4	1.34
Usage of improved technology (%)		11.3	10	19.6
Education (%)	Illiterate	25	28.5	23.6
	Primary	30.5	30.8	30.2
	Secondary	12.4	7.7	17
	Higher education	57.1	61.5	52.8
Age (%)	20-29 years old	17.1	25	9.4
	30-39 years old	34.3	40.4	28.3
	40-49 years old	19	9.6	28.3
	50-59 years old	10.5	5.8	15.1
	More than 60	19	19.2	18.9
Off-farm work (%)		58.1	46.2	69.8
Family labour (%)	Vary infrequently	3.8	7.7	0
	Infrequently	5.7	7.7	3.8
	Sometimes	8.6	3.8	13.2
	Frequently	51.4	42.3	60.4
	Very frequently	50.5	38.5	22.6

Source: Own elaboration using survey data, 2016

Toke Kutaye onion is classified as a supplementary irrigated crop and rain fed, which requires two operation during the winter season and end of summer season. Out of the total about 52% of the farmers still run their onion farm as a supplementary irrigated crop, most of them were concentrated in Toke Kutaye district. Rivers were the main water resource that the farmers relied on for irrigation purposes. However, the results show that only 45.7% of the total observed farmers had located around rivers that have capacity for irrigation. When the three districts compared in terms of education status Toke Kutaye district farmers was more educated than other district farmers. Furthermore, illiterate farmers were about 25% in the sample from Ambo district. Similarly, reliance on scientific materials in order to build a farm decision was recorded at a considerable percentage of 11.3%. It implies that educated farmers were able to adopt improved technology. This is speculated to be because educated farmers are exposed to more ideas, can use information more effectively, and simply have more experience making decisions (Caswell *et al.,* 2001).

The age distribution showed that most of the farmers (34.3%) were 30-39 years old. A notable share of old producers (>60 years; 19%) was also found. As well, family labor was detected as the main labor force in onion farm business. This may be attributable to their high education level, which enables them to easily find another job. Aged farmers were less involved in production of onion because they fear risk.

Risk Attitude

Onion farmers were asked to declare their degree of agreement with ten primary self-assessment statements (Table 2) on a 5-point scale where (1) Strongly disagree, (2) do not agree, (3) neutral, (4) agree, and (5) strongly agree. The statements were constructed in such a way that a score of higher than three would represent risk-seeking attitudes, while less than three would be risk-averse. From the total statements included to analysis the farmers perceptions towards risks four statements were worded so that the high disagreement implies that the farmer was accept more risk than if he agrees, therefore to avoid bias responses, these statements were reversed during analysis. The statement's Corrected Item-Scale Correlation (CISC), the coefficient alpha calculated by a particular statement excluded from the scale of the remaining nine statements, and the overall coefficient alpha for all 10 statements. The overall coefficient alpha of 0.68 for onion sample indicates the 10 statements account for 68% of the total variation. Based on most of investigators' appraisal these levels are acceptable. However, for a more representative scale, it is useful to look for a chance to improve the reliability (Hair *et al.,* 2010).

Highest Cronbach's coefficient alpha is the best scale, which contains the optimal amount of information about farmers' risk attitudes. The refinement procedures by exclusion of statements, which have negative or very low CISC, are necessary to improve Cronbach's coefficient alpha. The procedure of statement exclusion continues to increase the coefficient alpha for the remaining statements. If further statement exclusion reduces the overall coefficient alpha, the reliability scale cannot be improved to any further extent and, thus the self-assessment scale has been optimized in explaining the farmers' risk attitudes.

Table 2**:** Statements of risk attitude scale, and related CISC and coefficient alpha onion farmers, (n=300)

Self-assessment scale's primary statements	**CISC**	
1. I avoid decisions which bring forth either severe losses/high profits	0.84	0.78
2. To implement my farm plan goals, I am willing to take more risks than others	0.81	0.69
3. I am reluctant to adopt agricultural innovations, until I see their advantages and disadvantages from farmers around me	0.62	0.67
4. I am concerned with an existing profit more than several predicted and non-guaranteed profit, (bird on hand is bitter than ten on tree) (Reversed)	-0.32	0.63
5. I am more willing to adopt agricultural innovations than others	0.44	0.74
6. I take my decisions without hesitation regardless their probable risks	0.20	0.68
7. Before I take high risk probability decisions, I prefer to discuss them with my family (Reversed)	0.11	0.70
8. I am at the mercy of policy risk (Reversed)	0.26	0.52
9. I am at the mercy of market risk (Reversed)	0.60	0.64
10. I completely have production risk under control	0.03	0.72
Cronbach's coefficient alpha for 10 statements	**0.68**	

