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ASSESSMENT OF EFFECTS OF POST-HARVEST LOSSES OF SELECTED CEREAL CROP PRODUCE ON RURAL FARMERS IN BAUCHI AND ADAMAWA STATES, NIGERIA.

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Abstract
A survey was conducted to assess effects of post-harvest losses of cereal crop produce on rural farmers in Bauchi and Adamawa States, Nigeria. The population for the study consisted of all cereal crop farmers in Bauchi and Adamawa States. A multistage sampling procedure was adopted in obtaining 128 respondents as sample size for the study. Data for the study were collected using structured questionnaire. Data for the study were analyzed using both descriptive and inferential statistics. The causes of post-harvest losses of cereal crop produce showed that the major causes were: pest and disease infestation (x= 2.74), pre-mature harvesting (x= 2.67), lack of Extension service delivery (x– 2.50), lack of agro-based industries (x= 2.52) and poor storage facilities (x= 2.52). The result showed that there was no significant difference between Bauchi and Adamawa States (P>0.05) in terms of effects of post-harvest losses of cereal crop produce on rural farmers. Thus Hcal. (6.5) < x^2tab (11.07) at 0.05 level of probability. Factor analysis identified two major constraints to control of post-harvest losses of cereal crop produce in Bauchi and Adamawa State, namely: socio-economic constraints (Factor 1) and administrative constraints (Factor 2). It was therefore recommended that farmers should be taught improved methods of controlling post-harvest losses of cereal crop produce and they should be educated on strategies for mitigating the effects of post-harvest losses of cereal crop produce.

Keywords: *Assessment, effects, post-harvest, losses, cereal crops.*

1.0 Introduction

Agriculture constitutes the main source of livelihood of people in many parts of the world. In Nigeria, Agriculture is one of the most important sectors of the Nigerian economy, which provides employment opportunity for about 70 – 80 percent of the total population, most of whom are practising farming at subsistence level (Joyce and

Fadullah, 2016). The National policies on agricultural food production in Nigeria has explicitly made several efforts in an attempt to address the need to increase food production, especially rice among food crops in Nigeria (Joyce et al., 2016). However, in recent time, Nigeria has become a food-deficit country that on many occasions has been dependent on food import (Adeoye, 2010). Yearly, farmers produce a lot, to boost the economy, unfortunately, almost half of what they produce is lost at post-harvest stage (Olayemi, Adebola, Bamishaiye and Awagu, 2011).

According to Age (2017), post-harvest losses can be defined as measurable quantitative and qualitative damages or spoilage in the post-harvest value chain, caused by natural or artificial phenomena. These losses affect both the quality and quantity of crop produce, thus reducing their economic value and total income of the producers. Patrick (2013) reported that Nigeria records over 40 percent post-harvest losses, which have led to unprecedented hike in food importation in the country. In fact while significant losses occur yearly in the food supply chain, in industrialized region, in low income countries, food is lost mostly during the early and middle stages of the food supply chain Ahmed (2013) reported that post-harvest losses of crops, produce are making Nigeria farmers poorer. For a very long time, Nigerian farmers have lamented the situation without getting meaningful assistance.

Post-harvest losses do not only affect perishable crop produce but also grains and leguminous crop produce. It is estimated that as much as 50 percent of fruits, 40 percent vegetables, 15 – 20 percent grains are wasted after harvest (Olayemi et al., 2011). Recent trend in global food markets indicates that unless serious attention is given to post-harvest losses, the possibility of feeding over 9 billion people in 2050 and beyond is shrouded in uncertainty. This attention is even more crucial in Nigeria, where post-harvest losses are high. According to Bourne-Bourne (2014), Hodges, Buzby and Bennett (2011), one of the most important ways to increase food availability is to reduce post-harvest losses.

2.0 Objectives of the Study

The broad objective of this study was to assess effects of post-harvest losses of selected cereal crop produce on rural farmers in Bauchi and Adamawa States, North-East, Nigeria. The specific objectives include to:

i. identify perceived causes of post-harvest losses of cereal crop produce in the study areas
ii. determine effects of post-harvest losses on rural farmers and selected cereal crops produce in the study areas, and
iii. identify constraints to control of post-harvest losses of selected cereal crop produce in the study areas.

