COMPARATIVE ANALYSIS OF MAIZE STORAGE TECHNOLOGIES IN KWARA STATE, NIGERIA

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ABSTRACT

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A number of the constraints on agricultural development are directly related to lack of appropriate storage facilities, this has led to high cost of grains and low production. There is a need for the development of adaptive and innovative technology with the specific objective of optimizing the use of local knowledge and materials and providing a framework for integrating several techniques and practices. The study considered 200 maize farmers from Kwara State using a multi-stage sampling technique. The data collected for the study were analyzed using the budgetary technique and multinomial logit model. The study revealed that modern storage technology usage is most profitable, with gross margin of N2, 435/tonne, 28k as return on investment. Multinomial logit model result reveal the odd of using different storage technologies by maize farmers, it could be seen that rise in capital invested, transportation cost, labour cost and farmers' age enhance the probability of using modern storage is increased by the experience of the technologist, educational level of the farmers and quantity of maize to be stored by the farmer. Much earning flows in with the use of modern storage technology and since the level of education influence the use of modern technology, there should be provision of basic adult education on storage instructions for farmers in the study area.

Keywords: Comparative analysis, Grain production, Maize farmer, Storage technique

INTRODUCTION

All agricultural produce, either of plant or animal origin starts deteriorating almost as soon as they are harvested and it leads to losses. This deteriorating may start within a few minutes of harvest resulting in partial or total loss within days; it may also take place very slowly making the crop to retain some essential quality for months (Setamou *et al*, 1998). Agboola (1999, 2001) pointed out the urgent need to match all efforts of increasing crop production with equal efforts to save the crop that is produced from deteriorating and waste. Maize, an important food for man and an ingredient of poultry and livestock feeds is often with high moisture content during harvest and it is liable to microbial deteriorating even during storage (Asiedu *et al*, 2002). This sort of loss is unfortunate because it both lowers the income and standard of living of the farmers and also leads to waste of a large fraction of what is supposed to be a contribution to the nation's food supply (Asiedu *et al*, 2002).

Spoilage and total wastage of grains can be minimized through the use of storage technologies (Strahan and Page, 2003). Storage is a way or a process by which agricultural produce or products are kept for future use (Thamaga-Chitja *et al*, 2004). Maize needs to be stored from one harvest to the next in order to maintain its constant supply all year round and to preserve its quality until required for use. Despite the desire to store maize in order to cover food requirement and future cash needs, some farmers often sell large proportion of their produce at harvest, when price is low (Whitehead, 1998). This is frequently the case with 'poor' producers, who must satisfy cash needs immediately after harvest, only to buy grains again in season for family consumption.

Studies have shown that most Nigerian farmers stored maize in various indigenous storage structures for the purpose of self-sustenance and household food security. (Alika, 1995; Adekunle and Nabinta, 2000; Meikle *et al*, 2004). Storage structures (either traditional or modern) have been described as physical environment, medium or containers within which agricultural produce can be preserved against theft, pest and diseases for a desirable period of time (Agboola, 1999). Other functions of storage are crop/seeds preservation, quality improvement, quantity equalization and market price stabilization of agricultural produce. The various forms of storage techniques available for maize ranged from open field storage, polythene, jute bags, platform/tree storage to built structures.

Successful farm storage enables farmers to sell maize when price are most attractive (off season), but with the existing indigenous storage techniques, the market is subject to considerable short term and inter-seasonal price fluctuations, which affects the interests of both producers and consumers. The traditional storage techniques are very local and crude; some have been found to be functional, needing just little improvements while others are outdated and hazardous (Thamaga-Chitja *et al*, 2004). A major problem in agricultural development in the nation has been lack of modern and appropriate storage technologies for grains. Most new improved technological innovation packages are improperly set up and also very expensive for small rural farmers in Nigeria (Agboola, 2001).

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In the light of these, there exist a problem of storage and maize wastage in Nigeria. This study would therefore provide answer to the following questions: what type of storage technologies exist in the study area? How effective and profitable are these storage technologies? What are the main determinants of different storage technologies in the study area? What are the constraints faced with the present storage technologies? Answers to these questions would help in the quest to make recommendation that will help in solving the problems of maize storage technologies in Nigeria.