Source: Own elaboration using survey data, 2016

The refinement procedure for onion farmers was done as shown in Table 3. The statements with negative and low CISC values (4, 6, 7 and 10) were kept away consequently, and the overall coefficient alpha increased from 0.68 to 0.72. Removal of statements 8 and 9 produced the highest possible alpha value of 0.80. While continued exclusion of statement 5 lessened the overall reliability to 0.85. Therefore, the 3 self-assessment scale offers the best explanation of the variance with the overall coefficient alpha of 0.85, indicating that the communal variation of 85% is caused by risk attitudes. The resultant 3 refined statements scale was the developed scale for assessing risk attitudes among onion farmers.

Table 3: Refinement procedure of self-assessment scale's statements, the Onion farmers' responses, (n=300)

Self-assessment scale's primary statements	**10 Item-scale**		**6 Item-scale**		**4 Item-scale**		**3 Item-scale**	
	Onion		**Onion**		**CISC**		**CISC**	
1. I avoid decisions which bring forth either severe losses/high profits	0.84	0.78	0.80	0.67	0.71	0.78	0.87	0.75
2. To implement my farm plan goals, I am willing to take more risks than others	0.81	0.69	0.71	0.81	0.77	0.86	0.64	0.64
3. I am reluctant to adopt agricultural innovations, until I see their advantages and disadvantages from farmers around me	0.62	0.67	0.78	0.70	0.86	0.82	0.74	0.63
4. I am concerned with an existing profit more than several predicted and non-guaranteed profit, (bird on hand is bitter than ten on tree) **(Reversed)**	-0.32	0.63	-	-	-	-	-	-
5. I am more willing to adopt agricultural innovations than others	0.44	0.74	0.62	0.71	0.54	0.71	-	-
6. I take my decisions without hesitation regardless their probable risks	0.20	0.68	-	-	-	-	-	-
7. Before I take high risk probability decisions, I prefer to discuss them with my family **(Reversed)**	0.11	0.70	-	-	-	-	-	-
8. I am at the mercy of policy risk **(Reversed)**	0.26	0.52	0.41	0.72	-	-	-	-
9. I am at the mercy of market risk	0.60	0.64	0.57	0.75	-	-	-	-
10. I completely have production risk under control **(Reversed)**	0.03	0.72	-	-	-	-	-	-
Aggregate Cronbach's coefficient alpha	**0.68**			**0.72**		**0.80**		**0.85**

Source: Own elaboration using survey data, 2016

It can be concluded that the set of 3-refined statements (Table 4) measures the same underlying construct, onion farmers' attitudes toward risk, for the following reasons:

- ✓ High Cronbach's alpha values of 0.85 for onion (Hair *et al.,* 2010).
- ✓ Significant positive correlation ($p \leq 0.001$) among the answers given on the three statements (correlation ranging from 0.58 to 0.85 for onion farmers).
- ✓ High loadings of the statements on a single factor model (ranging from 0.71 to 0.86 for onion farmers) (with

eigenvalues of 2.74 for the same samples cascade).

Discriminant Analysis

Discriminant analysis was used to determine the risk attitude as well as examine the factors influencing the attitude of respondents towards risk in onion farming.

Table 4: Classification of onion farmers into groups on their attitude towards risk

Group	True Group	Predicted group		
		Risk averse	Risk Neutral	Risk Taker
Risk averse	121	72	30	19
Risk Neutral	100	56	20	24
Risk taker	89	60	14	5
Total	300	188	64	48

Source: Own elaboration using survey data, 2016

The result on Table 5 showed the classification of farmers into true and predicted groups based on their attitude to risk, (risk averse, risk neutral and risk taker). By using discriminant analysis, we were able to classify farmers based on their attitude to risk, that is, predicted group given the true group. From the total respondents, 121 respondents were risk averse, 100 respondents were risk neutral while the remaining 89 respondents were risk takers.

