Assessing drought readiness and recovery efforts of communal farmers: A case study of Outapi Constituency

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Abstract -This study aimed at assessing the preparedness of communal farmers of Outapi Constituency prior to the 2018/2019 drought, response approaches employed, and post-drought recovery strategies employed. Literature shows that appropriate distribution of resources is key, while building resilience at the household level. A mixed-methods research approach was employed to gather data from sampled communal households and key informants.

The study findings show that the 2018/2019 drought was associated with severe negative impacts such as high crop failure, high livestock mortalities, lack of water, and poor grazing, as 71% of households relied primarily on pensions, and subsistence farming. The majority of communal households (90%) relied on livestock supplementary feed for drought preparation. The majority of households (58%) cultivated drought-resistant crops as a strategy for crop and vegetable production drought preparation.

Communal households (78%) strengthened their coping capacities by relying on existing food reserves. Conservation of soil and water management (69%) was employed on water management strategies, while 82% relied on livestock supplement fodder support. Post-recovery measures employed were to rebuild livestock herds (72%), and 49% applied better crop management practices. Structural support systems play a role in community service delivery, whereby 96% acknowledges the services conveyed by the GRN and affiliated institutions. The study recommends enhanced market access for crops and livestock products; livestock destocking; strengthening existing institutional coordination; establishment of additional water harvesting infrastructure; finalisation of the National Drought Policy and Strategy of 1997; creation of a fodder bank; and establishment of a Government of the Republic of Namibia drought recovery programme.

Keywords: Drought, Communal farmers, Livelihoods, Preparedness, Response, Recovery

1. Introduction

Namibia is geographically situated alongside Africa's southwestern coast and shares borders with Angola in the northern part, while in the northeast lie Zambia and Zimbabwe (Green, 2021). In the eastern part lies Botswana, in the southern part lies South Africa, and in the west is the Atlantic Ocean. Namibia occupies an area of 824,290 km^2, and has three (3) categories of land tenure systems, namely: communal, freehold and state land (Namibia Statistics Agency [NSA], 2018). However, Namibia is characterised by sporadic rainfall patterns and unpredictable weather and climate with an average annual rainfall of 250 mm, with the north-central part generally receiving on average of 500 mm per year, while the Zambezi region receives above average rainfall (Green, 2021).

Namibia is the most arid country in the southern part of the Sahara with low agricultural production (Hegga, Ziervogel & Angula, 2016). Natural disasters (prolonged droughts & repeated flash floods) put more pressure on the already deprived environmental conditions, and therefore causing distractions to the ability of the land to produce sufficient food, leading to food insecurity, which is tied to poverty, especially at communal household level (United Nations Development Programme [UNDP], 2011). Reoccurring droughts have threatened and added more pressure to the country's food security and complementary efforts from both the GRN and the private sector to address food security and building resilience at household level (Rothauge, 2018).

It is estimated that about 58% of the Namibian population lives in communal areas and agriculture is the primary source of livelihood (Namibia Statistics Agency [NSA], 2015). The findings of a report on Namibia's Census of Agriculture on the communal sector shows that the overall population of agricultural households for the communal sector was 907,715 at the time of the census, of which 417,566 (46%) were male, while the remaining 490,149 (54%) were female (NSA, 2015). As communal farming is highly practiced in communal areas, there is normally minimal harvest to market, and in instances of surplus, the harvest is normally stored to sustain the household until the next harvest (Balcha, 2013).

As displayed in Figure 1, Namibia projected normal to above average rainfall over the first half of the rainfall season, whereas average to below-average rainfall was expected in the next half of the rainfall season, with the exclusion of Zambezi region that expected average to above-average rainfall (Ministry of Agriculture, Water and Forestry [MAWF], 2019). The MAWF (2019) further noted that, there was a 35% prospect within the above-average category, 40% prospect within the average category and 25% prospect in the below average category for the first half of the rainfall season. During the second half of the rainfall season, majority parts of Namibia expected a 25% prospect in the above-average category, 40% prospect in the average category and 35% probability in the below-average rainfall category, while Zambezi region had a 35% probability in the above-

average rainfall category, 40% prospect in the average category and 25% prospect in the category of below-average rainfall (MAWF, 2019).

