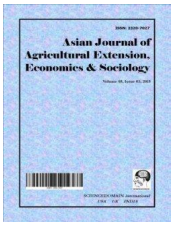

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Analyzing the Agricultural Livelihood Strategic Components in the Zambezi Region, Namibia

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Authors' contributions

This work was carried out in collaboration between both authors. Author JMN designed the study, collected the data and performed the statistical analysis. Author AB contextualized the analysis and provided meaning to it in the context of current developments in agricultural livelihood analysis. Both authors read and approved the final manuscript.

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ABSTRACT

While urban dwelling is increasingly becoming common across the world, in Namibia, the population settlement pattern is skewed towards rural areas and so is the case for the Zambezi region. The main livelihood strategy is agriculture, which is subsistence in nature and practiced on communal land. This paper investigates changes in the agricultural livelihood strategy in the rural Zambezi. The work is premised around the hypothesis that the agricultural livelihood strategy has improved since 2002 to 2008. 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. The majority of respondents are between the ages 36 to 60 years of age. Of the total respondents, 61% were married. The majority of respondents in the category of those with no education at all making up 35% are women. At Junior and Secondary education levels, women dominate men. Male respondents (at 5%) slightly outclass women respondents in terms of having

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attended tertiary education. 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 from 53% to 47% of the total cattle numbers and crop harvests among the marginalized households require some long-term policy interventions. Introducing small irrigation projects for rural farming households holds potential for increased crop outputs when there is inadequate rainfall. Other than opting for sustainable livelihoods, anything less is unlikely to be inappropriate for a rural farming 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 the 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 that is 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 [1] 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, the 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 the 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 require 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/Kalinki 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 the 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 [2].

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 CONTEXT

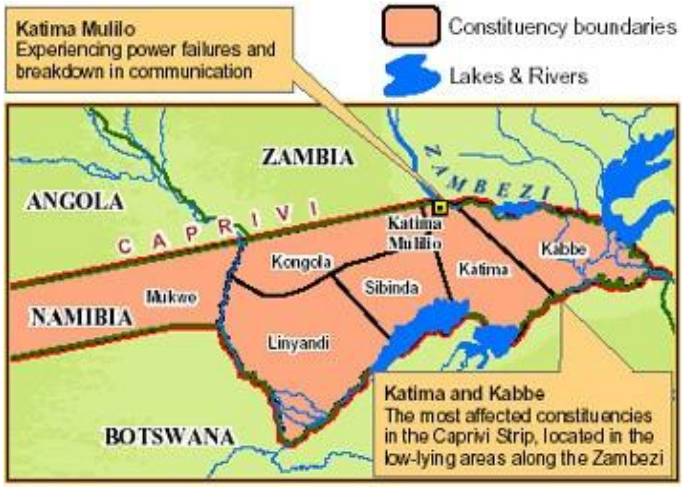
Zambezi region is one of the 14 regions of Namibia. It was formally known as Caprivi until in 2014 when the name was changed. The population of that region stands at 90 000. The Zambezi region is structured with eight political constituencies, namely Kabbe South, Kabbe, Katima Rural, Katima Urban, Linyanti, Sibbinda, Judea Lyaboloma and Kongola. The study was undertaken in Kabbe and Kabbe South, Katima Rural, Linyanti and Judea Lyaboloma constituencies. These constituencies are prone to flood and are also not exceptional 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.

3. LITERATURE REVIEW

[3] 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 [3].

What makes rural livelihoods unsustainable is a variety of factors including climate risk, income risk, harvest failures, diseases and death of livestock [4]. 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 [5].

It is against this backdrop that [6] believe that reliable rainfall prediction is essential to rural communities. There is no theory of livelihood and coping strategies, As demonstrated by [7], 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 [8].



Map 1. Map of the Zambezi region with surrounding rivers
Source: Yahoo.com (2017)

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 [9]. Some of the major reasons that can explain why there is low productivity in agriculture especially for smallholder and rural farmers. 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 [10]. It is now evident that in Sub-Sharan Africa, input use depends mainly on policy differences across countries than just farm, market and household socioeconomic situations [11].

