

# Analyzing the Agricultural livelihood Strategic Components in the Zambezi region, Namibia

## Abstract

While urban dwelling is increasingly becoming common across the world, in Namibia, the population settlement pattern is skewed towards rural areas. In the Zambezi region, the majority of the population is found in the rural areas. The main livelihood strategy is agriculture, which is subsistence in nature and practiced on communal land. The objective of this paper is to investigate changes in the agricultural livelihood strategy in rural Zambezi. The paper is premised around the hypothesis that the agricultural livelihood strategy has improved since 2002 to 2010. Parametric sampling approach in the form of stratified sampling technique based on environmental systems of being flood prone was used to yield a sample size of 253 respondents. SPSS was used in analyzing the data and in the process conventional descriptive statistics and a Chi-Square method were applied. The results show that households with members who were between 5 to 6 in number owned more land than households with more or few members. Furthermore, the findings proved otherwise in favour of the alternative hypothesis that changes to the livelihoods have occurred but in an adverse manner. The declining livestock numbers and crop harvests among the marginalized households require some long term policy interventions. Other than encouraging sustainability of livelihoods, anything less is unlikely to be appropriate for a rural household in the Zambezi region.

Keywords: *parametric, livelihood, chi-square, bi-annual harvesting tendencies*

## 1. INTRODUCTION

The geographic location of the Zambezi region makes it an attractive place for tourists. The region is surrounded by rivers and has the highest annual rainfall in Namibia. Wild animals move uncontrollably across the Zambezi region from Angola to Botswana and back and forth. While conservancies are imperative as income generating sources, their upsurge in the Zambezi region offers a placebo type of relief to the unsustainable livelihoods there. During the period 2002/3 to 2007/8, climate risk factors became rampant and the provision of food aid became the immediate solution to poor harvests. In the same era, community conservancies were gradually established. Livestock diseases also increased while the demand for meat across Namibia, as an exportable good for the overseas markets escalated. Of late, new vistas are emerging with regards to the increasing commercially driven agricultural practices in that region.

Over time, climate risk factors have devastated economic fabrics of rural communities with no or poor early warning systems. Failure to have a skilled workforce active in early warning systems could expose rural communities that rely heavily on subsistence agriculture to serious repercussions of a climate risk nature. Any study about rural livelihoods in the Zambezi region needs to consider the element of climate factors given that the mainstay of the rural economy is natural resource-based enterprises particularly agriculture. Climate risk in this study refers to rainfall-related issues such as droughts and floods, which have a direct effect on agricultural outputs. It is in line with such understanding that Erasmus et al. (2000) shared that complexity of atmospheric chemistry gives rise to rainfall, and then suggested that predicting changes in atmospheric temperature could be more rewarding than predicting hydrological developments.

Like in other north and northern regions of Namibia, land in rural areas in the Zambezi region is controlled by traditional leaders. Even though this is the case, land is owned and is vested with the government. The type of land tenure system that applies in the Zambezi region is communal. Such a system provides one with the right to cultivate the land but selling of it is prohibited by law. Therefore, the land on which rural communities operate is without private title deeds. The lack of title deeds entails that communal land is not a private property as such is not exchangeable as collateral when engaging in financial transactions that requires some form of security.

Since grazing is treated on a communal basis, farming is also subsistence. The farmers' primary objective is to produce for own consumption while surplus harvest is cleared by the price at a market. On marketing, it is increasingly becoming apparent that informal markets become vital to livestock marketing. With regards to bulk buyers for grain includes Kamunu Supermarket, Namib Mill and Rings/Kalinka and in some cases Likwama Farmers Association. However, the organised market is still preferred especially for marketing of livestock. The main buyer of livestock in the Zambezi region is the Meat Corporation (Meatco).

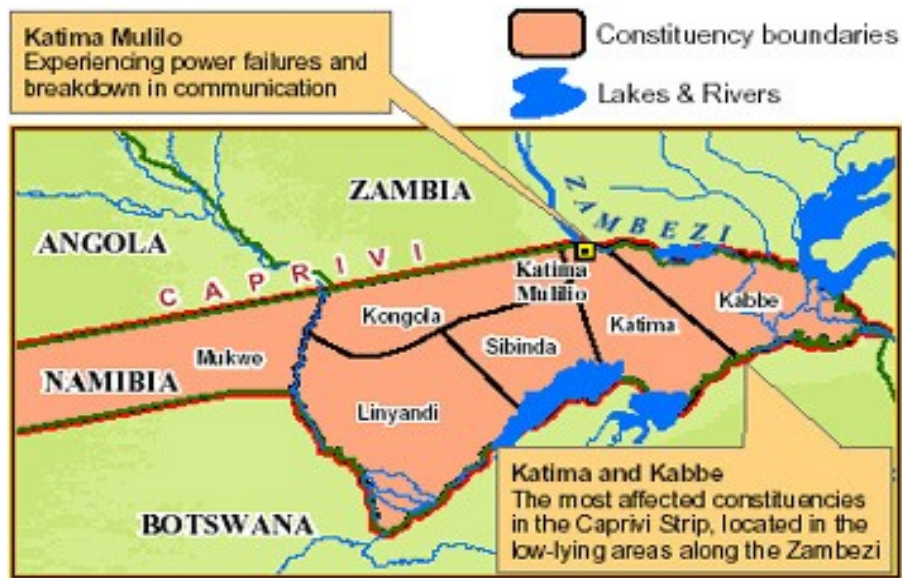
As the informal market is left to thrive, the spread of animal diseases poses more dangers for livestock breeders. In view of this difficult to control situation, it is clear that trans-boundary transmission of diseases is the main threat to maintaining a healthy livestock sub-sector in the Zambezi region. At times, wild animals from neighbouring countries transmit diseases such as Foot and Mouth Diseases, and Rift Valley Fever (Thomson and Venter, 2012).

