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Post-harvest monitoring and crop production assessment in Nertiti locality of Central Darfur State-Sudan

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Abstract

Crop productivity has declined all over the world due to weak investments in agricultural research, which negatively impact food production as well as food security situation. The purpose of this study is to explore the connection between post-harvest monitoring and food production security in Nertiti locality of Central Darfur state during 2012/2103 cropping rainy season. Descriptive statistical analysis by using Statistical Package for the Several Sciences (SPSS) was run. Three villages (Eraideeba, Salakoya and Rijlaldelaiba) were randomly selected. A total of 1600 (men & women) of beneficiary household head were targeted in the entire study area. Clustered random sampling technique applied. Crop harvest chick list and Focus Group Discussion were administered at the beneficiary and community level for planted areas, agricultural production and the effect on food and seed security. Due to, 20 households head randomly selected from each village. A total of 60 household head (40 men and 20 women) selected for chick list in addition to 15 household head for Focus Group discussion (10 men and 5 women) to represent the whole study area. Results of Statistical analysis related to crop yields indicated that the average yields of sorghum, millet and groundnut among improved seeds beneficiary managed farms exceed other traditional farms by 22%, 47% and 55%. Production at community level revealed that, Rijalldelaiba village gave highest millet production (1740 metric tons), Salakoyaproduced1409.4 metric tons of sorghum and Eriadeeba village gave 456 metric tons ofgroundnuts. Households also assessed that, their cultivated area increased by 33%, 50% same, while 17% said decreased. Group discussion and individual interview results related to food security and crop utilization showed that, food and seed security for 12 month is good, production covers consumption food for 8-12 month, the adopted coping strategies for the remaining 4 month were livestock sale, daily labor, migration, firewood collection, charcoal and bricks making. Regarding the crop utilization, the majority of respondents reported that, 50% left their by-products on the field, 27% used as animal fodder and 23% stored. A focus group discussion result addresses constraints of, problems of security, storage facilities, packing materials, marketing problems, extension services and inadequate improved seeds. Monitoring reached recommendation of, provision of improved seeds, training, marketing facilities and packing inputs.

Keywords: Post-harvest; Monitoring; Assessment; Descriptive; Chick list; Focus group discussion; Yield

1. Introduction

Post-harvest loss is a “measurable quantitative and qualitative loss of a product at any moment during the postharvest chain” and includes the “change in the availability, edibility, wholesomeness or quality of the food that prevents its consumption [4]. Both quantitative and qualitative losses of extremely variable magnitudes occurring at all stages in the post-harvest system from harvesting, through handling, storage, processing and marketing to final delivery to the

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consumer. Most losses occur in the latter part of the food chain through excessive processing, packaging and marketing. It has been reported that, the magnitude of losses depend on the nature of the commodities, the condition of the produce at the time of collection, distance travelled and the nature of the road network. Improper harvest and post-harvest practices result in losses due to spoiling of the product before reaching the market, as well as quality losses such as deterioration in appearance, taste and nutritional value. [3] added that, Postharvest loss (PHL) is defined as the measurable quantitative and qualitative loss of products at any point in the postharvest chain, from harvest to consumption. This leads to food losses and significant economic losses. The report found that nearly 800 million people, one in nine globally, are malnourished and that more than a billion tons of food never ends up with consumers. However, the extent of PHLs varies between developed and developing countries. Food loss in low-income countries mainly occurs in the early and middle stages of the food supply chain, with fewer amounts wasted at the consumer level. Inadequate harvesting stage, poor harvesting technique, transport, lack of a cold chain system, inadequate storage facilities, limited processing knowledge, and a lack of appropriate packaging and trading facilities are the main drivers of high PHLs in developing countries.

According to POSTHARVEST INFRASTRUCTURE BASELINE SURVEY FINAL REPORT [7], Post-harvest handling encompasses operations at harvest, transport to a packing facility, storage and transport technologies to preserve produced food until delivery to customers/consumers or market. It refers to a system of measuring, monitoring, and managing produce to improve food quality, minimize food waste, reduce risks and uncertainties, and maximize time and resources. Post-harvest handling in Rwanda is connected with appropriate infrastructures and equipment including drying (shelters & grounds for cereals like maize and rice), storage such as warehouses and metallic silos, and cooling (cold-rooms, charcoal coolers and pack houses) infrastructures for perishable and non-perishable crops.

Proper drying ensures that the grain will endure threshing and storage without spoilage. Drying is also part of the grain trading system [6]. The shelled grain should be dried to ≤ 13.5% moisture under safe conditions to avoid contaminations with fungi. Many smallholder farmers dry grain directly on the ground, which also contaminates it with soil-borne residues. The process is slow and encourages spillage and pest attacks. Grain losses equivalent to 2–9.5% occur in various African countries during drying. The Africa RISING (Research in Sustainable Intensification for the Next Generation) program validated and promoted the GrainPro Collapsible Dryer Case™ (CDC), a plastic sheet envelope designed for quicker and protected sun-drying. In use, the reinforced polyvinyl chloride sheet (optimized for solar energy absorption) is spread out, and the produce (cobs, pods, or the threshed grains) is placed on top. In bad weather (rains), the tarpaulin is folded to enclose the produce in a zipped envelope.