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 [12]. Focusing on Zimbabwe, [13] argue 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 [14]. In South Africa, remittances that Mozambicans earn from other engagements and sends home to Mozambique were seen as vital forms of livelihoods [15]. [16] 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 are the agro-climatic conditions. It was also found that agriculture remains a choice for livelihood consideration by many when conditions are conducive to farming activities [17].

In South Africa, rural livelihood composure seems to be deviating away from an agricultural based livelihood rural economy. The existence of government grants has a changing effect on how livelihoods are managed in that country [18]. 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 [19].

It is also understood that rural-urban migration is one of how 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 [20].

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 operates in the flood-prone areas called the floodplains. The harvesting seasons are classified in two ways, namely normal and abnormal based on the rainfall that was recorded in that particular cultivation- harvesting season. Abnormal is for below average and normal is when the average is reached. In 2006/7, a period considered being normal, the rainfall that was received in the Zambezi region is over 900 mm against an annual average of 653 mm [21]. A semi-structured questionnaire was administered to 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 to the fixed-ratio hypothesis that was stated as H_0: 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 (χ^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 [22], and [23 and mathematically, Chi-Square can be written as follows:

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

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

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

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 is the socio-economic features of the respondents as expressed in Tables 1 to 2 and Fig. 1 and in Fig. 2.

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 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.

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 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 that more members of the household may have aggregated their pieces of land to form small farm holdings. It is also pertinent to assess the educational levels of herds of households.

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

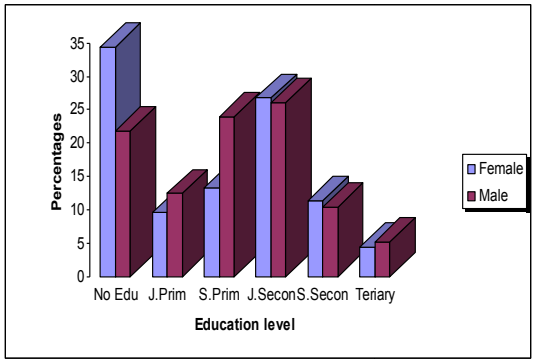


Fig. 1. Educational levels of respondents

In Fig. 1, 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

Fig. 2 shows marital orientations of respondents. It is evident that the majority of respondents (61%) 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 occur 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 which is mainly due to the 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 2007/8. 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: ≠ 0, that the ratio of total crops that are commonly harvested that is, maize, millet and sorghum is different. Table 1 presents the results of the survey. Disclaimer, in Table 3 and Table 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 Table 3 and Table 4. 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.

The results of the χ^2 test are based on disaggregated data that was deduced from Fig. 1. Applying the χ^2 formula and using aggregated data in Fig. 1 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 is 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 the 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 cultivated it in 2002/3 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 rural households to have 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. Using the Chi-Square test, 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

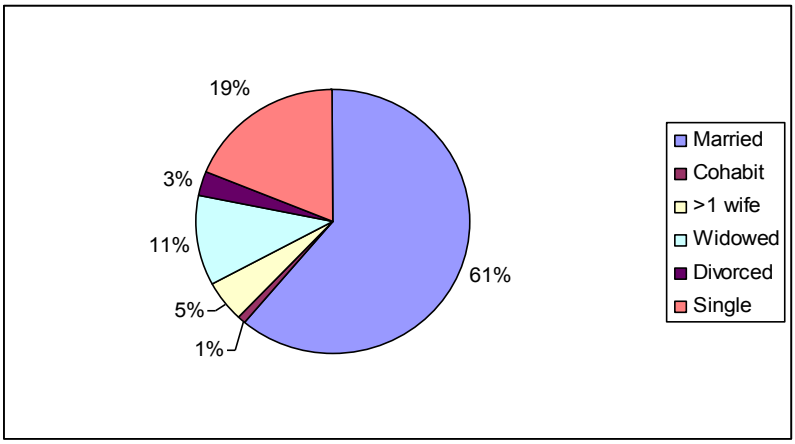


Fig. 2. Marital status of respondents

Table 3. Aggregate contingency table for maize, millet and sorghum in2002/3 and 2007/8

	<1bag 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
Mille I	54	59	14	7	5	139
Mille 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)

by sample households in 2002/3 and in 2007/8. H_1: ≠ 0, that the ration of ownership of goats, cattle and chickens by sample households is different for the two periods.