What warrants this study is the fact that so far, nowhere in any existing literature one captured changes in the agricultural livelihood strategic streams in the Zambezi region. This comes is necessary given the frequency of climatic risk factors. What also worsens is the existing agricultural policy that is biased towards compensating commercial agriculture in an event of climate risk factors taking their toll. Whereas in the communal areas, rural farmers are left to recover on their own when similar climate factors have tricked. This study is probably the first to report on such matters in a quantitative manner. Therefore, this paper contributes to the existing literature on livelihoods in the Zambezi region in particular and in Namibia in general.

## **2. STUDY AREA**

Zambezi region is one of the 14 regions of Namibia. It was formally known as Caprivi until in 2014 when the name was changed. The population of that region stands at 90 000. The Zambezi region is structured with eight political constituencies, namely Kabbe South, Kabbe, Katima Rural, Katima Urban, Linyanti, Sibbinda, Judea Lyaboloma and Kongola. The study was undertaken in Kabbe and Kabbe South, Katima Rural, Linyanti and Judea Lyaboloma constituencies. These are constituencies that are prone to flood and as such not also exceptions to incidents of drought. The Zambezi region has several conservancies that are owned by rural communities. Such facilities are also known to attract wild animals that get involved in human-wildlife conflicts and the destruction of crop fields. Conservancies are also known for supporting existing rural livelihoods as they provide needed natural resource products which can be consumed and in some cases sold.

### **Map 1: Map of the Zambezi region with surrounding rivers**



Source: Yahoo.com (2017)

### 3. LITERATURE REVIEW

Barrett *et al* (2001) point out two major factors that compel people to diversify their livelihoods, namely, push and pull factors. With push factors, diversification is influenced by a weakness in the risk-bearing capacity that exists in a weak financial system. Such a situation creates an incentive to choose a portfolio of activities for the sake of stabilizing income flows and household consumption. Further, diversification that arises reflects some existing limitations in the labour and land markets, as well as uncertainty regarding climate. With regards to pull factors, the influence of local economic activities such as agriculture is important. Proximity to an urban area is another pull factor that compels rural communities to create opportunities for income diversification (Barrett *et al*, 2001).

What makes rural livelihoods unsustainable is a variety of factors including climate risk, income risk, harvest failures, diseases and death of livestock (Dercon, 2002). A livelihood is sustainable if it is able to cope with and recover from various shocks and continues to maintain its capabilities while maintaining the environmental balance (Chambers and Conway, 1992 as cited by Scoones, 1998).

It is against this backdrop that Arndt and Bacou (2000) believe that reliable rainfall prediction is essential to rural communities. There is no theory of livelihood and coping strategies, As demonstrated by Deressa and Hassan (2009), the Ricardian model can be used to capture the effects of climate change and farm net revenue. In the context of this model, farm revenues could be treated as a proxy for income (Kurukulasuriya *et al*, 2006).

The degree to which poverty confronts a particular household can be perceived as a threat that also affects access to food. Although poverty is the main cause of food insecurity, it also has an impact on the ability of the affected to secure food for their households. Other causes of food insecurity do exist but some are secondary in nature and they include natural causes (drought and flood disasters), locust infestation, high food prices and political instability (Nwonwu,

2009). Some of the major reasons that can explain why there is low productivity in agriculture especially for smallholder and rural farmers are firstly, insufficient voice and lack of bargaining power and secondly, inability to invest in inputs due to lack of access to credit; thirdly, unavailability of good quality seeds; and lastly, un-customized extension services (Behera, et al, 2013). It is now evident that in Sub-Saharan Africa, input use depends mainly on policy differences across countries than just farm, market and household socioeconomic situations (Sheahan, 2017).

It is due to the uncertainty of rural livelihoods that rural people keep on looking for better opportunities elsewhere that can increase but also stabilize their incomes (Olawuyi and Rahji, 2012). Focusing on Zimbabwe, Makate et al (2016) argues that crop diversification as one of the livelihood strategies depends among others on various factors such as land size, access to extension services, information on product prices, and years of farming experience, location and asset wealth. Market-led diversification and the need to develop enterprises are now seen as ways that can boost and expand income opportunities for rural communities (Borbora, 2014). In South Africa, remittances that Mozambicans earn from other engagements and send home to Mozambique were seen as vital forms of livelihoods (Golooba-Mutebi and Tollman, 2004). Loison (2015) concurs that diversifying livelihood sources is considered a better option for many smallholder farmers. Distance and integration of agriculture in the urban setting have no influence on engagement in agricultural activities. Instead, what matters more are the agro-climatic conditions. It was also found that agriculture remains a choice for livelihood consideration by many when conditions are conducive for farming activities (Davis et al, 2017).