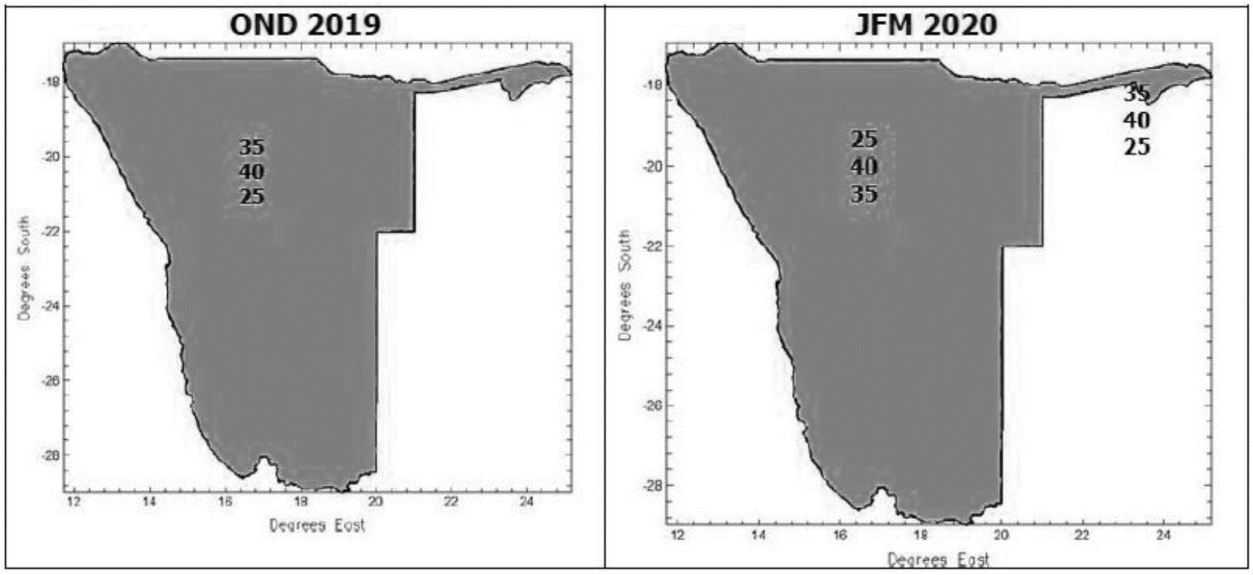

Figure 1: Namibia's rainfall outlook of October 2019 to March 2020
Source: (MAWF, 2019)

On the water supply situation, it was negatively affected by the drought, as reported by the MAWF (2019) which states that there was poor water supply in Ohangwena, Omusati, Oshana and Oshikoto region as reliable water catchments dried up, and this forced communal farmers solely rely only on pipelines, non-natural wells and boreholes. In the north-eastern regions (Zambezi, Kavango East and Kavango West regions) water supply was noted to be adequate with the key source being perennial rivers (MAWF, 2019).

On the other hand, in the southern and western parts of the country, the underground water table level was below average pumping levels (MAWF, 2019). The majority of dams and reservoirs across the country as shown in Figure 2 were low, because of low water inflow received during the 2018/2019 rainfall season. Specifically, the water supply situation in the Omusati region was a concern in most areas, as most of the human-made earth dams were completely dry and communal farmers were only dependent on pipeline water, natural wells, boreholes and the canal to access water (Shikangalah, 2020).

