



# Post-harvest Losses Survey Technical Report

NAMIBIA

OCTOBER 2018

## **Abstract**

Namibia received technical assistance from the Global Strategy to improve Agricultural and Rural Statistics (GSARS) on the measurement of post-harvest losses. The GSARS is a capacity development project on agricultural and rural statistics involving the Food and Agriculture Organization of the United Nations (FAO) and other organizations, such as the African Development Bank (AfDB).

The Post-Harvest Losses (PHL) pilot survey was conducted by the Namibia Statistics Agency (NSA) in collaboration with Ministry of Agriculture, Water and Forestry (MAWF) and the Agro-Marketing and Trade Agency (AMTA).

The goal of the pilot survey was to:

- Test the methodology of PHL
- Test the on-farm and off-farm questionnaires developed for Namibia on PHL
- Improve the field work organization for PHL assessment
- Reinforce the analytical capacities of the staff from the NSA, MAWF, AMTA as well as other organization involved in the collection and analysis of agricultural data such as research stations.

It is widely known that most Namibians are directly or indirectly dependent on agriculture for livelihood. The most commonly grown crops in the subsistence-based communal sub-sector are pearl millet, maize and sorghum. The On-farm pilot survey was conducted in Kavango West region, thus information presented in this report is valid for this region only.

## **Main economic activity**

A vast majority (89.5 percent) of households in Kavango West derives their income mainly from agriculture. Although there are other types of agricultural activities farmers are engaged in, the results indicate that the main activity for all households is agriculture specifically in the crop farming.

## **Demographic characteristics**

The average age of the Head of an agricultural household in Kavango West region is fifty-four (54) years and is likely to be male (61 percent) than female (39 percent). Most of these farmers (53.7 percent) have primary education as the highest level of education completed.

### **Area planted and yield**

For the ending cropping season (2017/18), an agricultural household in Kavango west region planted an average of 2.89 hectares for pearl millet and 1.48 hectares for maize. Average yield per hectare is 590.5 kilograms for pearl millet while maize is 892.8 kilograms.

### **Types of seeds**

The pilot survey found that most farmers in Kavango west region used their own seeds. Practically, the majority of farmers (93.9 percent) used their own maize seeds while about 65.0 percent used local pearl millet seeds. However, about 3 out of 10 (30.0%) farmers used hybrid pearl millet seeds.

### **Fertilizers**

Fertilizer use is not common in the region. Over 90 percent of all agricultural households did not use any type of fertilizer for maize or pearl millet in the past cropping season. Where fertilizers has been used, less than 10 percent of the households used either organic or inorganic fertilizer.

### **Harvesting, threshing/shelling, cleaning/winnowing, drying**

Generally, all agricultural households use manual methods of harvesting for both pearl millet and maize. . Although there are machines that can Harvest, thresh/shell and clean/winnow majority of the holdings use the manual method for most of the job for both Mahangu/millet and Maize. For Mahangu/Millet 99.0 percent harvest manually, 50.4 thresh/shell manually and 84 percent clean/winnow manually. Furthermore, the study found that only 1 percent, 49.6 percent and 16 percent of the agricultural households used machines to harvest, thresh/shelling and winnow pearl millet, respectively. This winnowing is a combined process while threshing when using a machine.

The traditional methods of drying are predominant in the region. Drying cribs is the main method used for drying pearl millet and maize (56.9 and 48.8 percent, respectively). Although not too common, some agricultural households also dry their crops on the ground and on the roof, 22.2 percent of the households dry pearl millet on the ground while 35.0 percent dried maize on the roof.

### **Utilization of previous harvest stock**

Most agricultural households in the region are subsistence farmers as they produce mainly for household own consumption. The pilot study found that over 60 percent of pearl millet and maize grains from the previous

cropping season (2016/17) was used for own consumption. A small proportion of the grains were sold (1.73 and 1.25 percent for pearl millet and Maize, respectively).

### **Loss prevention**

The most known strategy applied by 61 percent of agricultural households to prevent losses is to harvest on time. However, the most effective method is the use of ashes (43 percent agricultural households) and storage hygiene (33 percent agricultural households).

### **Post-harvest loss assistance**

About 33 percent of agricultural households received assistance on PHL, mainly in the form of advice (39.9 percent agricultural households).

## Table of contents

Abstract.....	2
List of Tables .....	6
List of Figures .....	7
List of acronyms.....	8
Chapter 1: Introduction.....	9
1.1. Background of the study.....	9
1.2. Objective of the PHL Pilot Survey.....	9
1.3. Methodology.....	10
1.3.1. Target population.....	10
1.3.2. Selection of regions.....	10
1.3.3. Sample design.....	10
1.3.4. Data collection method.....	11
1.2.5. Fieldwork Organization.....	11
Chapter 2: Agricultural Activities.....	11
2.1. Socio-Demographic Characteristics of the Agricultural Household Holdings.....	12
2.2. Agricultural Practices of the Household Holdings.....	14
2.2.1. Agricultural practices of the household holdings.....	15
2.2.2. Agricultural Inputs used.....	15
2.2.3. Type of seed used.....	16
2.2.4. Use of fertilizers and pesticides.....	16
2.2.5. Method used for Harvesting, Threshing/Shelling and Clean/Winnow.....	18
2.2.6. Quantity stored from previous harvest, by crop.....	19
2.3. On-farm loss analysis.....	22
2.3.1. Quantity losses.....	22
2.3.2. Loss prevention strategies by agricultural household holdings.....	24
2.3.3. Assistance received from the government.....	26
2.3.4. Main source of information used by household holdings to obtain post-harvest management information.....	28
Chapter 3: Off-farm loss analysis.....	30
3.1. Selection of a region.....	30
3.2. Selection of millers.....	30
3.3. Data collection method.....	30
3.4. Fieldwork operation.....	30
3.5. Results.....	30
References .....	32