Hypothesis

Null Hypothesis (Ho)	: There is no significant difference in the gross margins of the respondents
	using different types of storage technology.
Alternatives hypothesis (Ha)	: There is significant difference in the gross margins of the respondents using different types of storage technology
	using unrefert types of storage technology.

METHODOLOGY

The study was conducted in Kwara state. The choice of the study area is purposive because it is a major maize producing state in the middle belt area of the country. The headquarters of Nigeria Stored Products Research Institute (NSPRI) is situated in the state capital, ten storage facilities of 400 tones capacity each owned by government are located at Ilorin under the National Strategic Grains Storage Schemes and many indigenous ones are scattered all over the local government areas. Primary data was collected with the aid of a well-structured questionnaire. The sampling design employed in the study was multi-stage sampling technique. There are four agricultural zones in the state. In the first stage, eight (8) local government areas (LGAs) namely Baruteen, Kaima, Asa, Moro, Patigi, Ifelodun, Irepodun and Edu were selected from the four zones. The second stage of sampling involves the selection of the villages within the LGA and five villages or family communities were selected randomly from each local government area. The last stage was random selection of respondents from each village; five maize farmers were randomly selected from each village. Summarily a total of two hundred farmers were sampled for the study. The data collected for the study were analysed using the descriptive statistics, budgetary techniques and multinomial logit model.

Descriptive Statistics: were used to determine the socio-economic characteristics of the farmers.

Budgetary Technique: Budgetary technique was used to assess the cost and return implication of the various storage technologies existing in the study area. The gross margin formula is explicitly stated as:

Pij	= Price o	$_{\pm}$ Price of maize crop in i th storage technology for j th respondent								
Qi	_Quantit	₌ Quantity of maize crop in i th storage technology for j th respondent								
r _{ij}	= Price o	$_{\pm}$ Price of variable input in i th storage technology for j th respondent								
X _{ij}	_Quantit	y of varia	ble input in i th storage technology for j th respondent							
i	=1m									
j	=1n									
m	= types of	of storage	technologies							
n	= total n	umber of	respondents							
Where;										
	G. M.	= Gros	s margin (N/tonne)							
	Р	=	Average price of maize crop (N/tonne)							
	Q	=	Average quantity of maize crop (tonne)							
	\mathbf{r}_1	=	Purchase price of maize crop (N/tonne)							
	r ₂	=	Price of transportation (N/tonne)							
	r ₃	=	Price of chemical (N/litre)							
	r_4	=	Price of labour (N/man-day)							
	r ₅	=	Rent (N/month)							
	r ₆	=	Price of storage materials (N)							
	X_1	=	Quantity of maize purchased (tonne)							
	X_2	=	Quantity of maize transported (tonne)							
	X_3	=	Quantity of chemical used (litre/tonne)							
	X_4	=	Number of hired labour (man-day/tonne)							
	X_5	=	Month on rentage of storage (month)							
	X_6	=	Number of materials used for storage							

Multinomial Logit Model: The multinomial logit was used to determine the factors that will influence the maize farmers falling into any of the four categories; namely no storage, local storage, local storage, semi-modern storage, modern storage. The objective for using the econometric techniques was to test the relationship between the probabilities and several hypothesized determining factors (Lia, 1994).

For the objective the formula is written below;

$$Log \frac{\Pr ob(y=z)}{\Pr ob(y=z)} = \sum \beta_{zk} X_k$$

Where;

k

α

CP

- = 1Z-1 (various types of storage technologies)
- (total number of the respondents) = 1m
- = intercepts Coefficients
- β X = Value of explanatory or independent variable for the ith individual
- The explanatory variables (X) are
 - Farmers years of experience in maize storage business EX FS
 - = Source of money spent on maize storage, (measured by formal and informal sources)
 - = Capital invested on maize business, (measured in naira)
 - LA = Amount of money spent on transportation (measured in naira)
 - SC = Quantity of maize stored (measured in tonne)
 - = Educational level of the respondents, (measured by years of formal schooling). ED
 - AG = Age of the respondents (in years).

