

Risk and Risk Management Strategies in Onion Production in Kebbi State of Nigeria

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ABSTRACT In a study conducted in the onion producing area of Kebbi State of Nigeria in determining the risk and risk management strategies in onion farming, analyses (using frequency distribution, importance indices and portfolio model) of primary data collected from onion farmers revealed that output price followed by input price were ranked highest among the various risk sources. Onion farmers were poor in the use of risk reducing strategies to the extent that no risk reducing strategy exists for market risk. Reason for non-use of some risk reducing strategies is either that they are not available or difficult to implement. The most popular risk reducing strategy used was crop enterprise diversification. A risk-loving farmer should engage in onion enterprise only, and a risk averse farmer in non-onion crops enterprise if crop enterprise specialization is compulsory. In enterprise diversification, a low risk averse farmer should put high proportion of farm to onion, which reduces as risk aversion increases until onion farm is 20% of total farm size for high risk averse farmer. It is suggested that agricultural policy makers should encourage among onion farmers the use of formal insurance and cooperative marketing. Research effort should be directed at obtaining improved seed/seedling and efficient and effective storage and processing technologies that will elongate the shelf life of onion.

INTRODUCTION

Production, which is the conversion of inputs into output, takes place under either a perfect or an imperfect knowledge situation. A perfect knowledge occurs when the cause (action) and results are known with certainty. Most economic analyses assume a perfect knowledge which is more theoretical than real. An imperfect knowledge situation occurs when the decision-maker (farmer) is not very sure of the result(s) of the action to be taken. A situation of imperfect knowledge is more common in agricultural enterprises than non-agricultural enterprises. There are two variants of imperfect knowledge situations. One of them is a situation of uncertainty, in which either all the possible outcomes of an event/action or the probabilities associated with each outcome or both are not known. The other is a situation of risk, which occurs when all possible outcomes for a given management decision (action) and the probability associated with each possible outcome are known (Kay, 1981). Less emphasis is usually placed on the differences between uncertainty and risk because the two have similar effect (variation in level of income) on business enterprises. In this paper, the two terms are used interchangeably. All agricultural enterprises most especially in developing countries (onion production inclusive) operate under a situation of risk/uncertainty

The various sources of risk can be grouped into business risk and financial risk. Business risk occurs when there is variation in income levels and it is divided into the categories of technical, market and social risk. The technical risk is the risk associated with adverse variation in yield because of abnormally bad weather, disease or other climatological events (Penson and Lins, 1980). Market risk is that borne when actual prices are different from that originally expected. Social risk derived from human factors such as theft, strikes, sudden death, accidents, wars etc that can lead to unexpected decline in yield or total loss of output. The use of debt in financing farm enterprise exposes it to financial risk. Financial risk occurs when enterprise profitability (rate of return) is less than the cost of capital. It varies directly with financial leverage ratio (debt/equity ratio) and inversely with profitability. Since level of profitability of an enterprise depends on yield and prices of output and, inputs (cost of capital inclusive), financial risk is thus a by-product of business risk. Barry and Frazer (1984) noted that the risk sources are as a result of gestation lag, biological nature of farmer and farming enterprise. The rural households in Ethiopia are exposed to a variety of risk sources that include harvest failure as a result of drought, floods, frost and other climatic events; policy shocks such as changes in taxation and bans on migrants; and death and

illness of livestock (Dercon, 2002). High yearly yield fluctuations (in monetary term) per unit of land for the dominant crops in India (Townsend, 1994) and harvest failures of rural households in a resettlement area in Zimbabwe (Kinsey et al, 1998) are identified risk sources. The risk sources vary in importance from one enterprise to another and from a group of farmers to another. The California agricultural producers ranked output price and input cost highest among their production and financial risks (Blank and McDonald, 1995). Ezech and Olukosi (1991) identified irregularity in input availability, fluctuations in market prices, irregularity in water supply and variability in weather conditions as major risk sources responsible for variation in farmers' income in dry season farming. Osotimehin (1996) opined that many factors including vagaries of nature, diseases, insect infestations, general economic and market conditions contribute to the price, yield or net return variability of agricultural producers.