## List of Tables

Table 1: Household Holdings by Main Economic Activities.....	11
Table 2: Type of Agricultural Activity by Number of Holdings.....	12
Table 3: Highest Level of Education in the Household .....	13
Table 4: Crop Planted by the Households Holdings.....	14
Table 5: Area Planted for Maize and Mahangu .....	15
Table 6: Quantity harvested and yield, by crop.....	15
Table 7: Quantity of seeds used by main crops per ha.....	16
Table 8: Type of seeds used by crop.....	16
Table 9: Use of fertilizers and pesticides by main crop .....	17
Table 10: Method used by the agricultural household holdings for Harvesting, Threshing/ Shelling, Clean/ Winnow .....	19
Table 11: Method used by the agricultural household holdings for drying .....	19
Table 12: Utilization of the stored grains of each main crop from previous harvest.....	20
Table 13: Number of households by type of storage facility.....	21
Table 14: Number of holdings by type of pesticides/other products used to protect grains at storage level ...	22
Table 15: Loss quantities and comparison between farmers' declaration and physical measurement.....	23
Table 16: Percentages losses and comparison between farmer's declarations and physical .....	24
Table 17: Household holdings' strategies to prevent post-harvest losses and most effective action.....	25
Table 18: Assistance received from government .....	26
Table 19: Main kind of assistance received by household holdings.....	27
Table 20: Main source of information used by household holdings to obtain post-harvest management information .....	28
Table 21: Physical measurement loss off-farm.....	31

## List of Figures

Figure 1: Highest Level of Education in the Household.....	13
Figure 2: Head of the Household Holdings by Sex.....	14
Figure 3: Percentage of Households holdings using the different type of fertilizer on their main crops.....	17
Figure 4: Percentage of Households holdings using the different type of pesticides on their main crops .....	18
Figure 5: Percentage of utilization of the stored grains of each main crops from previous harvest.....	20
Figure 6: Number and Distribution of households by type of storage facility .....	21
Figure 7: Percentage and number of holdings by type of pesticides/other products used to protect grains at storage level.....	22
Figure 8: Household holdings' strategies to prevent post-harvest losses and most effective action .....	26
Figure 9: Assistance received from government .....	27
Figure 10: Main kind of assistance received by household holdings .....	28
Figure 11: Main source of information used by household holdings to obtain post-harvest management information .....	29

## List of acronyms

<i>PHL</i>	<i>Post-harvest Losses</i>
<i>FAO</i>	<i>Food and Agriculture Organizations</i>
<i>NSA</i>	<i>Namibia Statistics Agency</i>
<i>MAWF</i>	<i>Ministry of Agriculture, Water and Forestry</i>
<i>PSUs</i>	<i>Primary Sampling Units</i>
<i>PPS</i>	<i>Probability Proportional to Size</i>
<i>CAPI</i>	<i>Computer Assisted Personal Interview</i>

## **Chapter 1: Introduction**

### **1.1. Background of the study**

Namibia received technical assistance from the Global Strategy to improve Agricultural and Rural Statistics (GSARS) on the measurement of Post-Harvest Losses (PHL). The GSARS is a capacity development project on agricultural and rural statistics involving the Food and Agriculture Organization of the United Nations (FAO) and other organizations, such as the African Development Bank (AfDB).

The PHL pilot survey was conducted by the Namibia Statistics Agency (NSA) in collaboration with Ministry of Agriculture, Water and Forestry (MAWF) and the Agro-Marketing and Trade Agency (AMTA).

The On-farm pilot survey questionnaire on Post-Harvest Losses (PHL) has been developed in the context of the technical assistance activities. The goal of the questionnaire was to collect data on crop losses on the communal farm from harvest to storage, using the farmer's recall approach. Objective measurements to supplement and compare information from the farmer's recall was done by demarcating sub-plots in selected fields for PHL observations.

In addition, the study also helped to collect information on socio-demographic aspects of the agricultural households, agricultural practices such as seeds, fertilizers, pesticides, storage facilities and prevention of post-harvest losses needed for analyzing and comparing losses across agricultural households.

The pilot survey was conducted in Kavango West region only and the Primary Sampling Units (PSUs) were derived from the 2013/14 Agricultural Census frame. Staff from the Ministry of Agriculture, Water and Forestry (MAWF), (agricultural technicians as enumerators and agricultural technician as team supervisors) carried out field activities. The data collection took place from May 2018 to August 2018 (30 working days) and included both the subjective and objective measure of the PHL.

### **1.2. Objective of the PHL Pilot Survey**

The goal of the pilot survey is to:

- Test the methodology of PHL
- Test the on-farm questionnaire developed for Namibia on PHL
- Improve the field work organization for PHL assessment
- Reinforce the analytical capacities of the staff from the NSA, MAWF, and other organization involved in the collection and analysis of agricultural data such as research stations.

### **1.3. Methodology**

#### **1.3.1. Target population**

The target population for the PHL pilot study is all the agricultural households engaged in communal farming activities in the Kavango West region.

#### **1.3.2. Selection of regions**

A purposive non-probability sampling technique was used and Kavango West was selected on the basis that the region plants both crops of interest which are mahangu and maize.

#### **1.3.3. Sample design**

The PHL pilot study mainly followed the NCA 2013/14 methodology. The NCA 2013/14 used a stratified two stage cluster sample design for the communal sector survey. At the first stage, primary sampling units (PSUs) were selected with Probability Proportional to Size (PPS) from the sampling frame based on the Enumeration Areas of 2011 Population and Housing Census. The size measure of a PSU in the sampling frame was the number of agricultural households which was derived from the questions included in 2011 Population and Housing Census as per the FAO recommendations.

The list of agricultural households was prepared through the listing process within a selected PSU to form the secondary sampling frame from which a sample of agricultural households will be selected systematically.

A third stage of sampling was also introduced to measure objectively the average yields of the two major crops Maize and Pearl Millet for the purpose of estimating the production instead of the farmer's estimates. Hence a crop cutting experiment was then conducted to measure the average yields of these crops.

A list of plots under each of these crops in a sampled PSU was made, using the plot information of the selected households within the PSU. This list formed the sampling frames for each of the crops in the selected PSU.

One plot was randomly selected from the two main crops of the holder. An area was then marked within the selected plot according to the FAO guidelines and the matured crop inside this marked area was cut and weighed when the crop was wet and dry.

Crop cutting enable estimation of the yield of a crop and the losses during harvesting, threshing/shelling, and cleaning/winnowing. This was done through processing the produce of sub-plots in selected fields.

Interviewers did the crop cutting manually according to the techniques used by the farmer. After the manual harvesting was done, the second team of supervisors entered the field and collected all fallen ears/cobs, grains and weighed them after which the information was recorded.

These figures are used to estimate the average yields of each of the crops.

#### 1.3.4. Data collection method

The Post-Harvest Losses field assessment used a face-to-face interview method using CAPI questionnaire.