RESULTS AND DISCUSSION

Socio-economics characteristics of maize farmers in use of various storage technologies

Table 1 (Annexure 1 Table 1) revealed the socio economic characteristics of the respondents (farmers) in use of various storage technologies in the study area. In the table, male farmers constituted about eighty three percent while female constituted about seventeen percent of the total farmers in the study area. About 27% of the male farmers did not store, while 30% used local storage. However, female farmers used local storage mainly. Majority of the farmers (55%) were in the age range of 41-50 years, 20% of these group of farmers were not storing their maize, 17% used local storage, 12% used semi modern only 5% used modern storage. Farmers with no formal education were about 47% of the total population and out of these, about 18% of them did not store, 20% used local storage, 9% used semi-modern storage technology. Mainly (4.3%) with average of $7^{1/2}$ years in school used semi-modern technology while educated (above 10 years of school) used modern storage technology mainly (4.3%). Most of the farmer (16%) with an average of 8 dependents did not store in any of the storages. Majority of the farmers (53%) were married while a few of them were either separated (20%) or widowed (26%). Most of the separated (11%) and widowed (11%) were using local storage, while most married farmers (16%) were storing locally or not storing at all. Most of the farmers (11%) with a maximum of 5 years of experience were using local storage. As the years of experience increased, the percentage of farmers that used semi modern and modern storage increased. Larger percentage of the maize farmers (31%) stored less than 1 tonne of maize used local storage, while few of them used semi modern storage (4%). The rest farmers stored more than 2 tonnes of maize used semi modern (11%) and modern (10%) technologies.

Description of storage technologies in the study area

Table 2 (Annexure 1 Table 2) present the assessment of storage technologies in the study area. From the table 74% of the maize farmers made use of traditional/local storage (open field, roof, platform/tree, and local cribs), 23% used improved cribs (semi-modern) and only 3% of the farmers used modern storage (silos and warehouses). This implies that maize farmers used traditional storage because they operate at subsistence level. Most of the maize farmers (61%) inherited their storage structures which had been in existence for 10 year; this was confirmed by the maize farmers. Apart from the few modern storage, majority (70%) of the local storage could not contain more than 1.5 tonnes on the average. Fifty percent of the farmers stored maize close to 24 weeks (6 months) and only 28% of the farmers sold fresh and semi dry maize.

Storage losses are quite frequent among maize farmers. Seventy eight percent of maize farmers sampled reported that they suffered some losses in quantity and quality of their maize seeds owing to storage pest. They declared that there were too many damages on the stored maize; like rot, molding, and perforation, sprouting etc. The impact of the various storage problems is considerable and it represents a substantial amount of loss in revenue to maize farmers. The respondents address this issue by practicing some preventive measures, which aim at protecting the grains from attack with a view to reducing damages caused by storage pest. This brings about the use of chemical treatments. Even with local storage, some of the farmers still use chemicals to fumigate their maize, and they mainly obtained the chemicals from cooperatives (42%), extension agents (31%), and 13% got from other sources such as market. Majority (66%) of maize farmers agreed that chemical application to stored maize is very effective; at least it reduces some of the damages.

Cost and returns analysis for maize storage using different storage technologies

The measure of cost and returns of various maize storage technologies used by farmers in the study area was carried out using the budgetary techniques. Budgetary analysis is employed to assess the profitability of a

particular business. In pursuance of this the return analysis as presented in Table 3 was undertaken to determine the gross margin of the maize business using different storage technologies. Variable costs are rent, chemical cost, purchase (production) cost, labour cost, storage loss cost, materials cost and transportation cost. Storage loss cost depends on the storage technique used. According to the respondents, the storage loss in local storage and semi modern storage is about 8% and 4% respectively and there is little or no spoilage in modern storage, this is confirmed by Gwinners *et al* (1990) and Daramola (2000). All these were calculated per tonne of maize (which is 10 bags or 100kg) with average storage period of 9 months. The total returns is the value or price that the farmer received over a particular quantity (unit) of produce sold; this can be achieved by multiplying the selling price of maize with the amount of quantity sold.