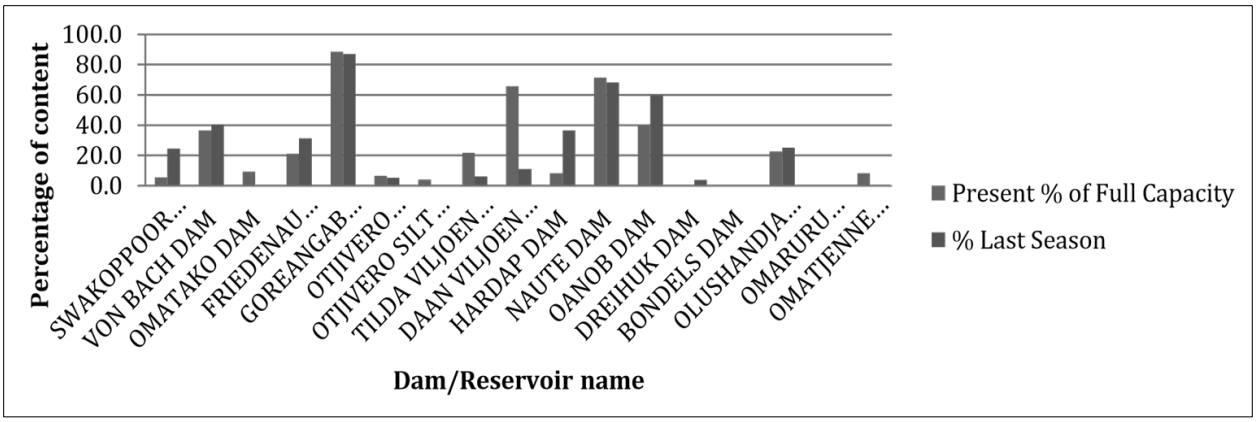

Figure 2: Summary of dam levels in Namibia as at 19 December 2019
Source: (MAWF, 2019)

The MAWF (2019) reported that over 88,219 livestock mortalities were reported as a result of the country's severe drought from the beginning of October 2018 to the end of September 2019. As presented in Table 1 that was retrieved from the Agricultural Inputs and Household Food Security Situation report exhibits that cattle account for more than 56 percent of livestock mortalities, followed by goats at 31 percent, sheep at 12.3 percent, and donkeys and horses at less than 1 percent each.

Table 1: Livestock mortalities as from October 2018 to September 2019

Region	Cattle	Goats	Sheep	Donkeys	Horses
Erongo	10,162	4,026	2,364	246	103
Hardap	20	0	0	0	0
//Kharas	2,738	14,069	1,148	0	0
Kavango East	0	0	0	0	0
Kavango West	59	8	539	0	0
Khomas	810	0	0	0	0
Kunene	8,681	2,602	4,357	102	79
Ohangwena	6,574	916	26	22	0
Omaheke	2,517	1,421	742	40	95
Omusati	6,412	1,378	88	150	0
Oshana	1,776	458	10	121	0
Oshikoto	1,984	80	12	11	0
Otjozondjupa	7,426	2,143	1,559	23	46
Zambezi	76	0	0	0	0
Total	**49,235**	**27,101**	**10,845**	**715**	**323**

Source: (MAWF, 2019)

In view of the above, this study assessed the drought readiness and recovery efforts of communal farmers of Outapi Constituency within Omusati region. Better projection is attainable which

involves timely, and sufficient distribution of resources, be it technical or financial to support and capacitate communal farmers especially in communal areas, hence building resilience at the rural household level. It is for that reason that sound conclusions, appropriate and well-informed recommendations, are comprehensively supported by findings resulting from this study.

2. Objectives

2.1 Overall objective

The aim of the study was to assess the drought readiness and recovery efforts of communal farmers from the 2018/2019 national agricultural drought.

2.2 Specific objectives

- To assess the level of preparedness by communal farmers prior to the 2018/2019 drought.
- To analyse drought interventions employed by communal farmers.
- To analyse post-drought recovery strategies employed by communal farmers.

3. Methodology

3.1 Study area

The designated study area was Eengolo settlement (Figure 3). This settlement is situated in the Omusati Region, Outapi Constituency, and approximately 13 kilometres alongside the national highway B1 tarred road from Outapi town towards the direction of Oshakati town. Outapi is an electoral constituency in the Omusati region, with an area of 949.1 km^2 (Namibia Statistics Agency [NSA], 2011). The settlement of Eengolo is the primary study area has five villages, namely: (i) Okahwa-Kangamba, (ii) Okathitu-Kakafimbi, (iii) Okahwa-Kangweva, (iv) Okapuku and (v) Omaputa. Access to portable clean water to these villages is by means of the rural water supply administered by the Ministry of Urban and Rural Development in partnership, in-partnership with the MAWLR, via Namibia Water Corporation. It is worth noting that not all communal households have access to portable clean tap water, because of fee-based services, but the relevant authorities are addressing access to portable clean water (Wilhelm, 2012).