#### 1.2.5. Fieldwork Organization

A total of 31 PSUs were listed and interviewed while the objective measurement was conducted only in nine PSUs

Nine enumerators were sourced from the Ministry of Agriculture, Water and Forestry agricultural technicians. These technicians were organized in 3 teams and each team comprised of one supervisor and three enumerators. Kavango West Region was chosen for the fieldwork and the NSA regional statistician coordinated the work in the region.

Enumerators interviewed three PSUs per person i.e. 31 PSUs divided by 9 field staff. It took, for an enumerator, maximum 3 days to complete one PSU.

### Chapter 2: Agricultural Activities

Agricultural households were asked to indicate their main economic activities. Table1 presents information on the main economic activities of agricultural households.

A total of 16 078 agricultural households participated in the Post-harvest loss pilot survey in Kavango West region. Out of this, 14 390(89.5%)indicated that agriculture is their main economic activity while only 1 688 (10.5 %household holdings) engage in non-agricultural activities as their main economic activities.

**Table 1: Household Holdings by Main Economic Activities**

Main economic activity	Number of holdings	%
Agriculture	14 390	89.5
Non-Agriculture	1 688	10.5
<b>Total</b>	<b>16 078</b>	<b>100.0</b>

Source: post-harvest losses survey in Kavango West, 2018

Table 2.1 shows the distribution of household holdings by main type of agricultural activity. The PHL pilot survey found that all 14 390 household holdings that reported agriculture as their main economic activity, regard crop production as the main type of agricultural activity.

**Table 2: Type of Agricultural Activity by Number of Holdings**

Main Type of Agricultural Activity	Number of holdings	% of total
Crop Production	14 390	100.0
Livestock	0	0.0
Fishery	0	0.0
Forestry	0	0.0
Horticulture	0	0.0
Fruit culture	0	0.0
<b>Total</b>	<b>14 390</b>	<b>100.0</b>

### 2.1. Socio-Demographic Characteristics of the Agricultural Household Holdings

Table 3, figure 1 and figure 2 show the household holdings' characteristics. The results depict that average age of the head of the household is 54 years.

Furthermore, Table 3 and Figure 1 provide information on the highest level of education of the household member.

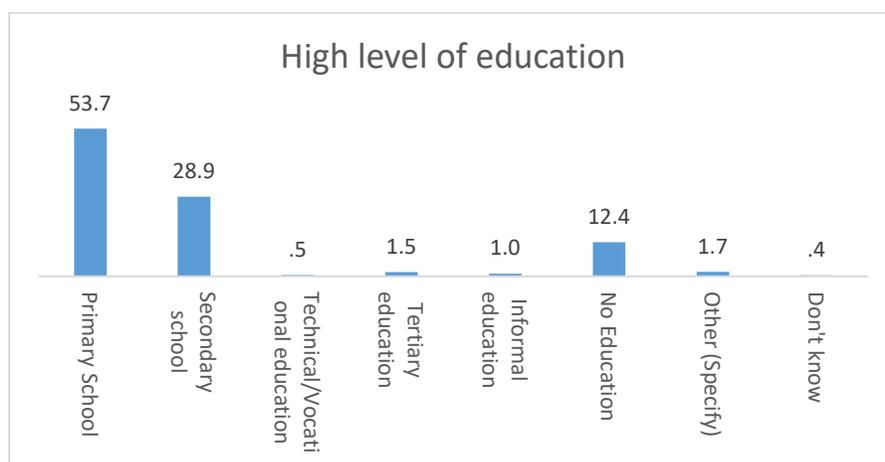
About 53.7 percent of the household members reported primary school as their highest level of education, this is followed 28.9 percent of household members who have secondary education while a mere 0.5 percent of the household members cited technical/vocational education as their highest level of education

**Table 3: Highest Level of Education in the Household**

Education levels	Number of people	%
Primary School	44363	53.7
Secondary school	23856	28.9
Technical/Vocational education	377	0.5
Tertiary education	1242	1.5
Informal education	825	1.0
No Education	10264	12.4
Other (Specify)	1392	1.7
Don't know	334	0.4

Source: post-harvest losses survey in Kavango West, 2018

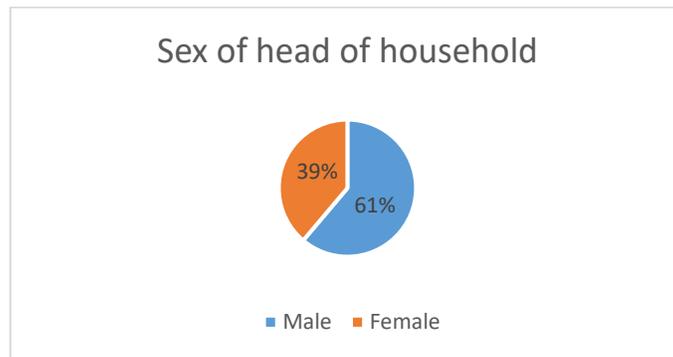
**Figure 1: Highest Level of Education in the Household**



Source: post-harvest losses survey in Kavango West, 2018

Figure 2 depicts the distribution of the household heads by sex and the results shows that most agricultural households are headed by male. The total number of head of household was 13 453 of which 8 228(61.0%) are male while5 225(39.0%) are female.

**Figure 2: Head of the Household Holdings by Sex**



Source: post-harvest losses survey in Kavango West, 2018

## 2.2. Agricultural Practices of the Household Holdings

Tables 4 and 5 provide information on agricultural practices adopted by household holdings. It is evident from Table 4 that Millet/Mahangu was the most planted crop for the majority of household holdings, which accounts for 15 936 (99%) followed by maize which was planted by 10 197(63%) holdings while Bambara nuts are only planted by 2 815 (18%) holdings.

The total area planted for the region for mahangu was 44 817 hectares while the one planted for maize was 11 977 hectares. Thus, averaging an area planted per agricultural holding to 2.89 hectares for Millet/Mahangu and 1.48 hectares for maize.

**Table 4: Crop Planted by the Households Holdings**

Crops	Number of households holdings reporting	%
Mahangu/ Millet	15 936	99
Maize	10 197	63
Sorghum	1 816	11
Beans	644	4
Groundnuts	184	1
Cow Peas	1 006	6
Bambara nuts	2 815	18

Source: post-harvest losses survey in Kavango West, 2018

**Table 5: Area Planted for Maize and Mahangu**

Crops	Total (ha)	Average (ha)
Mahangu/ Millet	44 817	2.89
Maize	11 977	1.48

Source: post-harvest losses survey in Kavango West, 2018

### 2.2.1. Agricultural practices of the household holdings

The number and distribution of the quantity harvested and yield by crop are presented in Table 6. The results show that Mahangu/millet is the major crop in terms of quantity harvested with an estimated 22 665 985.8 kilograms while 6 773 772.0 Kg of Maize were produced by the Agricultural households.