In South Africa, rural livelihood composition seems to be deviating away from an agricultural based livelihood rural economy. The existence of government grants have a changing effect on how livelihoods are managed in that country (Daniels et al, 2013). In Ethiopia, it was discovered that microcredit that could be expected to improve livelihoods, various results were found. Thus better off households benefited from microcredit while those in the poor position were made worse off (Siyoun et al, 2012).

It is also understood that rural-urban migration is one of the ways in which rural dwellers sustain their livelihoods. Remittances sustain many in rural areas in South Eastern Nigeria and such are sent mainly for educational support of relatives and funeral services, buying of food and building and maintenance of houses (Ajaero and Madu, 2014).

#### **4. METHODS**

The target population is that of rural communities that reside in the floodplains but also vulnerable to drought situations. Such communities rely heavily on subsistence farming albeit other livelihood strategies exist. This sample was drawn by means of a geographical stratification sampling process. The aim was to cascade down to a statistically well represented randomly sampled size of respondents. In total, the sampling process yielded 253 respondents whose livelihoods are mainly agriculturally based and operate in the flood prone areas called the flood plains. The harvesting seasons are classified in two ways, namely normal and abnormal based on the rainfall that was recorded in that the particular cultivation- harvesting season.

Abnormal is for below average and normal is when the average is reached. In 2006/7, a period considered to be normal, the rainfall that was received in the Zambezi region is over 900 mm against an annual average of 653 mm (Samsamwater, 2011). A semi-structured questionnaire was administered on respondents who were the heads of the household for the purpose of data collection. The analytical approach is the conventional descriptive statistics and a Chi-Square method that was used in testing the pre-set hypotheses. The Chi-Square test was applied on fixed-ratio hypotheses that will be stated now.  $H_0$  states that the agricultural livelihood strategy has remained the same from 2002/3 to 2007/8. This means that  $\beta = 0$ . While the  $H_1$  posits a contrast position of a change to have occurred which can be expressed as  $\beta \neq 0$ . Chi-Square ( $\chi^2$ ) is a statistical method that is helpful when analyzing small observations and also where the population may not be well distributed. This method used in this study is adapted from the works of Gomez and Gomez (1984), Spiegel (1992) and Wagner (1993) and mathematically, Chi-Square can be written as follows:

$$\chi^2 = \frac{(|a_1 - b_1| - \sqrt{2})^2}{b_1} + \frac{(|a_2 - b_2| - \sqrt{2})^2}{b_2} + \dots + \frac{(|a_i - b_i| - \sqrt{2})^2}{b_i} \dots \dots \dots (1)$$

So, the short version for the Chi-Square formula can be written as:

$$\chi_i = \frac{(|a_i - b_i| - \sqrt{2})^2}{b_i} \dots \dots \dots (2)$$

Where: n is the number of classes, a represents the number of observed units, and b is the number of units expected to fall into respective classes with an assumption that the hypothesized ratio is confirmed. Furthermore, || represents absolute values.

Therefore:

$$\chi^2 = \sum_{i=1}^n \chi_i$$

## 5. RESULTS

### 5.1 Descriptive findings

The first thing to look at, are the socio-economic features of the respondents as expressed in Tables 1 to 3 and in Figure 1.

**Table 1: Age and Gender Composition of Respondents**

| Age      | % Male | % Female |
|----------|--------|----------|
| 21 to 30 | 30     | 70       |
| 31 to 35 | 36     | 64       |
| 36 to 40 | 26     | 74       |
| 41 to 45 | 33     | 67       |

|          |    |    |
|----------|----|----|
| 46 to 50 | 25 | 75 |
| 51 to 55 | 37 | 63 |
| 56 to 60 | 29 | 71 |
| >61      | 54 | 46 |