Monitoring is the systematic and continuous collection and analysis of information about the progress of a development intervention. Monitoring is done to ensure that all the people who need to know about an intervention are properly informed, and so that decisions can be taken in a timely manner. There are many different types of monitoring, including financial monitoring, process monitoring and impact monitoring [9].

[1] stated that, Agriculture is the main sources of income in Central Darfur State. The main stable food crops grown by farmers are millet sorghum and wheat. The major problems prevailed in the state are poverty, unemployment, failure of crops, higher labor costs, lack of storage facilities, income, lack of capital for investment and emergency needs, in addition to, insufficient knowledge and skills, lack of awareness on mobilization and utilization of the locally available raw materials and natural resources, lack of marketing facilities and business skills. Due to all mentioned above people are living in low income level and economic status.

This study focuses on monitoring post-harvest and its influence on crop production and seed security. The assessment shade the light on production and consumption behavior, post harvest constraints and the contribution of production on food and seed security.

1.1. Goals and objectives

- To identify the influence of post-harvest on food and crop production
- To monitor challenges and constraints that limits post-harvest
- To assess food and seed security situation in the study area
- To reach recommendations and lesson leaned for the future interventions

1.2. Checklist

[8] a lemma in the Merriam-Webster dictionary describes a checklist as a “list of things to be checked or done”. This definition captures the supportive nature of a checklist to “tick off” work that has been carried out and to serve as a reminder of what is still left to do.

1.3. Descriptive statistic

Descriptive statistics is the simplest form of statistics: it is a tool to help people organize and summarize the inevitable variability in collections of actual observations or scores. It demonstrates the relationship between variables in a given sample, and it is often used to clean up and summarize scattered data, which is crucial for making inferential statistical comparisons and conducting research [2]

1.3.1. Frequency distribution and Pie chart

[5] to obtain a frequency distribution of categorical data, we simply count how many cases there are in each category. The frequencies of the categories can be expressed as their absolute number or as a percentage of the total. Calculating the percentage of a given category is very simple: divide the absolute frequency by the total and multiply by 100. While Pie charts are recommended to present frequency distributions. The area of the circle assigned to each category is proportional to its frequency.

2. Material and method

This study was conducted in Nertiti locality of Central Darfur State during 2012/2013 cropping rainy season. The area is geographically located between latitudes 12^0 25′ and 13^0 N and a longitude 40 10′and 240 12′E. Nertiti is not only one of the richest localities in Central Darfur State, but also is the one that has different cropping systems, variation in climate and ecological zones. It was situated in the southern east of Zalingei locality (65 kilometer and 3897 asl of sea level), volcanic soil is dominated, farmers depend mainly on agriculture as a sources of income, rain fall reaches up to 1000 mm in the uphill and high lands areas and 800 mm in the lowland areas. Three villages namely Eraideeba, Salakoya and Rijlaldelaiba were randomly selected. Checklists are used to collect information to cover a wide range of beneficiary and community level. Improved seeds sorghum millet and groundnut were provided to be grown and cultivated under FAO beneficiary managed and other traditional farmer's managed. Research technical packages of sowing date, sowing methods, spacing, thinning and harvesting and post harvest methods given to FAO beneficiary farmers. A total of2325 households targeted, comprising Residence (1050 HHs), IDPS (850 HHs), poor household head (250) and women household heads (175).Stratified random sampling technique applied. Due to, 60 household heads were randomly selected for checklists. Three communities for focus group discussion created (1 village each). Accordingly, 15 household head (10 men and 5 women) selected. Information collected to cover crop harvested area, production, yields, utilization, storage, marketing and harvesting constraints. Descriptive statistics was run for frequency distribution and charts display.

3. Results and discussions

Results of Table 1 showed that average yields kg/feddan under FAO beneficiary managed and other traditional managed was 235, 192 and 217, 148, and 357, 230 for sorghum millet and groundnut, respectively. It was also noted that yields of FAO beneficiary farmers exceed yields of other traditional farmers by 22%, 47% and 55% for sorghum, millet and groundnut, respectively. This result implies that there is a positive connection between post-harvest technology and crop production as well as food security under FAO farms managed and post harvest, while interventions and great attentions needed to improve farmers' yields under other traditional farms. Production under community level in table 2 indicated that, Rijalldelaiba village gave highest millet production (1740 metric tons), Salakoya produced 1409.4 metric tons of sorghum and Eriadeeba village gave 456 metric tons of groundnuts. It was recorded that the highest area devoted for sorghum cultivation is 1488 feddan in Salakoya, while millet and groundnut occupied 1980 and 960 feddan in Eraideeba, respectively. These results attributed to On the other hand 33% of respondents reported increase in their cultivated areas due to the FAO distributed seeds, while 50% reported no increase in their cultivated area and 17% of the respondents reported decrease figure 1.Group discussion and individual interview results related to food security and crop utilization revealed that, food and seed security for 12 month is good, production covers consumption food for 8 month; the adopted coping strategies for the remaining 4 month were livestock sale, daily labor, migration, firewood collection, and charcoal and bricks making. Regarding the crop utilization, the majority of households said that, 50% left by-products on the field, 27% used as animal fodder and 23% stored for future used as shown in figure 2. Households also reported post harvest losses due to bad roads. Study highlighted constraints of security problems, storage facilities, packing materials, extension services and inadequate improved seeds.