Similarly, Mahangu/Millet shows the highest quantity harvested on average with 1 484.3 kg per household while Maize recoded 739.1 kg for quantity harvested on average per agricultural household.

**Table 6: Quantity harvested and yield, by crop**

Crops	Total quantity harvested (kg)	Average quantity harvested per household (kg)	Yield (Kg/ha)
Mahangu/ Millet	22 665 985.8	1 484.3	590.5
Maize	6 773 772.0	739.1	892.8

Source: post-harvest losses survey in Kavango West, 2018

### 2.2.2. Agricultural Inputs used

The results from table 7 shows that Mahangu/Millet recorded the highest quantity of seeds 244 670.5 kilograms used for planting while maize recorded 121 925.4 kilograms used during planting. However, maize reported the highest quantity (13.2 kilograms) of seeds used for planting per hectare compared to Mahangu/millet (6.4 kilograms).

**Table 7: Quantity of seeds used by main crops per ha**

Crops	Total Seed	Seed rate
Mahangu/ Millet	244 670.5	6.4
Maize	121 925.4	13.2

Source: post-harvest losses survey in Kavango West, 2018

### 2.2.3. Type of seed used

Table 8 presents the number and distribution of household holdings using different types of seeds by crop. The results reveal that the majority of the household holdings use local seeds for both maize and mahangu/millet (93.9% and 65.0%, respectively) in the Kavango West region respectively, as opposed to improved/hybrid, mixed and other seeds. For mahangu/millet, a significant number of household holdings use improved/hybrid seeds (30.4%).

**Table 8: Type of seeds used by crop**

Main crop	Local seeds		Improved/ Hybrid seeds		Mixed seeds		Other	
	Number of holdings	% of total	Number of holdings	% of total	Number of holdings	% of total	Number of holdings	% of total
Mahangu/ Millet	11 207.7	65.0	5 236.4	30.4	702.5	4.1	89.2	0.5
Maize	8 558.6	93.9	182.5	2.0	181.1	2.0	196.0	2.2

Source: post-harvest losses survey in Kavango West, 2018

### 2.2.4. Use of fertilizers and pesticides

The number of agricultural households that applied different pesticides and fertilizers on their main crops by type of seeds is presented in Table 9, Figure 3 and Figure 4. The results show that a vast majority of household holdings do not use any type of fertilizers for their Mahangu/Millet and maize crops (90.8 and 92.2 percent, respectively).

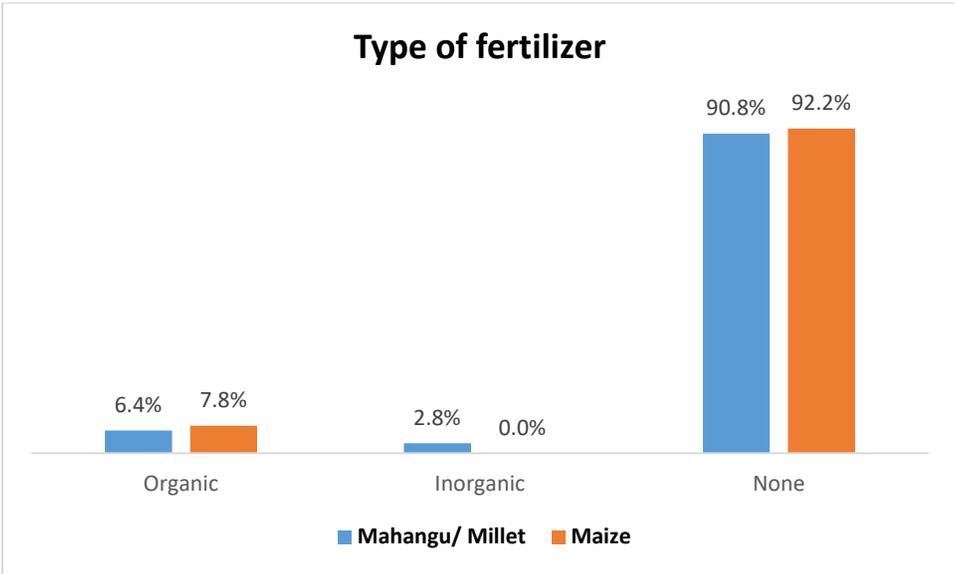
The results further reveal that none of the household holdings use any type of pesticides for their mahangu/millet and only 0.1 percent of the holdings use pesticides for maize.

**Table 9: Use of fertilizers and pesticides by main crop**

Crops	Main type of fertilizer used						Main type of pesticide used			
	Organic		Inorganic (mineral)		None		Insecticides		None	
	Number of HH holdings	%	Number of HH holdings	%	Number of HH holdings	%	Number of HH holdings	%	Number of HH holdings	%
Mahangu/ Millet	1 103	6.4	480	2.8	15 573	90.8	-	0.0	17 156	100.0
Maize	712	7.8	-	0.0	8 406	92.2	8	.1	9 111	99.9

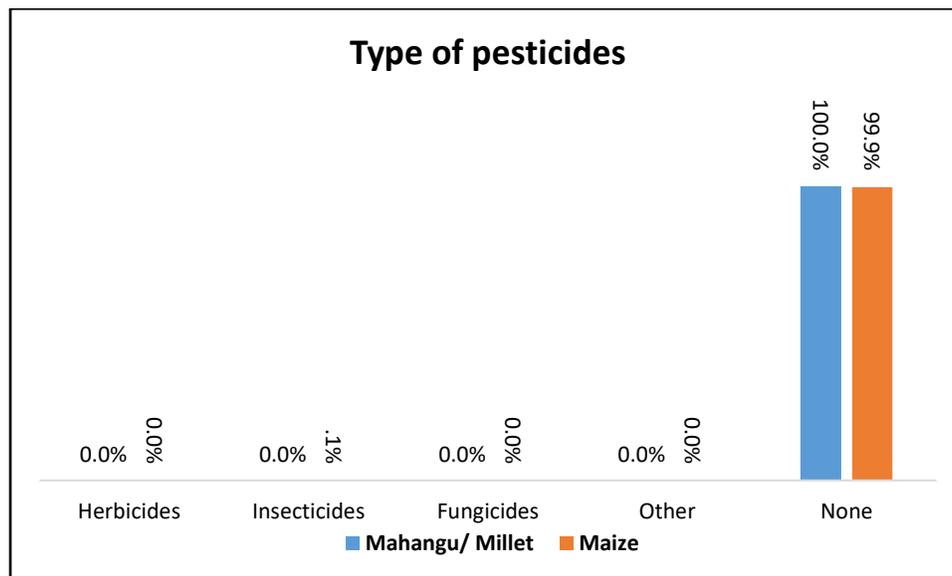
Source: post-harvest losses survey in Kavango West, 2018