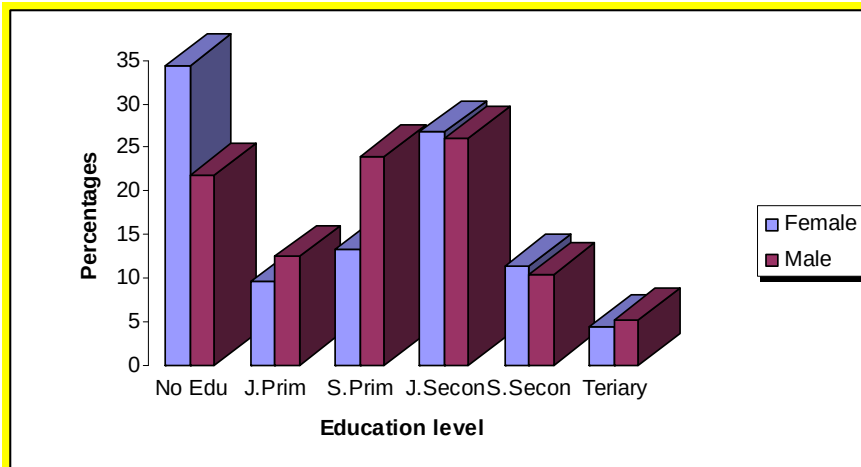
As it appears in Table 1, the dominant age category about 49% is of respondents who are in the ages of their full working life and mainly women. However, circumstances that dictated may have made them to reside in the rural areas and not formally employed. The younger ones who are between 21 and 40 years form 36% of the total percentage of respondents. It still shows that young people are increasingly joining the rural folks. This is worrisome when considering lack of facilities for entrepreneurial opportunities and a high unemployment rate especially among the youths in Namibia. It is worth mentioning about household size and the size of land respondents' own.

**Table 2: Household and Land Sizes of Respondents**

| Quantity | % Household Size | % of land Owned (Ha) |
|----------|------------------|----------------------|
| 1 to 2   | 9                | 20                   |
| 3 to 4   | 31               | 20                   |
| 5 to 6   | 34               | 16                   |
| >6       | 26               | 44                   |

In Table 2, the household sizes of between 5 to 6 members were in the majority forming 34% of the total respondents. These tallies well with the Namibia Statistics Agency figures of an average household size in the country, which is that of five people per household. The household size of more than 6 members owned land of at least 44 ha. This may be attributed to the fact more members of the household may aggregate their pieces of land to form small farms. It is also pertinent to assess the educational levels of herds of households.

**Table 3: Educational Levels of Respondents**



In Table 3, educational levels of respondents are presented. Women with no education are in the majority. Women at junior secondary school level are more than their male counterparts. Even at senior secondary level, women are more than men. Men dominate those with tertiary education among the respondents. It is important to indicate that women respondents were in general more than men. In a developing country as Namibia, it is an inherent inequality that men attain tertiary education compared to their female counterparts.

## 5.2 Agricultural Livelihood strategic components

**Figure 1: Marital Status of Respondents**

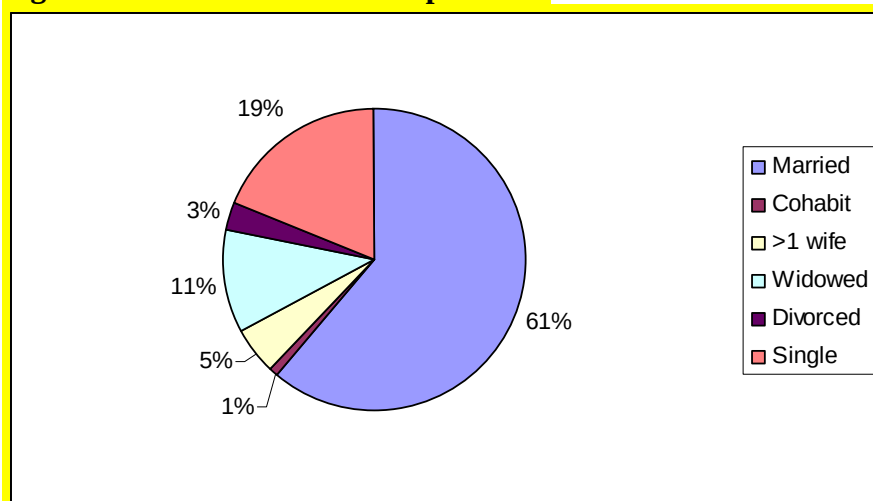


Figure 1 shows marital orientations of respondents. It is evident that the majority of respondents were married while a sizeable number were single. The smallest category forming about 1% is that of respondents who cohabited.

## 5.3 Agricultural Livelihood Strategic Components

### 5.3.1 Agronomic strategic component

Since this paper considers agriculture as the **main** livelihood strategy, it means that challenges of hunger and unemployment in the informal sector in rural areas could be found in the dynamics that occurs within the rural agricultural sector. When dealing with agriculture, two classifications are necessary and these are the agronomic and the animal husbandry components. These two agricultural livelihood enterprise components are essential and are treated in the context of conducting the hypotheses test.

Although rural households in the study area breed cattle, goats and chickens, they also engage in crop production. Common agronomic crops in the study area are maize, sorghum and millet. Maize is dominant over the other crops. Vegetables are also grown but are very rare. As a result of the rarity of vegetable enterprises I which is mainly due to total absence of irrigation systems, such enterprises were excluded from the analysis.