Particulars	No Storage	Local Storage	Semi Modern	Modern
Selling price (N/tonne)	40,100	49,500	53,700	55,600
Production cost	25,500	25,500	25,500	25,500
Rent(N)	-	3,150	4,500	6,750
Chemical cost(N/lit)	-	-	1,990	2,490
Transportation cost(N)	6,000	4,000	4,000	4,000
Labour cost(N/man-day)	4,000	4,000	4,000	4,000
Storage loss cost (N/t)	-	*4,080	*2,150	-
Material cost (N/t)	300	425	425	425
Total variable cost	35,800	41,155	42,565	43,165
Gross Margin(N)	4,300	8,345	11,135	12,435
Return on Investment	0.12	0.20	0.26	0.26

Table 3. Estimated Gross Margin for Maize Farmers

From Table 3, the gross margins for maize farmers using various storage technologies are; N4,300/tn (no storage), N8,345/tonne (local), N11,135/tonne (semi modern) and N12,435/tonne (modern). This shows that modern storage usage is most profitable followed by semi modern and local storage. Selling fresh maize is not as profitable as selling it after storing. The return on investment (ROI) for the four categories are; 0.12 (no storage), 0.20 (local storage), 0.26 (semi modern), 0.28 (modern) technology. This implies that for every N1.00 spent, 12k, 20k, 26k and 28k is gained using no storage, local, semi modern and modern storages respectively.

Result of partial budgeting for maize storage under different storage technologies

The objective of a partial budget in maize storage is to recommend technology that is agronomically different and economically superior among many other alternatives. (Alimi and Manyong, 2000). Table 4 revealed the partial budget for maize farmers. Difference in gross margin when farmer change from 'no' storage to local, semi modern or modern are N4,045, N6,835, N8,135 respectively. These positive differences indicate the amount by which the gross margin of local, semi modern or modern exceed the gross margin of 'no' storage. It is therefore recommended that the respondents can change to any of the storage technology and the best of the storage is the modern one because it has the highest difference in gross margin.

Changing from 'no' storage local storage				changing from 'no' storage to semi modern			Changing from 'no' storage to modern				
Positive	Value	Negative	Value	Positive	Value	Negative	Value	Positive	Value	Negative	Value
Effect	(N)	Effect	(N)	Effect	(N)	Effect	(N)	Effect	(N)	Effect	(N)
TAI	49,500	TAI	40,100	TAI	53,700	TRI	40,100	TAI	55,600	TRI	40,100
TRC	35,800	TRC	41,155	TRC	35,800	TAC	42,565	TRC	35,80	TAC	43,165
Total A	85,300	Total B	81,255	Total A	89,500	Total B	82,665	Total A	91,400	Total B	83,265
Change in gross margin: (Total A) minus (Total B)4,045			Change in (Total A) 1	gross margi ninus (Total	n: B)	6,835	Change in (Total A) 1	gross margi ninus (Total	n: B)	8,135	

Table 4. Estimated Partial Budget for Maize Farmers

Result of multinomial logit model

The multinomial logit model was estimated as presented in Table 5 (Annexure 1 Table 5) for maize farmers. Four responses were used as dependent variables. These are storage technologies defined as 'no storage', 'semi modern storage', and 'modern storage'. Age, education, experience, capital invested, sources of funds, labour, transportation and capacity of stored maize served as independent variables. The variable with 'no' storage was taken as the baseline category or reference cell. The calculation of odd-ratio were done relative to the baseline that is the coefficient of probabilities of the respondents using local, semi modern and modern storage were estimated with respect to 'no' storage. The positive coefficient implies that the probability of a respondent falling in the numerator category (local storage, semi modern storage and modern storage) is greater than the probability of falling in the baseline category. Only significant variables were discussed in the presentation. Chi-square (x^2) distributions was used to test overall model adequacy at specific significant level. Likelihood ratio also determines whether the multinomial logit model is preferable to a binomial logit model.

In Table 5, it was observed that only the coefficient of capital invested (Cp) and age (Ag) of the farmers are negatively significant in the use of local storage, this indicates that a unit increase in capital invested on storage by the farmer will increase the odds (probability) of using 'no storage' by 0.0006% (P=0.10), also a unit increase in farmer's age will bring about an increase in the odds of using 'no storage' by 18.3% (P=0.01) instead