Table 1 Harvested crop area/feddan, production/kg and yields kg/feddan under FAOBeneficiary managed across other farmers traditional managed, by village

Crops	**Under FAO beneficiary managed farms**			**Under other traditional managed farms**		
	Eraideeba	**Salakoya**	**Rijalldelaiba**	**Eraideeba**	**Salakoya**	**Rijalldelaiba**
Sorghum						
area	0.77	0.95	0.77	1.3	1.53	1.21
Production	94.5	252	243	195.3	452.7	157.5
Yield	123	265	316	150	295	130
Average yield	235			192		
% change	22%					
Millet						
area	1.55	1.3	1	1.75	1.6	2.9
production	197	280	310	258	190	520
yield	127	215	310	147	119	179
Average yield	217			148		
% change	47%					
G/nut						
area	0.25	0.25	0.27	1.35	0.3	0.32
production	76	84	116	154	68	112
yield	304	336	430	114	227	350
Average yield	357			230		
% change	55%					

Source: post harvest monitoring, 2012

Table 2 Harvested area/feddan across crop production in metric tons

Crop	**Estimated cultivated area/ feddan**			**Estimated production in Metric tons**		
	Eraideeba	**Salakoya**	**Rijalldelaiba**	**Eriadeeba**	**Salakoya**	**Rijalldelaiba**
Sorghum	1,242	1,488	792	581.4	1409.4	783
Millet	1,980	1,740	1,560	910	950	1740
Ground nut	960	330	236	456	300	454.4

Source: post-harvest monitoring, 2012

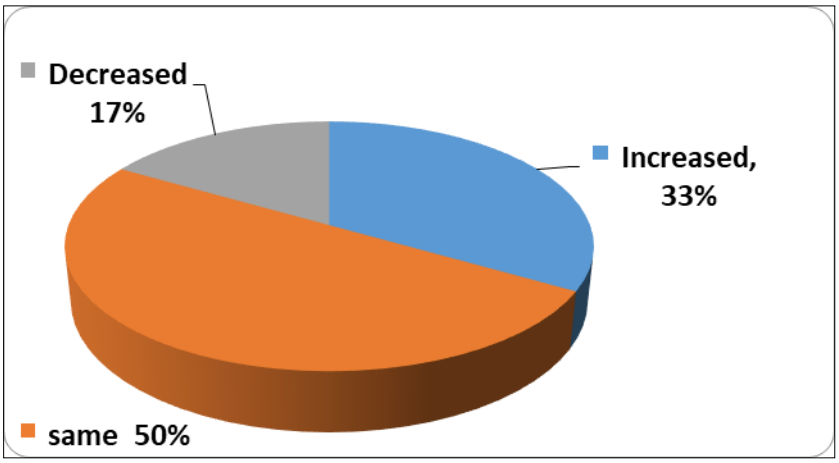

Figure 1 Crop area distribution

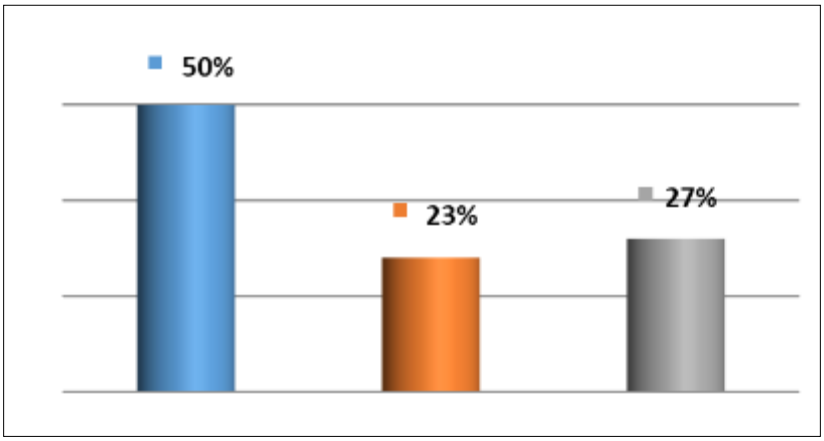

Figure 2 By-product utilization

4. Conclusion

This study was carried out in Nertiti locality of central Darfur State during 2012/2013 cropping season. The purpose of the study is to explore the connection between post-harvest technology and crop production and food security. The study founded that yields within FAO supported farms ensured food availability compared to other traditional farms. It was observed that post-harvest losses due to bad roads, while distances between markets are not so much far. It was obvious that providing research technologies tend to enhanced crop production as well as food security. Other constraints related to post harvest monitoring were security problems, storage facilities, packing materials, marketing problems, extension services and inadequate improved seeds. To improve post-harvest technology, great attention given to production strategies, training and capacity building, storage facilities, marketing and packing materials

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest stated by authors.

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