Maize, millet and sorghum are the main crops that are produced, consumed and/or marketed by rural households. Here the hypothesis that is tested is that there is a ratio of 1:1 of total harvest by sample households in 2002/3 and in 2007/7. Which also means that  $H_0: = 0$ , that there is no difference in the ratio of the total harvest by the sample households that cultivate maize, millet and sorghum.  $H_1: \neq 0$ , that the ratio of total crop harvested that is maize, millet and sorghum is different. Table 1 presents the results of the survey. Disclaimer, in tables 3 and 4, the words Maize, millet and sorghum, as well as cattle, goats and chickens respectively are denoted by I and II which represents the time period. Where: Maize I, stand for that crop in the initial period i.e. 2002/3 planting season while Maize II stands for that crop in the second period 2007/8. That designation applies to all the crops and livestock that are included in the tables 1 and 2. It is pertinent to indicate that the harvesting scenarios were influenced by environmental factors, namely a harvest when conditions were abnormal in 2002/3 and the actual harvests in 2007/8, which are considered to be normal because of recorded average annual rainfall. The disaggregated contingency tables are not included here but the aggregated ones only.

**Table 3: Aggregate contingency table for maize, millet and sorghum in 2002/3 and 2007/8**

|            | <1 bag weighing 0.05 tons | 1-5 bags weighing 0.05 tons | 6-10 bags weighing 0.05 tons | 11-20 bags weighing 0.05 tons | >20 bags weighing 0.05 tons | Total |
|------------|---------------------------|-----------------------------|------------------------------|-------------------------------|-----------------------------|-------|
| Maize I    | 2                         | 30                          | 57                           | 98                            | 65                          | 252   |
| Maize II   | 70                        | 89                          | 31                           | 2                             | 2                           | 194   |
| Millet I   | 54                        | 59                          | 14                           | 7                             | 5                           | 139   |
| Millet II  | 30                        | 17                          | 5                            | 1                             | 1                           | 54    |
| Sorghum I  | 25                        | 72                          | 56                           | 19                            | 4                           | 176   |
| Sorghum II | 47                        | 53                          | 7                            | 0                             | 0                           | 107   |

Source: Own survey (2007)

The results of the  $\chi^2$  test are based on disaggregated data that was deduced from Table 3. Applying the  $\chi^2$  formula and using aggregated data in Table 3 yields the following results:

Chi-Square sample statistics for maize is 245.18, for millet 4.42, and for sorghum 54.23; the degrees of freedom are 4 for each of the crops; the critical Chi-Square cut-off for 9.488 for all

crops respectively as determined by their equivalent degrees of freedom. Thus, at a 5% level of significance,  $H_0$  is rejected that the ratio of the total maize harvested by rural households that cultivate it is different. This implies that there is independence of association between the 2003 harvest which is more than the 2007/8 harvest. As for millet,  $H_0$  is accepted: that there is no difference in the ratio of the total millet harvested by rural households that cultivate it in 2003 to the one in 2007/8. For sorghum,  $H_0$  is rejected: that the ratio of total sorghum harvested by rural households that cultivate it is different and it shows that more sorghum was harvested in 2002/3 compared to 2007/8. So there have been some changes in the proportion of total harvest of the sorghum crop.

### 5.3.2 Animal husbandry strategic component

Over the years, but especially from 2002/3 to 2007/8, rural communities in the study area have received food aid. Something must have gone wrong for them to start receiving food aid. It is on this premise that after presenting current and past livelihood strategies, a need arises to test the hypothesis to determine whether the past livelihood strategy is no longer helpful. The hypothesis test is divided into two sub-tests on goats, cattle and chickens, and the maize, millet and sorghum harvests. Using the Chi-Square test, the first sub-test of the main hypothesis is specified on goat, cattle and chicken ownership as follows:

$H_0$ : = 0, that there is no difference in the ratio of the number of goats, cattle and chickens owned by sample households in 2002/3 and in 2007/8.  $H_1$ :  $\neq$  0, that the ration of ownership of goats, cattle and chickens by sample households is different for the two periods.

**Table 4: Aggregate contingency table for cattle, goat and chicken ownership during 2002/3 and 2007/8**

|             | 1 to 5 | 6 to 10 | 11 to 15 | 16 to 20 | 21 to 30 | 31 to 50 | >51 | Total |
|-------------|--------|---------|----------|----------|----------|----------|-----|-------|
| Cattle I    | 59     | 35      | 12       | 16       | 10       | 11       | 3   | 146   |
| Cattle II   | 27     | 25      | 16       | 25       | 11       | 8        | 19  | 131   |
| Goats I     | 31     | 26      | 8        | 2        | 1        | 0        | 0   | 68    |
| Goats II    | 12     | 14      | 12       | 11       | 3        | 1        | 0   | 53    |
| Chickens I  | 72     | 42      | 19       | 10       | 8        | 3        | 0   | 154   |
| Chickens II | 16     | 23      | 16       | 20       | 13       | 12       | 5   | 105   |

Source: Own survey (2007)

As in Table 3, the results of the  $\chi^2$  test are based on disaggregated data that was deduced from Table 3. Applying the  $\chi^2$  formula using aggregated data in Table 4 yields the following results:

The Chi-Square sample statistics for cattle is 18.61, for goats 20.58, and for chickens 47.50; the degrees of freedom are 6, 5 and 6 respectively; the critical Chi-Square cut-off for cattle is 12.592, for goats 11.071, and for chickens 12.592. Therefore, at a 5% level of significance,  $H_0$  is rejected for all types of livestock in favour of the alternative hypothesis. This means that the ratio

of goats, cattle and chickens owned in 2002/3 is not the same as in 2007/8. Thus there is a difference in terms of the fact that there were more goats, cattle and chickens owned in 2002/3 compared to the ownership in 2007/8.