Outapi Constituency has a population of 36,740 inhabitants of which 16,593 (43.2%) are male while 20,147 (54.8%) are female, and has a population density of 38.71 people per square kilometer (NSA, 2011). According to the national statistics by NSA (2011), the dominant age group composition is 15-59 years and on marital status, 65 percent of the inhabitants are not married while only 17 percent are married with certificates. Eengolo settlement consists of a few prominent features that are particularly noticeable (Government Health Clinic, Eengolo Combined School, and Eengolo Evangelical Lutheran Parish). All these prominent features are electrified, and a few communal households. In terms of network coverage, the common and local Mobile Telecommunications Company (MTC) network reception has been poor in recent years, and to

address this, the mobile communication giant MTC erected a network tower at the settlement in the year 2020 and this initiative was positively received, and applauded by local residents.

On road networks, as part of the five-year Strategic Plan 2013-2017 of the Ministry of Works and Transport (MWT), a gravel road linking the settlement to Outapi town was constructed by the Ministry of Works and Transport (Roads Authority), therefore making access to goods and services extremely easy. This new gravel road is equitably in good state as it is regularly, and continuously maintained. Transportation services are accessible by the majority of marginalised and less privileged communities to benefit from socio-economic development. As part of the long term plan, the MWT (Roads Authority), is at the moment revising road master plans at the regional level to prioritise on road construction, and tarring several gravel roads with the key aim of enhancing socio-economic development, and interlinking road networks (Shivute, 2013).

The type of land tenure present is communal land, and it belongs to the State as per the Namibian Constitution, and the Communal Land Reform Act, 2002 (No. 5 of 2002) (Ministry of Lands and Resettlement [MLR], 2009). The type of agricultural farming is communal farming on a subsistence basis, and is practiced on fenced fields around traditional, semi-traditional or modern homesteads where cultivation of crops such as mahangu, sorghum, maize, beans, groundnuts, watermelons and other horticultural crops is performed (NSA, 2015). Grazing land in communal area has no limitations outside these fences, and grazing is practised on areas referred to as commonage.

Figure 3: The study area: Outapi Constituency
Source: (Mazambani, 2021)

3.2 Scope

While the socio-economic impact of the 2018/2019 drought on communal farmers was well profiled by a number of environmental, and economic scholars, the majority of scholars have overlooked the aspect of communal farmers' readiness and recovery efforts in relation to the drought under review. As a result, the majority of communal farmers and the public sector have previously focused only on interventions meant at mitigating drought effects during the drought, of which many consider to be an expensive approach and creates a dependency syndrome. Instead of applying proactive approaches, the government, several institutions and communal farmers were always reactive to drought events as they occur. This study assessed the level of communal farmers' drought readiness, interventions and recovery efforts in response to the drought event, with the drought in question being 2018/2019 drought.

The study only interviewed communal households in five (5) villages of Eengolo settlement. Fieldwork by means of data collection ended only after all sampled communal households, and recognised key informants were interviewed, and all interviews were completed and verified. As part of data collection, a comprehensive questionnaire was administered to the head of the household, and the study further consulted key informants who play a key role in the drought management processes at the national, regional, and constituency level with the aim of getting an overview of concerns connected to communal farmers' and institutional drought readiness, implementation of legislations, constraints and drought-related interventions aimed at mitigating socio-economic effects allied to drought.

3.3 Research design

A mixed research method approach was employed to gather all the data and information. Ivankova and Clark (2016) define and interpret mixed research method, as a procedure that involves the collecting, analysing and combining both quantitative and qualitative data within a single study. Furthermore, a mixed research methods provided both numeric and text data concurrently and allowed for contextual interpretations and flexibility in choosing the best approaches to answer the research questions of the study. To fully address the study’s research objectives, a mixed research technique was chosen, and employed as a feasible option for this study.