of local storage. in the case of semi modern storage usage, the coefficient of labour cost (La) and transportation (Tr) are negatively significant while the quantity of maize stored (Sc) is positively significant, this means that a unit increase in labour cost (La) and transportation (Tr) will enhance the odds of using no storage by 0.2% and 0.53% (P=0.10) respectively, but a unit increase in quantity of maize stored (Sc) will improve the odds of using semi modern storage by 16.7% (P= 0.01). For the use of modern storage, more variables are quite significant; these include, the coefficients of years of experience (Ex), educational level (Ed), quantity of maize stored (Sc), transportation (Tr) and age of the farmer (Ag). The first three variables are positively significant while the last two variables are negatively significant. This implies that the probability (odds) of using modern storage increases by 2.6% (P= 0.01) and 5.6% (P- 0.10) with a unit increase in farmer's years of experience (Ex) and educational level (Ed) respectively. Also a unit increased in quantity of maize stored (Sc) will bring about an increase in the odds of using modern storage by 16.3% (P= 0.10), on the other hand a unit rise in transportation cost (Tr) will shoot up the odds of using 'no storage' by 0.89% (P= 0.10) and the odds (probability) of using 'no storage' also increase by 75.1% (P= 0.01) with a unit increase in farmer's age (Ag). Chi-squared x^2 was 50.76 and Log likelihood 130.12 at 0.05 level of significance, this showed that farmers estimated multinomial logit model provided good fit to the data.

Test of Hypothesis

The research hypothesis which state that there is no significant differences in the gross margins of maize farmers using various storage technologies was subjected to statistical testing and the result of Analysis of Variance (ANOVA) was presented in Table 6. The table showed that the observed value, F=778.99 is greater than the critical value, $F_{3,365} = 2.63$ at 1% critical level. Therefore the n null hypothesis is rejected and alternative one is accepted. Thus there is a significant difference in the gross margin of maize farmers using different storage technologies.

Source of variation	SS	df	MS	F	P-value	F crit
Between Groups	74310.57	3	24770.2	778.997	1.7E-157	2.63
Within Groups	11510.71	368	31.8	-	-	-
Total	85821.28	369	-	-	-	-

Table 6. Summary of Analysis of Variance (ANOVA) Result

CONCLUSION

Storage losses are quite frequent in stored maize. Farmers suffered losses in quantity and quality of their maize to storage pests. The study showed that modern storage technology is the best among all the storage technologies because it has the highest difference in gross margin and the highest marginal rate of return. Farmers should therefore be encouraged and motivated to use modern storage facilities.

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ANNEXURE 1

Table 1. Socioeconomic Characteristics of Maize Farmers in Use of Various Storage Technologies

Variables	Category	Storage Techniques									
variables	Category	No Stor	age	Local		Semi l	Modern	Mod	ern	Pooled	
		Ν	%	Ν	%	Ν	%	Ν	%	Ν	%
Sex	Male	50	26.5	56	29.7	30	15.9	20	10.6	156	86.9
	Female	8	4.3	15	7.9	9	4.8	-	-	32	17.1
	21 - 30	2	1.1	2	1.1	2	1.1	-	-	6	3.2
	31 - 40	5	2.7	6	3.2	5	2.7	5	2.7	21	11.2
	41 - 50	38	20.2	32	17.0	23	12.2	10	5.3	103	54.9
Age/yrs	51 - 60	6	3.2	12	6.4	8	4.3	3	1.6	29	15.4
	61 – 70	2	1.1	10	5.3	1	0.5	2	1.1	15	7.9
	>70	5	2.7	9	4.9	-	-	-	-	14	7.4
	0	34	18.1	37	19.7	17	9.0	-	-	88	46.8
Education/wrs	1 – 5	18	9.6	20	10.6	11	5.8	6	3.2	55	29.3
	6-10	6	3.2	11	5.8	8	4.3	6	3.2	31	16.5
	>10	-	-	3	1.6	3	1.6	8	4.3	14	7.4
	Single	-	-	-	-	-	-	-	-	-	-
	Separated	14	7.4	20	10.6	4	2.1	-	-	38	20.3
Marital Status	Widowed	14	7.4	21	11.2	10	5.3	5	2.7	50	26.4
	Divorced	-	-	-	-	-	-	-	-	-	-
	Married	30	20	30	15.9	25	13.3	15	7.9	100	53.3
	1 – 3	1	0.5	2	1.1	-	-	2	1.1	5	2.7
	4-6	17	9.0	18	9.6	6	3.2	4	2.1	45	23.9
Household Size	7-9	30	15.9	28	14.8	18	9.6	6	3.2	82	43.7
	10 - 12	8	4.3	17	9.0	10	5.3	4	2.1	39	20.7
	>12	2	1.1	6	3.2	5	2.7	4	2.1	17	9.0
	1-5	18	9.6	20	10.7	-	-	-	-	38	20.3
	6-10	12	6.4	12	6.4	4	2.1	-	-	28	14.8
Voors of Europianoo	11 – 15	9	4.9	12	6.4	6	3.2	1	0.5	28	14.8
rears of Experience	16 - 20	8	4.3	10	5.3	7	3.7	4	2.1	29	15.4
	21 - 25	6	3.2	10	5.3	10	5.3	5	2.7	31	16.5
	>25	5	2.7	7	3.7	12	6.4	10	5.3	34	18.2
	<1	-		40	30.8	5	3.8	-	-	45	34.6
Overtity Stand in town	1-2	-	-	14	10.8	10	7.7	-	-	24	18.5
Quantity Stored in tones	2-3	-	-	11	8.5	9	6.9	7	5.4	27	20.8
	>3	-	-	6	4.6	15	11.5	13	10.0	34	26.1