With regard to agronomic crops, some rural households often sell surplus maize to meet the income needs of the household. Income generated from selling surplus maize, millet and sorghum goes a long way, among others in supporting children to pay their school fees, paying for medical expenses and procuring other necessities. Marketing of surplus grains takes place at the urban market situated at Katima Mulilo, where three formal buyers, namely Kamunu Supermarket, Namib Mills and Kalinki Supermarket are found. Sometimes surplus produce is offered for sale at informal rural markets. These are harvesting scenarios that were influenced by environmental factors, namely a harvest when conditions were abnormal in 2002/3 and the actual harvests in 2007/8, which are considered because of recorded average annual rainfall.

The term harvesting under ‘normal conditions’ and under ‘abnormal conditions’ should be understood to mean that there are times when annual rainfall received reaches the average of 653 mm and abnormal times when annual rainfall received is extremely low or extremely high and causes floods. Despite average annual rainfall however, the 2006/7 harvesting season was poor. This is attributed to various factors, which will be further deliberated on. Recall questions were not used for the 2007/8 harvesting season since information at the disposal of the heads of the households was still fresh in mind, but recall questions were used to track the events of 2002/3. The 2002/3 harvesting season was subject to drought caused by uneven spread of rainfall and it became even worse in 2003/4 when heavy floods ravaged most of the crop fields and wiped away the hope for a potential crop harvest.

In 2002/3, for maize harvest under abnormal conditions (maize I), 39% of farming households produced maize in the output category of eleven to twenty of 0.05 ton maize bags. Of the target sample, 26% harvested at least twenty of 0.05 ton maize bags under normal conditions. In 2007/8, 46% of respondent households harvested one to five 0.05 ton bags of maize. With regards to millet, the highest performing category during abnormal conditions is that of those who harvested between one and five 0.05 ton bags. It is in the same category in which sorghum producers scored highly as well. The two crops are not very different under normal conditions. However, there are genetic differences which go with various cultivars too. In 2002/3, sorghum producers again performed well in the output category of six to ten 0.05 ton bags with 22% respondents, different from millet, where only 6% of the producers were recorded. As a result of drought resistance and the easy-to-adapt traits of millet, in the 2007/8 harvesting season some pockets of millet producers were recorded in the output category of eleven to twenty and beyond, while sorghum producers failed to register their presence.

### *Goats*

Goats are highly prized for slightly bigger get-together parties in rural areas of the Zambezi region. Overall, goats provide rural households with meat and milk. However, goat milk is not commonly consumed in the study area. Goats are cheap to rear, are resistant to diseases and can multiply more quickly than cattle. This study found that some households own goats. However, there was a shift in the ownership trend between 2002/3 and 2007/8.

From a sample of 253 respondents, 68 households reported that in 2002/3 they owned goats. Of the 68 respondents who owned goats, about 46% owned between 1 and 5 goats. The next big cluster of respondents forms 38% and includes respondents who owned between 6 and 10 goats. Ownership declined as bigger categories were considered. For example, in the same period, in the ownership categories of 21 to 30 and 31 to 50, there were only 2% and 1% of respondents respectively. In 2007/8 the situation changed with the highest number of respondents, i.e. 26%, owning between six and ten goats. The decline with progression to high goat ownership categories remained steady for the 11 to 15 and 16 to 20 categories, compared to the same categories in 2003. The trend is high in subsequent categories of 21 to 30 and 31 to 50 compared to the ownership trend in 2002/3. The overall picture shows that goat ownership declined generally, since only 58 respondents owned goats in 2007 compared to 68 in 2003.

### *Cattle*

There are quarantine facilities in which cattle are confined. Quarantine facilities are used as gatekeepers for observing, inspecting, treating diseases and feeding animals in preparing them for marketing. The duration of confinement is 21 days before slaughtering can take place. Cattle are considered mobile investments for rural households. Cattle are valuable assets and are popularly a means of payment to the family of the bride (*malobolo* in siLozi) when marital negotiations are concluded between two families. Many school-going children including the author of this study have benefited from the sale of cattle to pay for their education. Since these are communal areas, known for subsistence farming purposes but with rising need, cattle can be marketed to meet the immediate income needs of the household.

The period 2002/3 was characterized by high ownership of cattle in the category 1 to 5. Cattle owners comprised about 40% of the respondents and this category was followed by those who owned 6 to 10 cattle. Five years later (in 2007/8), the trend in cattle ownership for the 1 to 5 and 6 to 10 categories had declined, registering lower percentages of 20% and 19% respectively. The ownership trend is comparatively high for the categories 11 to 15, 16 to 20, 21 to 31 and >50 compared to the 2002/3 figures. The difference is that there is a shift, with more cattle owners beginning to own more cattle than before and a salient reflection is for the category >51, which in 2007/8 stood at 15% compared to 2% five years before. Nonetheless, the overall number of rural households who owned cattle in 2007/8 is low (131) compared to 146 in 2003.