**Figure 3: Percentage of Households holdings using the different type of fertilizer on their main crops**



Source: post-harvest losses survey in Kavango West, 2018

**Figure 4: Percentage of Households holdings using the different type of pesticides on their main crops**



Source: post-harvest losses survey in Kavango West, 2018

#### **2.2.5. Method used for Harvesting, Threshing/Shelling and Clean/Winnow**

Table 10 reveals that almost all agricultural household holding harvest mahangu and maize manually (99.0% and 99.2%, respectively).

All agricultural holdings in the region thresh/shell maize manually whereas 50.4 percent of the holdings use mechanical methods to thresh mahangu/millet.

As far as cleaning and winnowing is concerned, all household holdings use manual methods for maize while about 84.0 percent of agricultural households use manual methods for cleaning/winnowing the mahangu/millet.

**Table 10: Method used by the agricultural household holdings for Harvesting, Threshing/ Shelling, Clean/ Winnow**

Crops	Harvesting				Threshing/ Shelling				Clean/ Winnow			
	Manual		Mechanical		Manual		Mechanical		Manual		Mechanical	
	Number of holdings	%	Number of holdings	%	Number of holdings	%	Number of holdings	%	Number of holdings	%	Number of holdings	%
Mahangu/ Millet	15119	99.0	151	1.0	4594	50.4	4529	49.6	6949	84.0	1325	16.0
Maize	9090	99.2	75	0.8	3174	100.0	0	0.0	3183	100.0	0	0.0

Source: post-harvest losses survey in Kavango West, 2018

Table 11 reveals that 8 491 (56.9 percent) of agricultural holdings make use of drying crib for Mahangu/Millet followed by 3 316 (22.2 %) that indicated drying Mahangu on the ground while 3 046 (20.4%) of holdings dry their mahangu/millet on the roof.

Similarly, 3 488 (48.8 percent) of the agricultural holdings indicated drying crib as their main method for drying Maize followed by 2 506 (35.0 percent) holdings that are drying on the roof while 1 013 (14.2 percent) holdings dry maize on the ground.

**Table 11: Method used by the agricultural household holdings for drying**

Type of crop	Method used for drying							
	Drying crib		On the ground		On the roof		Other	
	Number of holdings	% total holdings	Number of holdings	% total holdings	Number of holdings	% total holdings	Number of holdings	% total holdings
Mahangu/ Millet	8 491	56.9	3 316	22.2	3 046	20.4	61	0.4
Maize	3 488	48.8	1 013	14.2	2 506	35.0	148	2.1

Source: post-harvest losses survey in Kavango West, 2018

### 2.2.6. Quantity stored from previous harvest, by crop

Household holdings were asked to reveal the utilization of stored grains of each crop from the previous harvest.

The results in Table 12 and figure 5 indicate that an estimated 68.0 percent of maize harvest was consumed followed by 5.9 percent given away while only 2.4 percent of maize was reported to have been stored.

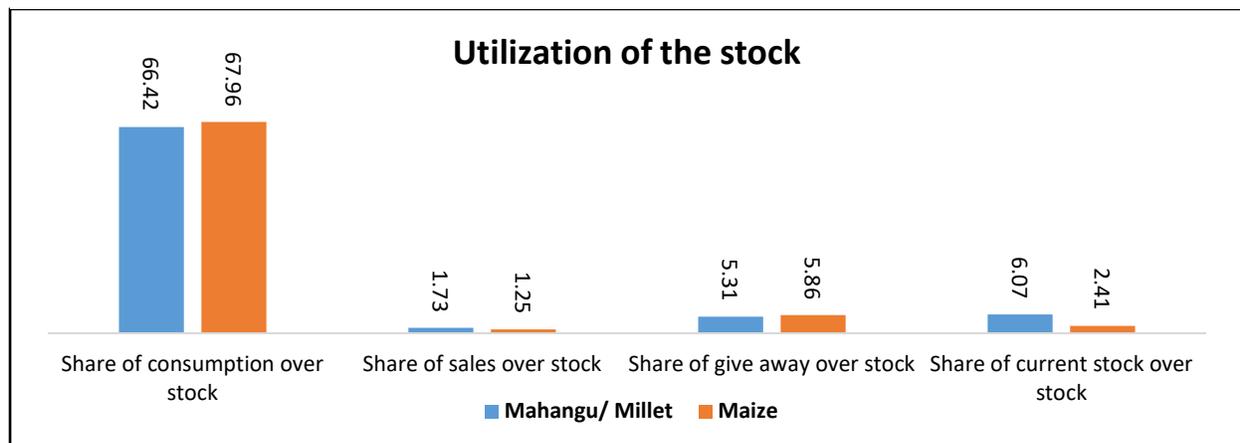
Similarly, consumption of about 66.4 percent mahangu/millet was recorded, followed by 6.1 percent that were in current stock while 5.3 percent of mahangu/millet was given away.