3.0 Methodology

A multistage sampling procedure comprising purposive, stratified and simple random sampling techniques were used to select a sample size of 255 respondents.

The first stage involved purposive selection of two States from the North-Eastern part of Nigerian due to their high level of production of cereal crops. In the second stage, each state was stratified into three agricultural zones giving a total of six agricultural zones based on the existing structures. In the third stage, two Local Government Areas were purposively selected from each of the six agricultural zones from the two States, due to the preponderance of post-harvest losses of cereal crop produce in the areas. In the fourth stage, two rural communities from each of the Local Government Areas were randomly selected making a total of twenty four rural communities. Finally, a sampling frame was developed for each of the selected rural communities and using a proportional allocation of 20% (0.2) across board, a sample size of 255 eligible respondents was selected for the study.

4.0 Results and Discussions

4.1 Causes of Post-harvest losses of Cereal crop

Table 1shows that the major causes of Post-harvest losses in Bauchi State were, pest and disease infestation ($\bar{x}$= 2.69), high temperature ($\bar{x}$= 2.19), premature harvesting ($\bar{x}$= 2.45), lack of proper storage facilities ($\bar{x}$= 2.62), lack of agrobased industries ($\bar{x}$= 2.54), poor ventilation ($\bar{x}$= 2.24), poor transportation and breakdown of vehicles ($\bar{x}$= 2.29), poor marketing facilities ($\bar{x}$=2.32), poor processing facilities ($\bar{x}$=2.47), poor packaging facilities ($\bar{x}$=2.37), poor handling ($\bar{x}$=2.28), contaminants ($\bar{x}$=2.36), pre-harvest production ($\bar{x}$=2.24), lack of agricultural Extension services ($\bar{x}$=2.50), microbial activities ($\bar{x}$= 2.30) and humidity ($\bar{x}$= 2.15).

In Adamawa State, pest and disease infestation ($\bar{x}$= 2.80), high temperature ($\bar{x}$=

2.31), premature harvesting ($\bar{x}$= 2.57), lack of proper storage facilities ($\bar{x}$= 2.72), lack of agro-based industry ($\bar{x}$= 2.51), poor ventilations ($\bar{x}$= 2.39), poor transportation and breakdown of vehicles (x= 2.27), poor marketing facilities (x= 2.40), poor processing facilities ($\bar{x}$= 2.57), poor packaging facilities ($\bar{x}$= 2.42), contaminants ($\bar{x}$= 2.28), pre-harvest production facilities ($\bar{x}$= 2.29), lack of agricultural extension services ($\bar{x}$= 2.50), microbial activities ($\bar{x}$= 2.47) and high humidity ($\bar{x}$= 2.26). This implies that all the perceived causes of post-harvest losses of selected cereals crops in Bauchi and Adamawa States were many, which means all of these causes contributes to post-harvest losses of cereal crops produce in the study areas. This result agrees with the World Bank (2011) whice stated that the causes of post harvest losses are manifold and occur at any stage between harvest and consumption. This also agrees with the Age (2015) who stated that lack of agro-based industries to process raw cereal crops produce into finished products is one of the causes loss of cereal crop produce in Nigeria.

Table 1: Causes of post -harvest losses of cereal crops produce in Bauchi and Adamawa States, Nigeria (n=255)

Variables	Bauchi Mean	Adamawa Mean
Pest and disease infestation	$\bar{x}$= 2.69	$\bar{x}$= 2.80
Lack of proper storage facilities	$\bar{x}$= 2.62	$\bar{x}$= 2.72
Lack of agro -based industry	$\bar{x}$= 2.54	$\bar{x}$= 2.51
Premature harvesting	$\bar{x}$= 2.45	$\bar{x}$= 2.57
Poor processing facilities	$\bar{x}$= 2.47	$\bar{x}$= 2.57
Lack of Agric Extension Services	$\bar{x}$= 2.50	$\bar{x}$= 2.50
Poor packaging facilities	$\bar{x}$= 2.37	$\bar{x}$= 2.57
Microbial activities	$\bar{x}$= 2.30	$\bar{x}$= 2.47
Poor marketing facilities	$\bar{x}$= 2.33	$\bar{x}$= 2.40
Poor handling of produce	$\bar{x}$= 2.28	$\bar{x}$= 2.42
Contaminants	$\bar{x}$= 2.36	$\bar{x}$= 2.28
Poor ventilation	$\bar{x}$= 2.24	$\bar{x}$= 2.39
Poor transportation breakdown	$\bar{x}$= 2.29	$\bar{x}$= 2.27
Pre-harvest production practices	$\bar{x}$= 2.24	$\bar{x}$= 2.29
High temperature	$\bar{x}$= 2.19	$\bar{x}$= 2.31
High humidity	$\bar{x}$= 2.15	$\bar{x}$= 2.26
Cut-off mean		$\bar{x}$= 2.20