3.4 Data collection

First and foremost, the researcher received a clearance and approval from the University pertaining to data collection instruments. Additionally, the researcher obtained an authorization letter that served as confirmation, and study identity. Before embarking on interviews with the sampled communal households and selected key informants, the researcher paid a courtesy visit at Omusati

Regional Council and Ombalantu Traditional Authority to provide a brief overview of the study which is inclusive of the purpose, target population, timeline and benefits associated with this particular study. During this study visit, the researcher emphasised the need to effectively convey awareness to the Chief Regional Officer of Omusati Regional Council, Councillor of Outapi Constituency in particular, Officials at Ombalantu Traditional Authority and Headmen of several villages that were visited. To supplement the identity of the researcher in the community, two (2) separate research authorization letters were issued by (i) Ombalantu Traditional Authority and (ii) Omusati Regional Council. These letters warrant permission to the researcher as a means of enabling fieldwork by engaging sampled communal households. As a prerequisite, the researcher was instructed to use to the collected information for the purpose of this study and furnish findings to Omusati Regional Council by means of a comprehensive study report after concluding the study.

A study questionnaire consisting of both open and closed ended questions was administered to communal household respondents via face-to-face interviews, and collected measurable quantitative and qualitative data. In instances where household heads were absent, the research assistants interviewed an available adult that is well-conversant, and knowledgeable about the drought under review. A household was used as a measurement unit for this particular study. NSA (2011) defines a household as "a group of people - related or unrelated - who live in the same dwelling unit and share or have common catering arrangements" (p. 63). Before data collection, all two sets of questionnaires were submitted to a professional language translator to be translated into the vernacular language of Oshiwambo, which is a common language among the target population.

Another approach that was employed by this study was a separate unstructured questionnaire that was administered to nominated key informants that they directly play a role in the drought preparedness, response and support system. Institutions consulted were the Office of the Prime Minister (National Disaster Risk Management Committee) (Directorate of Disaster Risk Management; Outapi Regional Council which consists of the Regional Disaster Risk Management Committee, Local Authority Disaster Risk Management Committee, Constituency Disaster Risk Management Committee, and Settlement Disaster Risk Management Committee); line Ministries – Ministry of Agriculture, Water and Land Reform specifically the Directorate of Planning and Business Development (Food Security) and Directorate of Agricultural Production Extension and Engineering Services; Ministry of Health and Social Services – Nutrition Section; Ministry of Works and Transport - Namibia Meteorological Service (Early Warning Information System).

Sampling is important since studying an entire population is both costly and time intensive, and it is however important that if the sample is representative, study findings would be similar to those collected by interviewing the population at a much lower cost (Bhardwaj, 2019). A mixed sampling design consisting of purposive (non-probability) and cluster sampling (probability) was

employed. Wegner (2012) defines cluster sampling where the target population is naturally divided into clusters, where each cluster is similar in terms of profile to every other cluster. Leedy and Ormrod (2015) explains purposive sampling as a way of purposely selecting specific units, for a particular purpose. During the undertaking of this study, Outapi Constituency was the target area and out of a number of settlements, Eengolo settlement was purposively selected. This selection was implemented grounded by literature review as this area was heavily impacted by the 2018/2019 drought under review. Households referred to as primary sampling units within all villages of the settlement were sampled by means of cluster random sampling.

Prior to selecting a representative sample size, the researcher requested and obtained approval for the technical assistance of data sets of communal households in the targeted villages. After approval was granted by the Executive Director of the MAWLR, data sets containing sheets of all communal households of the targeted and selected villages in Outapi Constituency namely: (i) Okahwa-Kangamba, (ii) Okathitu-Kakafimbi, (iii) Okahwa-Kangweva, (iv) Okapuku, and (v) Omaputa, all accommodated on the Namibian Communal Land Administration System were made available to the researcher for sampling purposes.