### *Chickens*

Chickens are popular among rural households. Chickens are the most commonly used items for delicious dishes, especially when there are events involving family get-togethers. These birds are cheap to purchase and are also affordable to many rural households in that they cost effective to feed given that they freely range. In 2007/8, the price for a rural chicken ranged between N\$30 to N\$50, with cocks being more expensive than hens.

The 2007/8 chicken ownership trend shows that most of the respondents who owned chickens owned between 1 and 5 chickens. This is represented by about 47%. However, the highest number of chicken-owning respondents owned between 6 and 10 chickens. In 2002/3 none of the respondents owned more than 51 chickens. Contrary to this, in 2007/8 about 5% of respondents owned at least 51 chickens. Despite this varying ownership trend, it is noticeable that in 2007 more chickens in high categories were owned by rural households compared to the pattern of

ownership in 2002/3. Broadly, chicken ownership declined, with a steady rise in ownership of chickens for higher categories. This is confirmed by the fact that of 154 respondents who owned chickens in 2003, only 105 owned chickens in 2007/8.

## 5.4 Discussion

The striking observation is that while 2007/8 recorded an average annual rainfall, maize II producing households were more prevalent than those producing other crops in the study area. Reasons for this include the fact that in the Zambezi region, maize is regarded as marketable good and maize producers may have worked hard in anticipation of a surplus harvest. The currency used in this study is Namibian dollars (N\$). The N\$ is pegged to the South African rand (R). Thus the parity is N \$1 = R1. In October 2007, the price of maize at Katima Mulilo stood at N \$170 for a 50 kg bag of maize not milled and for a milled one, the price stood at N \$300 which was an equivalence of US\$23 at that time. This price was astronomical because of an excess demand for maize, not only in Zambezi but also in Namibia at large. However, it should not be confused with the fact that prices of maize and millet are at variance in the Zambezi region when compared to the regions of Kavango, Ohangwena, Omusati, Oshana and Oshikoto. Unlike in these regions where millet is extensively consumed and preferred as staple food, in the Zambezi region maize is the staple food.

As a result, the price of maize will be expected to surge quickly when the demand is high and at times when there is an import restriction. Further, maize is a strategic commodity given that it is consumed by many people in Namibia. Thus, annually the Namibian Agronomic Board imposes a moratorium on the importation of maize grain and maize-meal until the local supply has been absorbed into the market. Once a deficit is anticipated resulting from excess demand, imports are then permitted by an official announcement in the print media and on radio. Imports are only allowed when the consumption of the locally produced maize has reached a critical low level. This step has a price-escalating effect on locally produced maize. The price effect comes in because often, the demand outstrips the supply and as maize becomes increasingly scarce before the borders are re-opened for imports, the price of maize-meal could have become much higher, and inhibitive to the purchasing power of many poor rural households.

From a strategic rural livelihood point of view, the dire situation of rural households having to face serious food shortages can be attributed to climate change that has brought changes to the natural environment. The changes are such that rural farmers have now abandoned one of the crucial and traditional coping strategies of engaging in bi-annual harvesting tendencies in a year. It happened that rural households whose fields were close to rivers used to plant and harvest twice across the usual planting season. Locally this practice is called *kulimalitapa*. *Kulimalitapa* is a Lozi statement, which entails planting early and it suggests a provision for the second planting scenario. *Kulima* simply means to cultivate while *litapa* is the early cultivation practice. The first case scenario of *litapa*, would assist the household in meeting its food requirements when the usual ploughing takes place late in November-December. *Kulima litapa* used to take place around September. By the month of October, consumption of pumpkin leaves and related crop-field vegetables would usually take place. Late in November, consumption of sweet corn resulting from *litapa* would then follow.

As indicated, the second planting season usually started late in November to early December for a good reason that school children were on holiday. This timing was crucial for two reasons, namely for accessing the required labour from the presence of school pupils; and the conduciveness of environmental factors, given that reliable rainfall would be received during the month of December to escalate ploughing activities. The findings show that all rural households in the study area have since abandoned such practices. This explains the switching from *litapa* to a single harvesting approach. Some of the reasons are annual flood water that would still be found in river-based fields, unlike before; reduced labour supply to rural households due to migration and deaths in families; and increased occurrence of terminal diseases such as HIV and AIDS in rural households. These factors have rendered it difficult to access household labour in attempting to meet the food and income needs of the affected household.

## 6. CONCLUSION AND POLICY RECOMMENDATIONS

The frequency of floods and drought in the study area often renders unintended consequences on the livelihoods of rural households. Households that continue to suffer from natural disasters of this kind should be assisted in order for them to operate livelihood strategies that are resilient to natural shocks. As it is evident now that livelihood strategic components declined when it comes to their performance from an output-point of view, rural households in the study area require assistance in the form of improved crop varieties and other adaptable livestock for them to continue to command their lives in an uninterrupted manner. Early warning systems should be strengthened so that rural farmers may know whether or not the bi-annual harvesting tendencies should be considered. The success of this depends heavily on the ability to forecast atmospheric changes way before their occurrence.