Source: Field Survey, (2022).

4.2 Effects of Post-harvest losses on cereal crop farmers in Bauchi and Adamawa States

Table 2 shows that there is no significant difference in the effects of post-harvest losses of cereal crop produce on rural farmers in Bauchi and Adamawa States ($p>0.05$), The kruskal-Wallis test (H) conducted reveals that H. calculated (6.5) < $X^{2,}$ Tabulated (11.07) at 0.05 level of probability. It reveals that summation $R_1 = 652.5$, $R_2 = 372.0$, $R_3 = 244.5$, $R_4 = 513.0$, $R_5 = 459.59$, while $R_6 = 423.5$. From the findings above it was observed that all the effects of post-harvest losses of cereal crop procedure on rural farmers were common among rural farmers in Bauchi and Adamawa States were similar or common across the agricultural zones. This finding agrees with Patrick (2013) who reported that Nigeria records over 40 percent of post-harvest losses which had led to hike in food importation in the country. This also agree with the findings of Kughir et al. (2015) who stated that post-harvest losses have led to food insecurity in the country. To corroborate this Lipinski et al. (2013) stated that food losses and waste have many negative effects on the economic and environmental impact. Economically, they represent a wasted investment and can reduce farmers' income and can also increase consumers' expenses.

Table 2: Kurskal -Wallis Analysis of effects of post-harvest losses of cereal crop produce on Rural Farmers in Bauchi and Adamawa States

State	Bauchi						Adamawa					
Variables	Central Zone		Western Zone		Northern Zone		Mubi Zone		Gombi Zone		Mayo Belawa Zone	
	Freq.	R_1	Freq.	R_2	Freq.	R_3	Freq.	R_4	Freq.	R_5	Freq.	R_6
Reduces farmers' income	60	60.5	30	23.5	33	32.5	30	23.5	60	60.5	30	23.5
Reduces availability 9of produce	70	69.0	40	39.0	13	1.5	40	39.0	50	51.5	30	23.5
Reduces quality of produce	65	65.0	45	46.0	13	1.5	60	60.5	30	23.5	30	23.5
Causes poverty among farmers	60	60.5	33	32.5	30	23.5	30	23.5	50	51.5	40	39.0
Discourages farmers from more production	80	72.0	20	7.0	23	13.0	40	39.0	60	60.5	20	7.0
Aflotoxin contaminations	50	51.5	50	51.5	23	13.0	20	7.0	30	23.5	70	69.5
Low storage life	70	69.5	23	18.0	30	23.5	50	5.5	40	39.0	30	23.5
Food insecurity	65	65.5	40	37.0	15	3.0	40	39.0	20	7.0	60	60.5
Waste of time	40	39.0	50	51.1	30	23.5	40	39.0	20	7.0	40	39.0
Botulism	50	51.1	23	13.0	50	51.5	60	60.5	20	7.0	40	39.0
Environmental pollution	50	51.1	30	23.5	43	45.5	20	7.0	30	23.5	70	69.5
Waste of labour	70	69.0	30	23.5	23	13.0	40	39.0	60	60.5	20	7.0
H.cal = 6.5	∑	R_1=652.2	∑	R_2=372.0	∑	R_3=244.5	∑	R_4=513.0	∑	R_5=459.5	∑	R_6=423.5
^{2}-Tab., 11.07												

4.3 Constraints to Control of post-harvest losses of cereal crop produce in Bauchi and Adamawa States.

Table 3 shows that there were two major categories of constraints to effective control of post-harvest losses of cereal crop produce among rural farmers in Bauchi and Adamawa States, namely: socio-economic cum environmental constraints (Factor 1) and administrative cum infrastructural constraints (Factor 2).