3.5 Sampling

A representative sample for this study was determined in accordance with Leedy and Ormrod (2015) standards and guidelines. During the planning phase, the study population was +/-400 households as per the data sets from the Namibia Communal Land Administration System (NCLAS) that administers registered and issued new and existing communal land rights in Namibia (Middleton, Carlowitz & Becker, 2016). Geographical Information System data sets retrieved from NCLAS shows that the study area consists of +/-400 households and the area covered is approximately 129,277,323.18 m^2/129 km^2 (Mazambani, 2021). A set of guidelines and standards offered by Leedy and Ormorod (2015) and reinforced by Gay, Mills and Airasian (2012) specified that if the population size is about +/-500 (give or take 100), a 50% which attributes to half of the population should be sampled to give a true reflection of the entire population. Based on this guidelines provided, it was imperative and a sufficient and representative sample size of +/-200 households were sampled. Table 2 shows the fieldwork data collection sheet on the number of households that were sampled, successfully interviewed and those that were interviewed because of circumstances like refusal, and lack of a knowledgeable household individual.

Table 2: Fieldwork data collection sheet on sampling, interviewed and deficits

Name of the Village	Total Number of Households	Number of Households sampled	Number of Households interviewed	Deficits
Omaputa	15	7	7	0
Okapuku	28	14	14	0
Omakuku	54	27	27	0
Okafitu-kakafimbi	65	32	26	6
Okahwa-kangamba	65	32	30	2
TOTAL	**227**	**112**	**104**	**8**

Source: Author

4. Data analysis

Prior to data collection by means of fieldwork, all close-ended questions of the household questionnaire were coded to numerical figures for easy entry of response codes into the SPSS (Statistical Package for Social Science) version 26.0 as this made analysis of several variables easy (George & Malley, 2019). A few final open-ended questions of the household questionnaire, and the entire key informant questionnaire were not coded as this were meant to accord respondents, and key informants with an opportunity to express and give insights on aspects which were not addressed by close-ended questions. After data collection was completed, data cleaning was performed to validate, detect and remove (or perform correction) of detected errors and discrepancies in a data set due to wrong entry or omission. All incomplete data was identified, and the relevant measure was applied. Incorrect or inconsistent data can lead to a variety of issues, such as drawing of inappropriate conclusions (Chu, Llyas, Krishnan & Wang, 2016). Data analysis was performed with SPSS, supplemented by MS Excel. Table 3 shows the data analysis process comprising variables, and how it was applied in this study.

Table 3: Data analysis by specific objectives

Objective	Data used	Analysis method performed
To assess the level of preparedness by communal farmers prior to the drought	**1) Independent variables:** • Gender • Educational level • Marital status **2) Dependent variables:** **2.1 Drought preparedness on livestock:**	**Descriptive statistics** **Cross-tabulation and Chi-square:** Analyse factors (Independent variables) influencing the choice of drought preparedness

	• Livestock destocking • Livestock relocation • Livestock supplementary feeds • Drought resilient breeds • Early warning/advice **2.2 Drought preparedness on crops:** • Drought-resistant crops • Irrigation of crop fields • Establishment of backyard gardens • Dry/early planting • Mixed cropping • Mulching • Weeding • Seed density reduction • Early warning/advice	strategies (Dependent variables)
To analyse effective drought interventions employed by communal farmers	**1) Independent variables:** • Gender • Educational level • Marital status **2) Dependent variables:** **2.1 Household livelihood coping strategies:** • Dietary reduction • Food seeking • Drought relief food parcels • Food reserves • Selling household items **2.2 Soil and water management strategies:** • Irrigation • Backyard garden establishment • Crop/vegetable windbreak • Water conservation • Soil erosion prevention	**Descriptive statistics** **Cross-tabulation and Chi-square:** Analyse the association between factors (Independent variables) influencing the choice of drought intervention strategies (Dependent variables)