Farmers, most especially in developing countries, are risk averse. This is probably because of their low resource base and the consequences of failure on their social and economic status in the community. Oguntade and Bamire (1994) using safety-first rule indicated that 81% of the arable crop farmers of Odo-Otin local government area in Nigeria exhibited risk averse behaviors. However, variation exists in the degree of farmers' aversion to risk such that for some of them to absorb additional risk would require higher compensations than others. Thus, a farmer or a group of farmers (could be described as showing a high or low aversion to risk or occupy a position in between the two extremes) exhibits either increasing or constant or decreasing aversion towards risk.

Farmers take actions to reduce risk by the production, marketing and financial organizational arrangements of the farm business (Boehije and Trede, 1977). A number of risk reducing strategies that could be used by farmers are diversification, insurance, cooperative marketing, forward contracting, hedging, outside equity, resource reserve, native safeguards, flexibility and liquidity. Blank and McDonald (1995) reported that diversification of production or income sources was the most common risk reducing strategy used by California agricultural producers rather than hedging, forward contracting and crop insurance because of their poor availability. Oluwasola (1996) observed

that farmers in Ondo State of Nigeria practiced agro-forestry (a form of enterprise diversification) but the enterprise combination used was not optimal for a tolerable minimum risk in an agro-forestry system.

There are generally two measures of business risk. These are standard deviation and coefficient of variation. The weakness of standard deviation as a measure of risk arises when choice has to be made between enterprises having the same standard deviation but different expected values of income/return. Coefficient of variation becomes better in this regard as its measure combines expected income value and standard deviation (Penson and Lin, 1980).

The general objective of this study is therefore to identify the risk and risk management strategies in onion farming. This will be achieved through the following specific objectives:

- i Identifying the risk sources and their relative importance in onion farming.
- ii Determining the use and the reason for low or non-use of each risk reducing strategy.
- iii Identifying the appropriate risk reducing enterprise mix for each risk aversion category

This study will assist onion farmers (both current and potential) and agriculture policy makers in the management of risk in onion farming to ensure high and stable income to onion farmers, and regular supply of onion to markets (consumers) at affordable prices.

RESEARCH METHODOLOGY

Study Area and Data Collection

The study was carried out in two of the most popular Local Government Areas (LGAs) of Kebbi State of Nigeria in onion production. The two LGAs are Jega and Aliero. Apart from being onion-producing areas, onion-marketing centers also exist in the two LGAs. Onion production in the study area is usually in the dry season with the aid of irrigation facility.

Primary data were collected from onion farmers. An individual was considered to be an onion farmer if onion was one of the crop enterprises engaged in. From each of the two LGAs, five villages were selected using simple random sampling technique. The number of onion farmers selected from each village was in proportion to the population of onion farmers in the village and

simple random sampling technique was used in the selection of the respondents. In all two hundred onion farmers were interviewed.

Structured questionnaire was used to collect data on the onion farmers' cropping pattern; risk sources and level of concern by ranking (a particular risk is considered a major concern if it is ranked among the most important six); risk reducing strategies, their use (if used) and reason for non-use.

Analytical Techniques

The data collected were analyzed using frequency distribution (tabulation) to indicate the level (proportion of farmers) of use of risk management strategies. The ranking of risk sources was by importance indices. Both standard deviation and coefficient of variation of income were used as measures of risk. Portfolio model analysis was used to select optimal crop enterprise combination(s) for different risk aversion levels, and for specialization and diversification options.

Importance Indices: In order to identify the relative importance of different sources of risk in onion farming, importance indices were constructed (Meynsse et al,1994; Jose and Valluru,1997). To construct the indices each onion farmer was asked to state all the sources of risk encountered and to rank the most important six risk sources on a 1 to 6 scale, 1 being the most important and 6 the least important. The scale was reversed for convenience of index construction. The mean score for each source of risk and the proportion of onion farmers identifying the source of risk as the most important were computed and multiplied together to obtain the importance index used for ranking.