As depicted on Table 6 seven of the 11 discriminating variables influence farmers' attitude towards risk in onion farmers. These variables include education status, land cultivated, access to credit, income from onion farm, other sources income, percent of farm income to total income, and distance to nearest market. Farmers with large-scale operation are likely to be exposed to greater amount of risks, and thus they are expected to make extensive use of risk management tools. For example, diversification activities, one of risk management strategies, are concentrated on large farms this finding consistent with the finding of Fetien *et al.,* (2009). The independent variables access to credit services affecting the farmers' attitudes towards risks significantly and positively at 5% significance level. This implies that access to credit may enables the farmers to get additional income in such a manner that enables the farmer to afford the risk management mechanisms provided by the market to help them deal with shocks.

Table 5: Linear discriminant function for groups in onion farming

Discriminating variables		Risk averse	Risk neutral	Risk taker
Constant		0.42	-34.396	-36.892
Farming Experience		-0.13	-0.61	-0.46
Education status	**Illiterate**	0.09*	0.64	0.83
	Primary	0.25	0.52	0.21
	Secondary	0.01	0.96	0.36*
	Above	0.12	0.78	1.24***
Family size		2.69	0.68	1.62
Land cultivated		0.64**	0.75	0.82
Access to credit		0.91**	0.29	0.66
Other sources of income		4.528**	5.190	3.859
Membership to cooperative		0.67	1.21	0.47
Income from onion farm		1.23**	0.20	0.05
% of farm income to total income		1.43***	1.28	0.75
Sex of Household head		3.44	1.12	0.80
Distance to nearest market		1.17**	0.79	1.15

Source: Own elaboration using survey data, 2016

The coefficient of farm income proportion is positive and significant in influencing the farmer's attitudes towards risks. This is the fact that as farm income increases the purchasing power of the farmer could increase so that the farmer can afford the risk bearing ability increases and applies risk management strategy to help him deal with pest/diseases risks faced during onion production in the study area. This finding is in line with the result of Kumilachew *et al.,* (2013) which conducted study on Risk Management Strategies and Pesticides Use in Vegetable Production: The Case of Smallholder Farmers in Kombolcha Woreda, East Hararge Zone, Oromia.

Farmers' perception on major sources of risk in onion farming

The major risks the farmers face in the study area were categorized under two classes such as production and marketing risk that severely affect the onion producers in West Shewa farmers. Thus, by using Kruskal-Wallis One Way Analysis of Variance (ANOVA) by ranks, the major sources of risk as perceived by the respondents

were ranked from 1-11. With 1 and 11 representing the lowest and highest ranked sources of risk respectively as shown by Table 6.

Table 6: The major sources of production risk

Sources	Onion	
	Mean	Rank
Damage by pest and disease	120.18	7
High price of inputs	205.37	3
High damage during loading and unloading	68.79	2
High cost of production	38.76	5
Infrastructural bottlenecks	61.71	9
Weak research and extension agents	35.23	6
Traditional methods of farming	46.03	8
Weather dependency	14.05	10
Poor productivity	78.44	1
High post-harvest losses	84.54	4
Chi-square	127.93	
Degree of freedom	10	
Asymp. Sig.	0.005	

Source: Own elaboration using survey data, 2016

The major sources of production risks that happened in the study area includes damage by pest and disease, high damage during loading and unloading, poor productivity and high inputs prices. It is implied that the poor productivity mean 78.44, high damage during loading and unloading mean of 68.79 and high prices of inputs mean 205.37 were perceived as the highest ranked sources of risk in production by the onion respondents while infrastructural bottlenecks mean 61.71, weather dependency mean of 14.05 and traditional methods of farming mean 46.03 were perceived as the lowest ranked risk sources by the onion respondents. The Table also showed that all the sources of risk in production of the onion respondents was significant at 5% significance levels and that they are statistically different from one another.

Table 7: The major sources of market risk

Sources	Onion	
	Mean	Rank
Perishability of produce	51.05	4
Low price of produce	57.50	9
High marketing cost	56.26	1
Lack of discriminating pricing systems based on quality and grades of produce	39.91	7
Lack of coordination among producers to increase bargaining power	30.07	6
Exploitation by middlemen or many middlemen	72.06	5
Poor product handling and packaging	42.89	8
Lack of market information	98.59	3
Poor market linkages	33.14	2
Lack of markets to absorb production	80.75	10
Chi-square	112.016	
Degree of freedom	9	
Asymp. Sig.	.0001	

Source: Own elaboration using survey data, 2016

The result implied that perishability of produce (mean 51.05), lack of market information (mean 98.59), poor marketing linkages (mean 33.14) and high marketing g cost (mean 56.26) were perceived as the highest sources of market risks as ranked by the onion respondents. But lack of markets to absorb production (mean 80.75), low price of produce (mean 57.50) and poor product handling and packaging (mean 42.89) were the lowest ranked sources of market risk as perceived by the onion respondents. Similarly, as with the sources of production risk, this table also showed that all the sources of market risk in the onion respondents were significant at all levels and that they are statistically different from one another.