**Table 12: Utilization of the stored grains of each main crop from previous harvest**

Crop	Share of consumption over stock	Share of sales over stock	Share of give-away over stock	Share of current stock over stock
Mahangu/ Millet	66.4	1.7	5.3	6.0
Maize	68.0	1.3	5.9	2.0

Source: post-harvest losses survey in Kavango West, 2018

**Figure 5: Percentage of utilization of the stored grains of each main crops from previous harvest**



Source: post-harvest losses survey in Kavango West, 2018

Table 13 and figure 6 shows the number of households by type of storage facility. The results show that the majority of the households (13 275 which is 60.9%) use bags to store their grains. This is followed by a room and granary that are used by 10.3 percent and 8.0 percent,

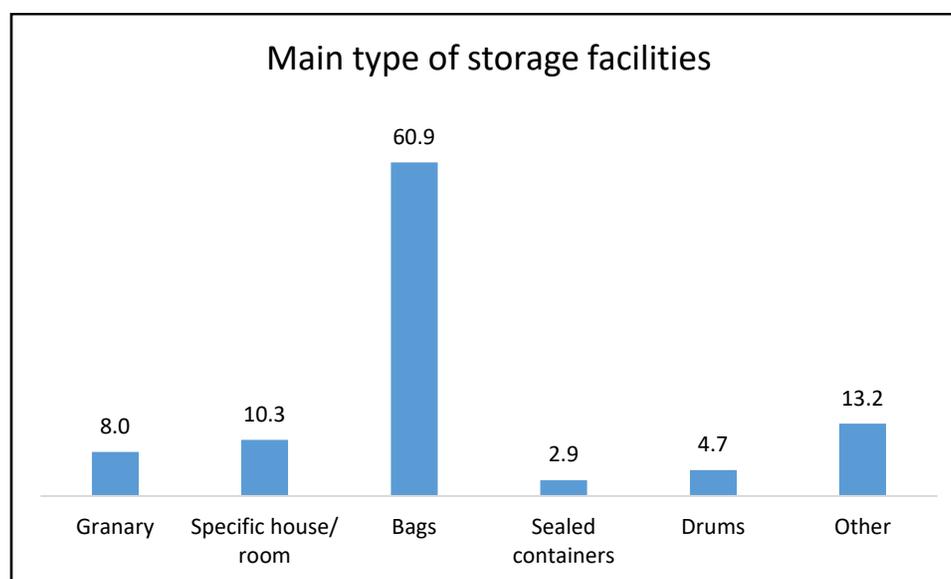
respectively. The use of sealed containers was the least storage facility used as reported by 2.9 percent of the households.

**Table 13: Number of households by type of storage facility**

Type of storage facility	Number of holdings	% of total
Granary	1 755	8.0
Specific house/ room	2 238	10.3
Bags	13 275	60.9
Sealed containers	633	2.9
Drums	1 031	4.7
Other	2 882	13.2
<b>Total</b>	<b>21 814</b>	<b>100.0</b>

Source: post-harvest losses survey in Kavango West, 2018

**Figure 6: Number and Distribution of households by type of storage facility**



Source: post-harvest losses survey in Kavango West, 2018

The number of agricultural holdings that applied pesticides on crops by type is presented in Table 14 and the results show that 44 household holdings applied insecticides on maize.

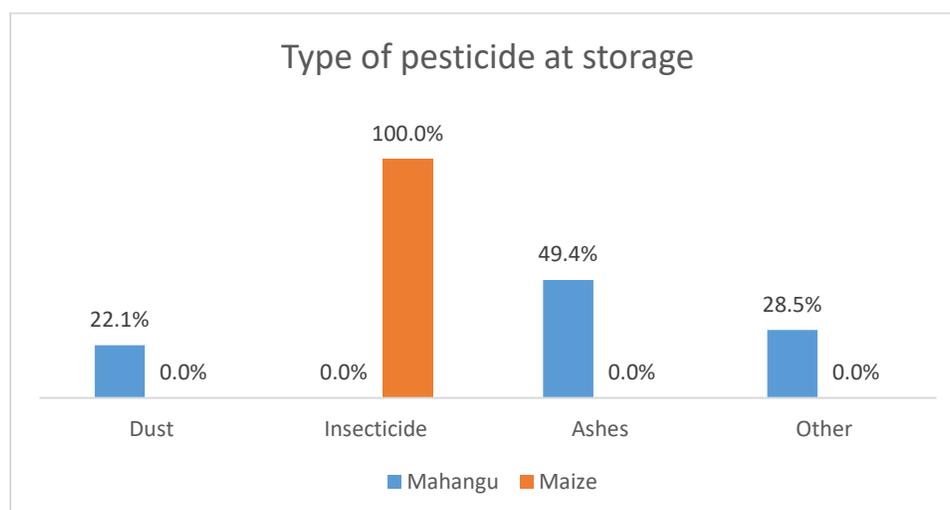
In the case of mahangu/millet, 49.4 percent of the household holdings used 'Ashes' as prevention of pesticides while 22.1 percent applied dust.

**Table 14: Number of holdings by type of pesticides/other products used to protect grains at storage level**

Type of crop	Main type of pesticide/ other products used							
	Dust		Insecticide		Ashes		Other	
	Number of HH holdings	%	Number of HH holdings	%	Number of HH holdings	%	Number of HH holdings	%
Mahangu/ Millet	23	22.1	0	0.0	52	49.4	30	28.5
Maize	0	0.0	44	100.0	0	0.0	0	0.0

Source: post-harvest losses survey in Kavango West, 2018

**Figure 7: Percentage and number of holdings by type of pesticides/other products used to protect grains at storage level**



Source: post-harvest losses survey in Kavango West, 2018

## 2.3. On-farm loss analysis

### 2.3.1. Quantity losses

Mahangu/Millet losses was recorded the highest at 337251 on farmer's physical declaration followed by farmer's declarations losses at storage with 245240 and farmers declaration on losses at harvest respectively, while Maize was recorded the second crop losses on physical declaration with 119,471 followed by 89,192 on farmer's declaration on losses at harvest.

Loss quantities and comparison between farmers' declaration and physical measurement is present in Table 15.

There are huge discrepancies observed between farmers' declaration and actual estimates through physical measurement for mahangu/millet and maize.

In particular, farmers declared losses at threshing/shelling to be 173 196 kg as compared to the actual measurement recording of 337 251.4 kg. Similarly, farmers underestimated losses for mahangu/millet 30 191 kg as opposed to the recorded 43 625.5 kg for physical measurement.

The results further indicate that farmers reported a triple digit (180 263 kg) overestimation of mahangu/millet losses at drying as compared to the actual losses of 56 211.7 kg.

Likewise, the losses at threshing/shelling for maize was more than ten times underestimated by the farmers. They declared the losses to be 10 561 kg while the estimates through physical measurements were 119 471 kg.