Given matrices A, B and C, such that:

$$A = \begin{bmatrix} f_{11} & f_{12} & \cdot & \cdot & \cdot & f_{1n} \\ f_{21} & f_{22} & \cdot & \cdot & \cdot & f_{2n} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ f_{m1} & f_{m2} & \cdot & \cdot & \cdot & f_{mn} \end{bmatrix}$$

$$B = \begin{bmatrix} w_1 \\ w_2 \\ \cdot \\ \cdot \\ \cdot \\ w_m \end{bmatrix}$$

$$C = AB = \begin{bmatrix} f_{11} & f_{12} & \cdot & \cdot & \cdot & f_{1n} \\ f_{21} & f_{22} & \cdot & \cdot & \cdot & f_{2n} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ f_{m1} & f_{m2} & \cdot & \cdot & \cdot & f_{mn} \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ \cdot \\ \cdot \\ \cdot \\ w_m \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \\ \cdot \\ \cdot \\ \cdot \\ c_m \end{bmatrix}$$

Matrix A gives the distribution of onion farmers on each risk source according to risk source ranks. The matrix indicates that there are m risk sources to be put in n categories of rank.

Matrix B is the weight attached to each of the ranks, w_i is the weight attached to rank j where $i=j$, $i=1,2,\dots,m$ and $j=1,2,\dots,n$. w_i is the weight attached to rank 1, w_2 to rank 2 etc.

Matrix C gives the product of matrices A and B (AB). It is the total value of importance attached to each risk source. For example $C_2 = f_{21}w_1 + \dots + f_{2n}w_m$ = total value of importance attached to risk source 2. C_i is the total value of importance attached to risk source i.

$$\text{Importance rating for risk source } i = \frac{1}{\lambda_i} C_i$$

Where $\lambda_i = f_{i1}$ = total number of onion farmers selecting risk source i as important.

$$\text{Importance index} = \frac{C_i}{f_{i1}} \times \frac{f_{i1}}{\sum_{i=1}^m f_{i1}}$$

Such that f_{i1} is the number of onion farmers (frequency) ranking risk source i as the most important (rank).

Portfolio Model: The portfolio model is specified thus:

$$R_T = P_o R_o + (1 - P_o) R_n$$

$$s_T = (P_o^2 s_o^2 + (1 - P_o)^2 s_n^2 + M)^{1/2}$$

where $M = \{2 P_o (1-P_o) Z s_o s_n\}$

R_T is total gross margin from all enterprises
 R_o is mean gross margin from onion enterprise
 R_n is the mean gross margin from non-onion crops.
 s_o , s_o and s_T represent the standard deviation of onion, non-onion crops and all crops combined respectively.

Z is the correlation coefficient between the gross margin of onion and non-onion crops. Gross margin is the difference between Total Income and Total Variable Cost of an enterprise.

The decision rules are that a low risk averse (risk loving) entrepreneur will choose the enterprise (in case of specialization) or combination of enterprises (in case of diversification)

that gives the highest return/income regardless of its associated level of risk (standard deviation or coefficient of variation); and a high risk averse entrepreneur will select an enterprise or a combination of enterprises having the lowest risk its associated level of income notwithstanding.

RESULT AND DISCUSSION

The identified risk sources and their ranking in order of importance are presented in Tables 1 (a) and (b). None of the farmers considered floods, war and unsecured land tenure important risk sources, as they (risk sources) did not appear

among the first six. Flood was considered inconsequential as onion farming was during the dry season and controlled irrigation was employed to supply necessary moisture for plant growth. None of them anticipated any civil disturbance and land tenure insecurity in the nearest future that could affect their farming. All the farmers stated drought, pest/diseases, input price, output price, theft and lack of capital as important risk sources. Not as high as ten percent of the respondents considered each of the risk sources of ill health, death and unavailability of labour important. All the respondents ranked drought, input and output prices; not less than

Table 1(a): Farmers' ranking of risk sources (n = 200)

Risk Sources	Rank						*1	*2
	1	2	3	4	5	6		
<i>Technical-drought</i>	14	44	106	14	10	12	200	100
- pest/disease	12	8	44	96	22	16	200	99
- floods	-	-	-	-	-	-	0	0
<i>Market</i>								
- input price	26	104	26	16	12	16	200	100
- output price	140	36	24	0	0	0	200	100
<i>Social</i>								
- theft	0	0	0	14	68	111	200	96.5
- ill-health	0	0	0	0	4	2	19	3
- death	0	0	0	0	0	1	7	0.5
- war	-	-	-	-	-	-	0	0
<i>Inavailability of</i>								
- labour	0	0	0	0	1	2	11	1.5
- capital	8	8	0	60	83	40	200	99.5
- land(unsecured tenure)	-	-	-	-	-	-	0	0
<i>Financial</i>	-	-	-	-	-	-	0	0

*1 - number of respondents mentioning each risk source

*2 - proportion of total respondents ranking each risk source among the most important six.