Variables	Category	Frequency	Percentage
		Farmers	Farmers
	Barns	32	21.6
	Cribs	41	27.7
	Rumbu	04	2.7
Storage Type	Platform/tree	25	16.9
	Roof	10	6.8
	Open field	34	22.9
	Warehouse	02	1.4
	Silo	-	-
	>5	3	2.0
	5-10	47	31.8
Year of existence	11-15	69	46.6
	$\frac{11}{16-20}$	5	3.4
	<20	24	16.2
	Inherited	90	60.8
	Rent	28	18.9
Storage acquisition	Purchased	08	5.4
Storage acquisition	Constructed	20	13.5
	Others	02	14
	>1	59	30.0
	1 2	45	30.4
Storage capacity/toppe	$\frac{1-2}{2-3}$	15	10.1
Storage capacity/tollic	$\frac{2-5}{3}$	1.1	0.5
	<u> </u>	14	10.1
	None	15	10.1
	Few	32	21.6
Storage losses	Many	58	30.2
		58	39.2
	Pot	05	2.4
	- KOL	03	3.4
	Shirinkage	02	1.4
Damages during storage	Moulding	42	20.0
	Denfenetien	43	29.0
	Perforation	52	35.1
	Durchased	24	10.2
	Purchased	20	13.3
Chemical source	Cooperatives	62	41.9
	Extension agent	46	31.1
	Others	20	13.5
	1-3	10	6.7
	4-6	24	50.0
Length of storage/months	7 – 9	54	36.5
	>9	10	6.7
	Not efficient	29	19.6
	Fair	63	42.6
Storage assessment	Efficient	51	34.4
5	Very efficient	05	3.4
	Others	-	_

Table 2. Description of Storage Technologies in the Study Area

	Coefficient	t ratio	Coefficient	t ratio	Coefficient	t ratio
	For Local Storage		For Semi Modern		For Modern Storage	
Constant	2.967	1.635	-2.346	-1.029	3.603	1.081
Ex	0.319(1.085)	1.054	-0.0328(0.0784)	-0.964	0.011***(0.0257)	2.542
Fs	-0.088(0.224)	-1.501	0.127(0.3397)	0.166	-0.206(0.6069)	-0.165
Ср	-0.00003*(0.00006)	-1.965	-0.00001(0.000023)	-0.584	0.00054(0.00124)	0.235
La	0.00039(0.00089)	0.903	-0.00087*(-0.0020)	-1.701	0.00015(0.00035)	1.564
Tr	0.00015(0.0035)	1.330	-0.0023*(0.0053)	-1.647	-0.00386*(0.0089)	-1.894
Sc	0.0367(0.088)	1.606	0.0672***(0.1673)	2.875	0.0657*(0.163)	1.687
Ed	0.0442(0.107)	0.640	0.0880(0.2246)	1.146	0.0238*(0.0563)	1.740
Ag	-0.0731***(0.183)	-2.589	-0.0254(0.006)	-0.839	-0.930***(0.7511)	-2.650
Sample Si	ze -	148				
Chi – Squ	ared-	50.76	***=Significant At 0.	01 Level		
Log Likel	ihood-	-130.12	**= Significant At 0.0	05 Level		
Restricted	Log Likelihood-	-155.5	*= Significant at 0.10	level		
Level Of S	Significance-	-0.05				

Table 5. Multinomial Logit Estimate on Maize Storage by Farmers

*Odd – ratio in parentheses-