Strategies of risk management in onion farming

The risk management strategies being adopted in the onion farming have been summarized in table 9.

Table 8: Risk management strategies onion farmers

Strategies	Onion	
	Response	Percentage
Adoption of new farming techniques	104	34.7
Crop planning and time management	192	64
Crop diversification	240	80
Processing of produce for better prices	51	17
Sell within their locality	276	92
Sell at low prices due to perishability	189	63
Maintain good relations with traders	285	95
Non-farm businesses	231	77

Source: Own elaboration using survey data, 2016

Table 9 revealed that majority of the onion respondents (95%) maintained good relationship with traders as an effective risk management strategy. Nevertheless, this time, it was closely followed by selling within the locality (92%) and non-farm businesses (77%). About 80% of the respondents engage in crop diversification as a way of minimizing risk while crop planning and time management (64%), sell at low prices due to perishability (61.3%) and adoption of new farming techniques (34.7%) followed in that order. Similarly, processing of produce for better prices (17%) as a means of managing risk is low with the onion respondents.

Conclusion and Recommendation

Agricultural production faces a number of unpredictable risks. The variability of yields and unstable input and output prices are important sources of risk that produce farm income volatility. The study showed that high damage during loading, unloading, and poor productivity is the most perceived sources of production risk in the study area. It was also shown that the high marketing cost and poor market linkages are the most perceived sources of market risk in the study area. Among the variables included in linear discriminant analysis education status, land cultivated, access to credit, income from onion farm, other sources income, percent of farm income to total income, and distance to nearest market were significantly affects the farmers attitudes towards risk. Hence, provision of storage facilities would ensure that these produce are processed, stored and sold at better prices. It is also necessary to reduce risks and uncertainties in onion farming through the introduction of a more comprehensive agricultural insurance scheme. Cultivation of high-value crops such as onion involves risks and uncertainty due to high resource requirement and high perishability. Thus, farmers' adoption of crop diversification practices requires a favourable environment that fulfills resource requirements and effective policy support for reducing their risks. As such, improved subsidy packages for agricultural inputs like insecticides and pesticides would go a long way in combating these sources of risk. It has been found that farmers have developed coping strategies to face the constraints they encounter in onion production. Based on the finding of the study the policy makers can facilitate better risk management through improved information system, development of financial markets and promotion of market-based price and yield insurance schemes, thus ensuring that the marginal farmers are able to benefit from these interventions as well as participate in the emerging system.

REFERENCE

Ali, J. and S. Kapoor. (2008). Farmers' Perception on Risks in Fruits and Vegetables Production: An Empirical Study of Uttar Pradesh. Agricultural Economics Research Review 21: 317- 326.

Ayinde, O.E., Omotesho O.A. and Adewumi M.O., (2008). Risk Attitudes and Management Strategies of Small-Scale Crop Producers in Kwara State, Nigeria: A Ranking Approach. African Journal of Business Management, 2(12):217-221.

Bard, K. Sharon, and Barry, P. J. (2000). "Developing a scale for assessing risk attitudes of agricultural decision maker," International Food and Agribusiness Management Review, vol. 3, pp. 9-25.

Binswanger, H.P., (1980) "Attitudes toward Risk: Experimental Measurement in Rural India",American Journal of Agricultural Economics, vol. 62: 395-407.

Caswell, M., Fuglie, K., Ingram, C., Jans, S., & Kascak, C. (2001). Adoption of agricultural production practices: Lessons learned from the U.S. Department of Agriculture area studies project. Harvard Review of Psychiatry.

CSA (2015). Summary and Statistical Report of the 2007 Population and Housing Census of Ethiopia. Addis Ababa, Ethiopia.

Dawit A., Abera D., Lemma D. and Chemdo A., (2004). Domestic Vegetable Seed Production and Marketing. Research Report No 5. EARO, Ethiopia. 17p.

Dercon, (2002). Income Risk, Coping Strategies and Safety Nets. The World Bank Research Observer, 17(2):141.