For example eleven respondents (5.5%) mentioned labour unavailability as a risk source but only three (1.5) put it among the most important.

Table 1(b): Farmers' ranking of risk sources

Risk Sources	Importance ratings Mean	Most important risk source %	Importance index	
			Index	Rank
<i>Technical</i>				
- drought	4.02	7	28.14	3
- pest/disease	3.18	6	19.08	4
- floods				
<i>Market</i>				
- input price	4.34	13	56.42	2
- output price	5.58	70	390.66	1
<i>Social</i>				
- theft	1.45	0	0	6
- ill-health	0.05	0	0	
- death	0.005	0	0	
- war				
<i>Unavailability of</i>				
- labour	0.02	0	0	
- capital	2.37	4	9.48	5
- land (unsecured tenure)	-	-	-	0
<i>Financial</i>	-	-	-	0

96.5% of respondents ranked pest/diseases, lack of capital; and 3%, 0.5%, 1.5% ranked ill-health, death, unavailability of labor respectively; as being within the six most important risk sources in onion production.

Analysis of ranking of risk sources by onion farmers using importance indices [Tables 1(a) and 1(b)] indicated output price as the most important risk source with seventy percent of the respondents putting it first and having the highest index. It was so important that none of the farmers ranked it lower than third position. Next in importance is the input price. The highly affected input prices were that of fertilizers and fuel (petrol for running irrigation equipment) which were very unstable and high during the period. The third, fourth, fifth and sixth most important risk sources were drought, pest/diseases, unavailability of capital and theft respectively. All other identified risk sources were not among the most important six. It shows that onion farmers ranked market risks (the risk that actual price will be different than originally expected-input and output prices) most important. Technical risks (drought and pest/diseases) were ranked next and more important than social risks (unavailability of capital and theft), and financial risk last. There was no financial risk, as the farmers employed nothing in term of debt financing. This is because of the cultural/religious belief that was against charging interest on loans, which therefore reduces loans

availability, as there was no incentive to give them (loans).

Risk sources cause adversity in yield, prices and production units. Each or any combination of the outcomes, of the risk sources (bad yield, poor prices, and inadequate production units) leads to poor farm income. There are several strategies that risk-averse farm operators can use to reduce the farm exposure to business and financial risks. A number of the risk management strategies and the proportions of onion farmers adopting each are indicated in Table 2.

Formal insurance allows a means of substituting a certain small expense for the possibility of a large uncertain loss. The various types of insurance (if available) that could be used by a farm operator are crop, property and personal. Crop insurance prevents/reduces the technical risk of obtaining very low crop yield than expected and caused by adverse weather condition. Property insurance is the protection against destruction of farm assets by fire, wind, theft and accidental damage. Personal insurance protects farm operators and their families against losses in equity due to ill health or death of the insured individual(s). None of the onion farmers used any of the formal insurance types stated above because of their unavailability.

Technical method is another means of reducing technical risks. It involves the use of improved seeds/seedling, fertilizers, chemical/

Table 2: Farmers' use of risk management strategies

Strategy		*1	*2
Formal Insurance	- crop	0	1
	- property	0	1
	- personal	0	1
native safeguards		86	
technical method (use of)	- improved seeds/seedling	0	1
	- fertilizers	48	1
	- chemical insecticides	11	1
Diversification (of)	- income sources	46	
	- enterprises	100	
Sequential marketing		4	2
Cooperative marketing		0	1
Forward Contracting		0	1
Hedging		0	1
Outside equity		0	1
labour contract		0	1
Government commodity programs		0	1

*1 - proportion of farmers using

*2 - reason for non-use

1 - inavailability/unknown

2 - difficult implementation

insecticides and irrigation to obtain high and stable yield. None of the farmers used improved onion seeds/seedlings, as they were not available. Only 48%, 11% and 56% used fertilizers, chemical/insecticides and effective irrigation respectively. The low or non-use was as a result of either unavailability or high prices. For example, effective irrigation could not be practiced because of unavailability and high prices of fuel (petrol) to operate irrigation pumps.

Significant proportion (86%) of the onion farmers used one form of native safeguards or the other. The various native safeguards in use by onion farmers are fencing of the farm to bar destructive animals from entering, use of scare-crows to keep off birds from damaging crops and the use of native medicine (juju) and guards (watchmen) to scare and prevent thieves.