**Table 15: Loss quantities and comparison between farmers' declaration and physical measurement**

Crops	Losses at harvest (kg)		Losses at drying (kg)		Losses at threshing/shelling (kg)		Losses at cleaning/winnowing (in Kg)		Losses at storage (Kg)
	Farmers declaration	Physical measurements	Farmers declaration	Physical measurements	Farmers declaration	Physical measurements	Farmers declaration	Physical measurements	Farmers declaration
<b>Mahangu/Millet</b>	228 816.00	191 755.89	180 263.00	56 211.65	173 196.00	337 251.38	30 191.00	43 625.53	245 240.00
<b>Maize</b>	89 192.00	7 925.05	53 149.00	14 963.54	10 561.00	119 471.04	6 676.00	10 043.66	72 025.00

Source: post-harvest losses survey in Kavango West, 2018

Table 16 below shows the percentage of Loss quantities and comparison between farmers' declaration and physical measurement.

In comparison of the losses between mahangu/millet and maize at all stages, mahangu/millet was the highest crop recorded to have been lost compared to maize.

**Table 16: Percentages losses and comparison between farmer's declarations and physical**

Crops	Losses at harvest (%)		Losses at drying (%)		Losses at threshing/shelling (%)		Losses at cleaning/winning (%)		Losses at storage (%)
	Farmer's declaration	Physical measurements	Farmer's declaration	Physical measurements	Farmer's declaration	Physical measurements	Farmer's declaration	Physical measurements	Farmer's declaration
Mahangu/Millet	1.5	13.8	.9	5.5	2.4	.7	1.8	3.6	6.8
Maize	2.2	4.8	1.1	4.4	1.9	.5	1.3	2.9	4.3

Source: post-harvest losses survey in Kavango West, 2018

### 2.3.2. Loss prevention strategies by agricultural household holdings

During the survey, household holdings were asked to state three main actions they implemented in order to prevent post-harvest losses.

Table 17 and figure 8 present the number and distribution of holdings by Post Harvest Losses (PHL) prevention strategies adopted and the most effective actions declared.

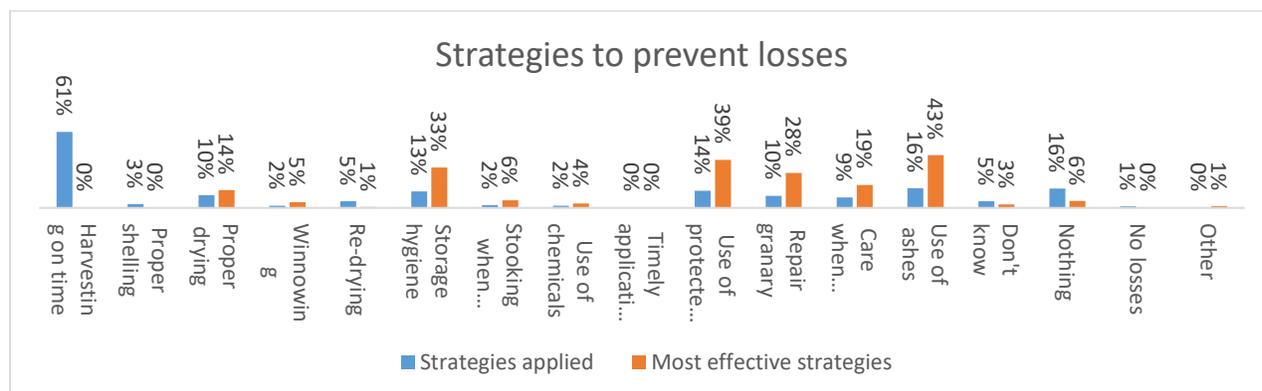
The results reveal that the majority of household holdings 6 485 (61%) harvested their fields on time, followed by 1 688 (16%) household holdings who used ashes while 1 658 (16%) did not take any actions. The use of chemicals was the least applied method by 173 (2%) household holdings.

**Table 17: Household holdings' strategies to prevent post-harvest losses and most effective action**

Strategies	Strategies applied		Most effective actions	
	Number of Holdings	Strategies applied (%)	Number of Holdings	Most effective strategies (%)
Harvesting on time	6 651.6	64	6 716.0	65
Proper shelling	2 611.3	25	2 241.0	22
Proper drying	3 866.3	37	4 018.0	39
Winnowing	711.0	7	876.0	8
Re-drying	678.3	6	307.0	3
Storage hygiene	1 858.6	18	3 081.0	30
Stooking when harvesting	413.9	4	363.0	3
Use of chemicals	217.3	2	1 711.0	16
Timely application chemicals	281.0	3	88.0	1
Use of protected granaries	2 244.5	21	2 866.0	28
Repair granary	1 181.9	11	2 986.0	29
Care when processing	946.0	9	1 423.0	14
Use of ashes	1 687.8	16	1 721.0	17
Don't know	569.8	5	52.0	1
Nothing	1 657.9	16	144.0	1
Other	92.5	1	91.0	1

Source: post-harvest losses survey in Kavango West, 2018

**Figure 8: Household holdings' strategies to prevent post-harvest losses and most effective action**



Source: post-harvest losses survey in Kavango West, 2018

### 2.3.3. Assistance received from the government

Household holdings were further asked whether they received any assistance from government or non-governmental organizations during the reference period as well as to indicate whether any assistance was received specifically for post-harvest losses.

Table 18 depicts the number and distribution of holdings that received assistance from government by the type of assistance.

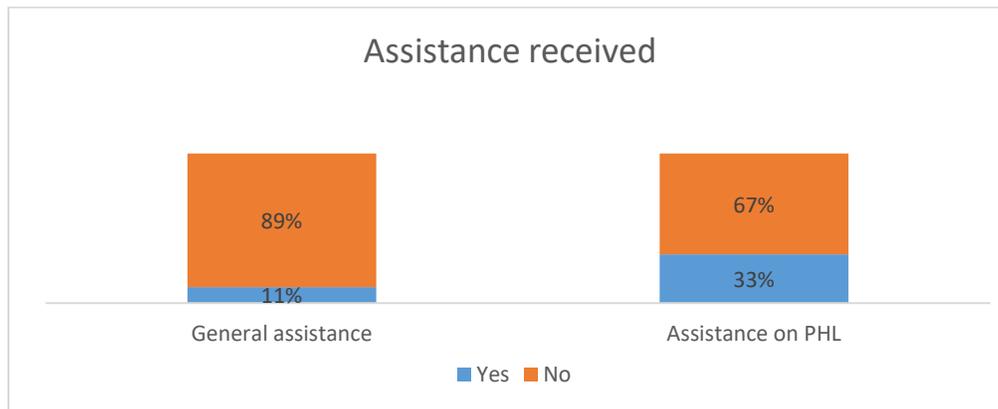
Household holdings (10 592) were asked whether they received any assistance from government out of which 1 131 (11%) agricultural households received general assistance. Only 383 (33%) households cited receiving specific assistance on post-harvest losses.