DeVellis R. F. (1991). Scale development: Theory and application, Applied Social Research Methods Series, vol. 26. Newbury Park, CA: Sage Publications,.

DeVillis, R.F., (1991). Scale development: theory and applications. Applied Social Research Methods Series vol. 26. Newbury Park, CA: Sage Publications.

DillonJ. L. and Hardaker J. B. (1993). Farm Management Research for Small Farmer Development, 2nd ed. Rome: FAO, 302 pp, 1993.

Douglas, M., and Wildavsky A., (1982). Risk and culture, An Essay on the Selection of Technical and Environmental Dangers. Berkeley: University of California Press.

Edossa, D. C., Woyessa, Y. E., & Welderufael, W. A. (2014). Analysis of droughts in the central region of South Africa and their association with SST anomalies. International Journal of Atmospheric Sciences, 2014.

Emana, B., & Gebremedhin, H. (2007). Constraints and opportunities of horticulture production and marketing in eastern Ethiopia. Dry land coordination group (DCG) report, 46.

Emana, B., Afari-Sefa, V., Dinssa, F. F., Ayana, A., Balemi, T., & Temesgen, M. (2015). Characterization and Assessment of Vegetable Production and Marketing Systems in the Humid Tropics of Ethiopia.Quarterly Journal of International Agriculture, 54(2), 163-187.

Fetien Abay, B. Asmund and S. Melinda, (2009). Measuring on Farm Diversity and Determinants of Barely Diversity in Tigray: Northern Ethiopia.

Hardaker, J. B.,. Huirne, R. B. M and Anderson. J. R. (1997). Coping with Risk in Agriculture. New York: CAB International.

Klecka, W.R. (1980). *"Discriminant Analysis Series: Quantitative Applications in the Social Sciences.* SAGE publications inc. California, U.S.A.

Kumilachew A.,Mengistu K., and Fekadu G. (2013). Risk Management Strategies and Pesticides Use in Vegetable Production: The Case of Smallholder Farmers in Kombolcha Woreda, East Hararge Zone, Oromia National Regional State, Ethiopia. Journal of Economics and Sustainable Development www.iiste.org Vol.4, No.7,

Kumilachew A., Mengistu K., Fekadu G., (2007). Economic Analysis of Risks In Fruit and Vegetable. , 37(September 2012), pp.473–491.

Lagerkvist and Carl J. (2005). "Assessing farmers' risk attitudes based on economic, social, personal and environmental sources of risk: evidence from Sweden," presented at the AAEA Annual Meeting, Providence, Rhode Island, July, 24-27.

Mishra, A.K., and H.S. El-Osta. (2002) "Managing Risk in Agriculture through Hedging and Crop Insurance: What Does a National Survey Reveal?" Agricultural Finance Review, 62:135–48.

Moscardi, E., de Janvry, A., (1977). Attitudes toward risk among peasants: an econometric approach. Amer. J. Agr. Econ.59:710-716.

Nunally J. P. and Bernstein I. H (1994)., Psychometric Theory, 3rd ed. New York: McGraw-Hill,.

Pennings J. M. Wansink, E., B. and Meulenberg M. T. G (2002). "A note on modelling consumer reactions to a crisis: the case of the mad cow disease," International Journal of Research in Marketing, 19: 91-100.

Salau, O. I. (2009). *"Risk Analysis of Maize Production in Kwara state".* A Project submitted to the Department of Agricultural Economics and Farm Management, University of Ilorin, Ilorin, Nigeria.

Teknomo, K. (2006). *"Discriminant Analysis Tutorial"* available online at http//people.revoledu.com/kardi/tutorial/LDA.

Velandia M., R. M. Rejesus, T.O. Knight, B. J. Sherrick (2009) "Factors Affecting Farmers' Utilization of Agricultural Risk Management Tools: The Case of Crop Insurance, Forward Contracting, and Spreading Sales" Journal of Agricultural and Applied Economics, Vol. 41 (1):

Wayne, D.W. (1990). *"Applied Non-parametric Statistic".* Second Edition, PNS-Kent Publishing Company, Boston. Pp 225-226.

Weinberger, K., and Lumpkin T.A. (2007): Diversification into horticulture and poverty reduction: A research agenda. In: World Development 35 (8): 1464-1480.

WP (Woreda Profile), (2016). Socio-economic Profile of the Woreda.