A strategy to stabilize farm household income is diversification. Diversification involves deriving income from two or more activities or enterprises. The two general types are diversification of income sources and diversification of farm enterprises. Diversification of income sources occurs when a farmer does not rely entirely on income derived from farming only, implying that the farmer has non-farm income source(s). Forty six percent of the onion farmers apart from farming engaged in non-farm activities from which they earned non-farm income. Engaging in and earning of non-farm income will lower the variance of income to the farm family by providing a steady income regardless of the success of the agricultural enterprises in a given season. Diversification of enterprises is the production of two or more crops or livestock enterprises simultaneously by a farmer and all the enterprises in the combination being in agriculture. All the onion farmers engaged in enterprise diversification. Onion production was combined with usually some other vegetable crops.

Sequential marketing, forward contracting, hedging and cooperative marketing are some of the strategies that can reduce market risks. Sequential marketing involves gradual release into the market of the commodity for sale, instead of dumping the entire quantity at once to depress market price. Sequential marketing is possible if the agricultural product is either non-perishable or an effective and economic storage facility exists. Only 4% of the onion farmers claimed to carry out sequential marketing and this they did by harvesting in piecemeal over the harvesting

period. Once onion is harvested, sequential marketing could not be carried out as it is a perishable commodity for which effective storage and or processing facility is presently non-existent in Nigeria. Cooperative marketing agreement is a way of sharing market risks with others and increasing market power to source more favourable prices. None of the farmers was a member of any cooperative marketing organisation as it did not exist. Both hedging and forward contracting reduce price risk by allowing farmers to agree and be sure of the price they will sell their agricultural commodities in future before they are ready for disposal. None of the onion farmers engaged in either hedging or forward contracting. The use of outside equity capital is a strategy required for expanding production and reducing financial risk. The three most popular methods of outside equity capital acquisition are capital leasing, incorporation and partnership agreements. None of the farmers used any of these sources. The form of business organisation in practice was basically sole proprietorship with little or no external production input sources. There was no government commodity programs to assist farmers stabilize onion prices or organized marketing of onions.

Generally, onion farmers were very poor in the use of risk management strategies due largely to unavailability of the strategies. Despite the ranking of marketing risk as the most important, farmers did not use any of the indicated relevant strategies to eliminate or reduce the risks. Diversification of farm enterprises, native safeguards and diversification of income sources were the most common strategies used to manage risks in order of importance among the onion farmers.

Farmers' Risk Attitudes and Farm Production Organization

The onion farmers apart from engaging in onion enterprise also produced other crops such as tomatoes, pepper, potatoes, maize etc. The mean farm size cultivated was 1.12ha out of which 0.895ha (79.88%) was for onion and 0.225ha (20.12%) was for other crops combined. The mean net income of onion enterprise was ₦ 4318 with a standard deviation of ₦ 1324. Other non-onion crops combined gave a mean net income of ₦ 2795 with a standard deviation of 524. The correlation coefficient between the net incomes of the two enterprises (onion and other crops) was 0.2165. The relevant parameters for the

determination of optimal enterprise combination using portfolio model analysis are indicated in Table 3.

Where the decision is that a farmer should specialize (choose between onion enterprise and non-onion crops enterprise), a low risk averse (risk loving) farmer should cultivate only onion as it gives higher gross margin (4318/ha) than non-onion crops enterprise (2995/ha). Although, this choice has higher coefficient of variation (higher risk) than non-onion enterprise, the low risk averse nature of the decision-maker (farmer) has beclouded the danger posed by the risk. However, a high-risk averse farmer will have to choose non-onion crops enterprise because of its lower coefficient of variation (risk) relative to onion enterprise although at a cost of lower income (gross margin). Upton (1979) stated that farmers are prepared to forgo a certain part of their income every year to avoid occasional large losses. Oguntade and Bamire (1994) using linear programming model observed that risk loving arable crop farmers of Odo-Otin local government area of Nigeria were compensated for by a higher return compared to those who exhibited risk averse behaviors