In Factor 1, the major socio-economic cum environmental found were; lack of handling and processing skills (0.508), lack of awareness about post-harvest (0.703), inadequate credit facilities (0.615), lack of PHL technology (0.466), lack of marketing information (0.572), climate change (0.464), illiteracy of farmers (0.419) and ignorance about effects of aflotoxin contaminants (0.503).

In Factor 2, the major administrative cum infrastructural constraints were lack of packaging facilities (0.746), lack of database on PHL (0.401), insufficient storage facilities (0.840), lack of effective distribution system (0.558), lack of policy framework for control of PHL (0.793), lack of incentive to farmers (0.719) and lack of political will (0.700).

This implies that socio-economic cum environmental constraints (Factor 1) and administrative cum infrastructures constraints (Factor 2) were the major constraints responsible for high post-harvest losses of cereal crop produce among farmers in Bauchi and Adamawa States. This agrees with Age (2017) who stated that constraints to post harvest losses of cereal crop produce include lack of knowledge on proper post-harvest handling practices, poor transportation facilities, lack of credit facilities and lack of storage facilities.

Table 3: Factor Analysis of constraints to control of post -harvest losses of cereal crop produce among Rural farmers in Bauchi and Adamawa States.

S/No	Variables	Factor 1	Factor 2
	Lack of handling and processing skills (LHPS)	0.508*	0.173
	Lack of awareness about PHLs (LOA)	0.703*	0.058
	Inadequate credit facilities (ICF)	0.615*	0.185
	Lack of packaging facilities (LPF)	0.019	0.746**
	Lack of training and control of PHL (LTCPH)	0.619*	0.030
	Lack of information on PHL Technology (LIPHT)	0.466*	0.048
	Lack of marketing information (LOMI)	0.572*	0.314E.02
	Lack of database on PHL (LDPHL)	0.331E.02	0.401**
	Insufficient improved storage facilities (LSPF)	0.052	0.840**
	Climate change (CC)	0.464*	0.095
	Illiteracy of farmers (IOF)	0.419*	0.135
	Lack of effective distribution system (LEDS)	0.015	0.558
	Lack of policy framework for control of PHL (LPFHL)	0.023	0.793**
	Lack of incentive to farmers (LIF)	0.104	0.719**
	Lack of political will (LPW)	0.170	.0700**
	Ignorance about effects of afl atoxin contaminants (IEAC)	0.503*	0.280

Method: Varimax with Kasier normalization

*Factor 1: Socio -economic cum environmental constraints

**Factor 2: Administrative cum Infrastructure constraints

5.0 Conclusion and Recommendations

5.1 Conclusion

The assessment of effects of post-harvest losses of cereal crop produce among rural farmers in Bauchi and Adamawa States have revealed that, cereal crop farmers in the two States were greatly affected by post-harvest losses. These effects include: Reduced farmers' income, reduced availability of produce, reduced quality of produce, caused poverty among farmers, discouraged farmers from producing more, low storage life, food insecurity, waste of time, waste of labour, environmental pollution etc. These result showed no significant difference between Bauchi and Adamawa States in terms of effects of PHLs on cereal crop farmers. The result showed major causes of PHLs of cereal crop produce among rural farmers in Bauchi and Adamawa States were pest and disease infestation, lack of proper storage facilities, premature harvesting, lack of agro-based industries, poor processing facilities and lack of agricultural extension service delivery among others. Finally, the major constraints to control of PHLs of cereal crop produce in

Bauchi and Adamawa States were identified as socio-economic constraints and infrastructural constraints.

5.2 Recommendations

Based on the findings of the study, the following recommendations were made:

i. Farmers should be taught improved methods of controlling post-harvest losses of cereal crop produce.

ii. Farmers should be educated on strategies for mitigating effects of post-harvest losses of cereal crop produce by Agricultural Extension workers.

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