**Table 18: Assistance received from government**

Number of households/holdings received assistance during last two years		Number of holdings	% of total
Household receive general assistance	Yes	1131	10.7
	No	9461	89.3
Household receive Specific assistance on post-harvest losses	Yes	383	32.7
	No	788	67.3

Source: post-harvest losses survey in Kavango West, 2018

**Figure 9: Assistance received from government**



Source: post-harvest losses survey in Kavango West, 2018

Table 19 presents the number and distribution of household holdings by main kind of assistance received.

The results show that out of the total of 414 household holdings, 165 (39.9%) household holdings have received Advices/Information as their main kind of assistance, while only 26 (6.2%) household holdings received assistance on training.

**Table 19: Main kind of assistance received by household holdings**

Main kind of assistance	Number of holdings	% of Total
Trainings	26	6.2
Advices/ Information	165	39.9
Direct assistance in the field	0	0.0
Other	223	53.9
<b>Total</b>	<b>414</b>	<b>100</b>

Source: post-harvest losses survey in Kavango West, 2018

**Figure 10: Main kind of assistance received by household holdings**



Source: post-harvest losses survey in Kavango West, 2018

#### **2.3.4. Main source of information used by household holdings to obtain post-harvest management information**

The main source of information used by household holdings to obtain post-harvest management information is displayed in Table 20.

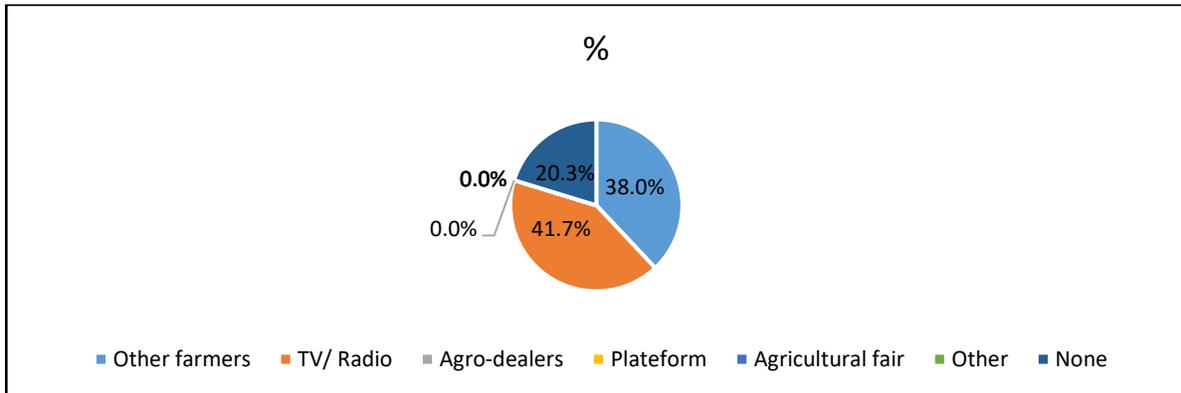
The results show that out of the total of 383 household holdings, 160 (41.7%) household holdings cited TV/Radio as their main source of information, 145 (38.0%) household holdings have used other farmers while 78 (20.3%) holding have used none of the main source of information.

**Table 20: Main source of information used by household holdings to obtain post-harvest management information**

Main source of information on PHL	Number of holdings	%
Other farmers	145	38.0
TV/ Radio	160	41.7
None	78	20.3
<b>Total</b>	<b>383</b>	<b>100</b>

Source: post-harvest losses survey in Kavango West, 2018

**Figure 11: Main source of information used by household holdings to obtain post-harvest management information**



Source: post-harvest losses survey in Kavango West, 2018

### **Chapter 3: Off-farm loss analysis**

#### **3.1. Selection of a region**

A purposive non-probability sampling technique was used in the selection of a region for the PHL Off-farm fieldwork to cater for limiting factors such as the availability of resources (human, finance, distance) as opposed to randomness. Khomas region was selected because of the short distance to the millers. Additionally, there are also AMTA Inspectors (interviewers) based in Khomas region for collection of data from millers.

#### **3.2. Selection of millers**

There are only four millers registered with AMTA in Khomas region. For the purpose of PHL pilot, only millers dealing with Mahangu/Millet and Maize crops were part of the data collection and were all covered.

Data collection was done by AMTA Inspectors as Interviewers of the Off-farm questionnaire to the miller (s).

#### **3.3. Data collection method**

The Post-Harvest Losses field assessment used a face-to-face interview method using a paper based questionnaire. The millers was asking to estimate their losses (declaration) and a sample of grains was taken to the lab for physical measurement analysis.

#### **3.4. Fieldwork operation**

The team composition was two interviewers and one supervisor (regional statistician from NSA). The duration of the field work was 10 working days and each interviewer was visiting all the millers assigned to him/her every three days. Samples taken from the millers were to the MAWF lab. The lab analyzed the sample and gave the report back to the interviewers who then handed it to the NSA data processing team for further transmission.

All data collection followed confidential procedures as per the Statistics Act no 9 of 2011.

#### **3.5. Results**

The results for the millers' declaration was not computed because of the quality of the data collected. The interviewers misunderstood some questions that led to wrong answers from the millers. Indeed, only the results for the physical are presented below.

The percentage loss for Namib Mills is lower than the other. This is explained by the fact that Namib Mills has gained lot of experience in the area of processing being one the oldest miller in Namibia. The percentage losses presented here are mainly due the broken grains. Qualitative loss was not performed in this study.

Indeed, miller might not consider broken grains as loss and may sell them in the market at a normal price.

**Table 21: Physical measurement loss off-farm**

<b>Millers</b>	<b>%</b>
<b>Shipalula trading cc</b>	7.30
<b>Bokomo Namibia</b>	7.34
<b>Namib Mills</b>	2.32

Source: post-harvest losses survey in Kavango West, 2018

## References

GSARS (2018). Guidelines on the measurement of Post-Harvest Losses; Recommendations on the design of a harvest and post-harvest loss statistics system for food grains (cereals and pulses). Global Strategy Guidelines: Rome