If diversification of enterprises is allowed, a high-risk averse onion farmer should not specialize as diversification of enterprises reduces risk without reducing income. Risk reduction through diversification was made possible because the obtained correlation coefficient of the gross margins of the two enterprises (onion and non-onion enterprises) is although not negative, the positive relationship is not strong, thus there is some degree of independence between the earnings of the two enterprises. The

optimal enterprise combination level for a high-risk averse farmer is obtained when the coefficient of variation is least (least risk). For this set of farmers it is the enterprise combination where 20% of estimated farmland is allocated to onion enterprise and the remaining to non-onion crops. The lower the risk aversion of the farmer the higher the proportion of cultivated farm land to be allocated to onion enterprise. If in addition to minimizing risk, a farmer is interested in cultivating an enterprise combination that gives the highest minimum gross margin below which certain important obligations (such as personal business commitments and subsistence requirement) could not be met, and farmer would not want to operate. The decision criterion to use is the selection of alternative with the highest lower bound. A handy statistical measure in the selection of the lower bound is two standard deviations below the mean income (expected income). The value of lower bound for each enterprise combination is indicated in Table 3. The optimal combination (the combination with the highest lower bound) using this criterion is either, 30% of the cultivated farm size allocated to onion only and 70% for non-onion crops, or 40% to onion crop only and 60% to non-onion crops, both of which gave the same and highest lower bound (₦ 2.060). The implication of this is that at the worst, the onion farmer would obtain a minimum gross margin income of ₦ 2060, which is the highest of the worst incomes from each of the crop combinations.

Nigerian farmers like farmers in other developing countries are high risk averse (Oguntade and Bamire, 1994). Following this characteristic of theirs, the preceding results reveal that the onion

Table 3: Parameters of enterprise combinations in onion farming using portfolio model analysis

Combination Levels	Proportion of Cropped land		Expected Income	Standard deviation (₦)	Coefficient of Variation	Lower Bound (₦)
	Onion (O)	Non-Onion (N)				
I	1	0	4318	1324	0.3066	1670
II	0.9	0.1	4166	1204	0.289	1758
III	0.8	0.2	4013	1087	0.2709	1039
IV	0.7	0.3	3861	973	0.252	1915
V	0.6	0.4	3709	864	0.2329	1981
VI	0.5	0.5	3557	763	0.2145	2031
VII	0.4	0.6	3404	672	0.1975	2060
VIII	0.3	0.7	3252	596	0.1833	2060
IX	0.2	0.8	3100	542	0.1748	2016
X	0.1	0.9	2947	517	0.1754	1913
XI	0	1	2795	524	0.1875	1747

Note: One U.S dollar (\$) = One hundred and eleven Naira (₦).

farmers are not efficient in their crop diversification bid. Instead for the farmers to allocate 20% of the cultivated farmland to onion crop only in order to reduce risk to the barest minimum, or to have 30% onion farm size to ensure obtaining the highest minimum return, they allocated 79.88%. The implication of this is that the occurrence of any negative production and marketing conditions can lead to an economic disaster since the farmers are highly deficient in the use of other risk reducing strategies.

In order to combat risk in onion farming it is recommended that the agricultural policy makers should encourage onion farmers in the use of, formal insurance, cooperative marketing and improved seed/seedling. Research into improved seed/seedling and efficient and effective storage technology should be focused to increase the shelf life of onion which will prevent dumping of onion in the market at any price once harvested.

SUMMARY AND CONCLUSION

Most farmers in developing countries are risk averters, and farming takes place under a situation of risk/uncertainty. In order to assist farmers earn stable income from farming and ensure regular supply of farm output to consumers, it is necessary to know the risk sources and risk reducing strategies in the production of each crop.

Primary data were collected from onion farmers of Kebbi State of Nigeria on risk and risk management strategies used in the production of onion, and were analysed using frequency distribution portfolio model and importance indices.

Of all the risk sources in onion farming, output price, input price, drought, pest/disease, capital and ill health were of greatest concern in that order of importance. Onion farmers were poor in the use of risk management strategies to combat risk sources because of their (risk management strategies) unavailability. The most popular risk reducing strategy used by respondents in onion farming was enterprise diversification. Portfolio model analysis of the diversification strategy indicated that onion farmers were not efficient in their enterprise combination. It was suggested that agricultural policy makers should make policies that will encourage the onion farmers to use formal insurance, cooperative marketing and improved seeds/seedling. Research effort should

be directed at obtaining improved seed/ seedling and effective and efficient storage and processing technology to reduce/eliminate the high perishable nature of onion that is responsible for the risk.

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