As in Fig. 1, the results of the χ^2 test are based on disaggregated data that was deduced from Fig. 1. Applying the χ^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. Meaning that in 2002/3 cattle numbers stood at 53% while in 2007/8, the cattle population was at 47% of the entire total number of cattle that were recorded over the whole period.

With regards 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 go a long way, among others in supporting children to pay for their school fees, for medical expenses and for 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 Super market 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.

It is worth noting that the term harvesting under 'normal conditions' and under 'abnormal conditions' should be understood to mean that

Table 4. Aggregate contingency table for cattle, goat and chicken ownership during 2002-2003 and 2007-2008

	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)

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 in the 2006-2007 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, maize harvest under abnormal conditions (maize I) shows that 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 0.05ton 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.

In the past, it happened that rural households whose fields were close to rivers used to plant and harvest twice across the planting season. Locally this practice is called *kulima litapa*. *Kulima litapa* is a siLozi 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 be taking place. Late in November, consumption of sweet corn resulting from *litapa* would then follow. This strategy is no longer popular and is mainly blamed on the erratic nature of the rainfall brought by climate change. The implication being that rural communities turn out to become food insecure. The fact that there are no small-scale irrigation schemes that are tailor-made for small-scale farmers, the situation exacerbates chances of food insecurity in the study areas.

5.3.2.1 Goats

Goats are highly prized and sought after for 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 areas. 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 the periods 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 in 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.

5.3.2.2 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 could 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 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 needs, 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 form about 40% of the respondents and this category were 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 2002/3.

5.3.2.3 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 are cost-effective to feed given that they free 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 had 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 trends, it is noticeable that in 2007/8 more chickens in high categories were in the hands of 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.

6. DISCUSSION

The striking observation is that while 2007/8 recorded an average annual rainfall of 653 mm [21], 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 a marketable good and maize producers may have worked hard in anticipation of a surplus harvest.

The inherent *kulima litapa* practice that provided households with food items appears to have been abandoned as that was not registered with the respondents. 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 and also reduced labour supply to rural households due to migration and deaths in families. It is some of these factors that have rendered it difficult to access household labour in attempting to meet the food and income needs of the affected household.

The declining livestock numbers are also worrisome when considered from a food security point of view. It should be noted that other opportunities may be filtering in to rural communities especially those that can serve as survival strategies. A few more natural-based livelihood strategies especially those that are agricultural in nature are increasingly becoming crowded out. This notion and finding concur with the insight found in Mellor's Law. In such a law, [24] assert that agriculture can grow faster and later decline against other sectors that utilize technology. It is also believed that the nature and quality of development policies that contribute to sector resource allocation, migration and urbanization have negative effects on the agricultural sector [25].The same holds in this study. Over time, the risky nature of rural agricultural practices and their biological expositions may have rendered other forms of livelihoods becoming more preferred in the context of technological growth opportunities to which rural communities are now exposed to. These can include, among others the opening up of small shops, popularity of cellphones that has led to increased sales of airtime by many vendors including those in rural areas.

Climate-related factors are mainly to blame for declining agricultural livelihood components. This finding is supported by [26] who pointed out that in Sudan, rainfall has been the limiting factor on crop and livestock farming practices. It is real that climate risk remains a challenge that undermines the agricultural livelihood strategies including in the Zambezi region.

7. 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 those rural farmers may know whether or not the bi-annual harvesting tendencies should be considered. Where possible, *kulima litapa* should be encouraged in the rural setting. 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 food insecurity risks when weaker early warning systems remain 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 crop fields and gardens. That may also require assistance from the Ministry of Agriculture, Water and Forestry and also from financiers so that rural farmers may acquire needed irrigation equipment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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