Reliance on agricultural practices alone may also carry livelihood risks when weaker early warning system remains in place. Therefore, other income generating opportunities should be attempted as a way of assisting rural farming households to continue to use such as coping strategies when disasters strike. Other interventions that can support rural livelihoods should take the form of erecting catchment dams for flood water so that rural farmers may utilize that water for irrigating gardens.

## 7. REFERENCES

Ajaero, C.K. and Madu, I.A. (2014). Rural-urban migration and livelihoods in South Eastern Nigeria. *Developing Country Studies* 4(6): 6 – 15.

Arndt, C. and Bacou, M. (2000). Economy-wide effects of climate variability and climate prediction in Mozambique. *American Journal of Agricultural Economics* 82: 750-754.

Behera, D., Chaudhary, A.K., Vutukuru, V.K., Gupta, A., Machiraju, S. and Shah, P. (2013). Enhancing agricultural livelihoods through community institutions in Bihar, India. *South Asia rural livelihoods*; Series 3 note no. 1. Washington D.C.: The World Bank.

Borbora, S. (2014). Financing value chains for developing rural livelihoods. *International Journal of Managing Value and Supply Chains* 5(1): 9-18.

Daniels, R.C., Partridge, A., Kekana, D. and Musundwa, S. (2013). Rural livelihoods in South Africa. National Income Dynamics Study, Discussion Paper 122. South Africa: University of Cape Town.

Davis, B., Di Giuseppe, S., and Zezza, A. (2017). Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa. *Food Policy* 67: 153-174.

Deressa, T. and Hassan, R.M. (2009). Economic impact of climate change on crop production in Ethiopia: Evidence from cross-section measures. *Journal of African Economies* 18(4): 529-554.

Erasmus, B., Van Jaarsveld, A., Van Zyl, J. and Vink, N. (2000). The effects of climate change on the farm sector in the Western Cape. *Agrekon* 39(4): 559-573.

Golooba-Mutebi, F. and Tollman, S.M. (2004). Survival to livelihood strategies for Mozambican refugees in South Africa. *Forced Migr Rev* 20:28-29.

Gomez, K.A. and Gomez A.A. (1984). Statistical procedures for agricultural research. John Wiley and Sons, York.

Heltberg, R. (2009). Malnutrition, poverty, and economic growth. *Health Economics* 18: 77-88.

Kurukulasuriya, P., Mendelsohn, R., Hassan, r., Benhin, J., Deressa, T., Diop, M., Eid, H., Fosu, K.Y., Gbetibouo, G., Jain, S., Mahamadou, A., Mano, R., Kabubo-Mariara, J., El-Marsafaury, S., Molua, E., Ouda, S., Ouedraogo, M., Séne, I., Maddison, D., Seo, S.N. and Dinar, A. (2006). Will African Agriculture Survive Climate Change? *The World Bank Economic Review* 20(3):367-388.

Loison, S.A. (2015). Rural livelihood diversification in Sub-Sharan Africa: A literature review. *The Journal of Development Studies* 51(9): 1125-1138.

Makate, C., Wang, R., Makate, M. and Mango, N. (2016). Crop diversification and livelihoods of smallholder farmers in Zimbabwe: adaptive management for environmental change. [Springerplus](#) 5(1): 1135.

Nwonwu, F. (2009). The rise of food prices and the challenge of development in Africa. *Africa Insight* 38(4): 44-58.

Olawuyi, S.O. and Rahji, M.A.Y. (2012). Analysis of livelihood strategies of household's heads in Ode-Omi Kingdom, Ogun-Water Side local Government Area, Ogun State, Nigeria. *IJRRAS* 11(2):337 – 345.

SAMSAMWATER.(2011). Annual rainfall calendar. [Online] Available at [www.samsamwater.com](http://www.samsamwater.com). [Downloaded: 2011-11-08].

Scoones, I. (1998). Sustainable Rural Livelihoods: A framework for analysis. [Online] Available at: <http://www.ntd.co.uk/idsbookshop/details.asp?id=419> [Downloaded: 2006-04-03].

Sheahan, M. and Barret, C.B. (2017). Ten striking facts about agricultural input use in Sub-Saharan Africa. *Food Policy* 67: 12-25.

Siyoun, A.D., Hilhorst, D. and Pankhurst, A. (2012). Differential impact of microcredit on rural livelihoods: A case study from Ethiopia. *International Journal of Development and Sustainability* 1 (3): 957 – 975.

Thomson, G.R. and Venter, R. (2012). Risk analysis of animal disease hazard associated with import of animal commodities (including live animals) and products into Namibia and consequences thereof. Windhoek: Meat Board.

Wagner, T. (1993). Applied Business Statistics: Methods and applications. Juta & Co, LTD: Kenwyn.