	• Controlled litter disposal • Good tillage practices **2.3 Livestock herd management strategies:** • Destocking • Early weaning • Herd separation • Parasite control • Feeds licks • Supplement fodder • Establishment of new water points	
To analyse effective post-drought recovery strategies employed by communal farmers	**1) Independent variables:** • Gender • Educational level • Marital status **2) Dependent variables:** **2.1 Post-drought recovery strategies:** • Build livestock herd • Debt repayment extension • Compensation by insurance companies • Compensation by GRN • Agricultural diversification • Other emergency funds • Provision of sufficient water supplies • Access to training on conservation agriculture • Better crop management practices • Capacity building of communal farmers	**Descriptive statistics** **Cross-tabulation and Chi-square:** Analyse the association between factors (Independent variables) influencing the choice of post-drought recovery strategies (Dependent variables)

Source: Author

5. Study limitations

A number of limitations were met during the implementation of this study, but there were mitigations employed to overcome all limitations.

- Insufficient financial resources were experienced in the course of commissioning this study. Nevertheless, alternative financial arrangements were planned for in case of financial shortage, and this aided immensely in addressing this specific drawback.
- During fieldwork, it experienced that a number of communal households, particularly elderly residents, had difficulty remembering key events pertaining to the drought. However, caution and patience was observed to clarify what is being asked to ensure that accurate, reliable, and appropriate data was collected.
- Despite desiring household heads as study targets, most household heads were physically absent as they were out with mostly employment obligations. In that scenario, interviews were conducted with the available adult as an alternative. However, careful probing was observed to get the intended data.
- Due to the high number of national Covid-19 infections at the time of fieldwork, a few respondents were hesitant in researchers and assistants accessing their households for face-to-face interviews. However, all necessary precautions and protocols were observed in accordance with the set health regulations by the Ministry of Health and Social Services.
- During the study planning phase, the researcher opted to apply the multinomial logistic regression analysis to analyse how independent variables (gender, educational level & marital status) influences the choice of dependent variables (drought preparedness, response & post-recovery strategies), but after extensively examining the feasibility, it was realised that collected data were not compatible with this analytical approach. On that note, alternative analytical method (cross-tabulation & chi-square) were employed.

6. Results and Discussion

6.1 Household demographics

6.1.1 Age

Household demographic variables presented in this section provides an overview and the general characteristics of interviewed households, and this overview illustrates how several characteristics of the population are represented. Household demographic information presented in these sections are age, gender, marital status, level of education, and employment status of respondents. The relative age group that emerged to be associated with the highest number of response is above 60 years, which emerged with a 64% (Figure 4). Furthermore, the age group of household heads between the range of 51 – 60 years (21%) emerged the second highest in terms of age representation, while the least age group (<=30 years) of household heads stands at 3%.

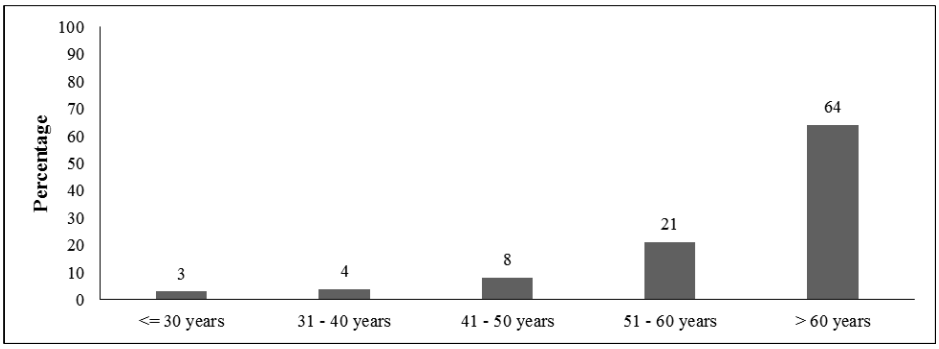

Figure 4: Percentage of household heads by age groups
Source: Author

6.1.2 Gender

Results in Figure 5 indicates that there is an equal distribution of gender in terms of household head, whereby both male and female emerged with 50% respectively. This study findings on gender distribution are closely conforming to demographic statistics from Namibia's 2011 Population and Housing Census. Gender distribution specifically for Omusati region as presented in the census report shows that male headed households stood at 45%, while female headed households stood at 55%, with a margin of 10% (NSA, 2011).

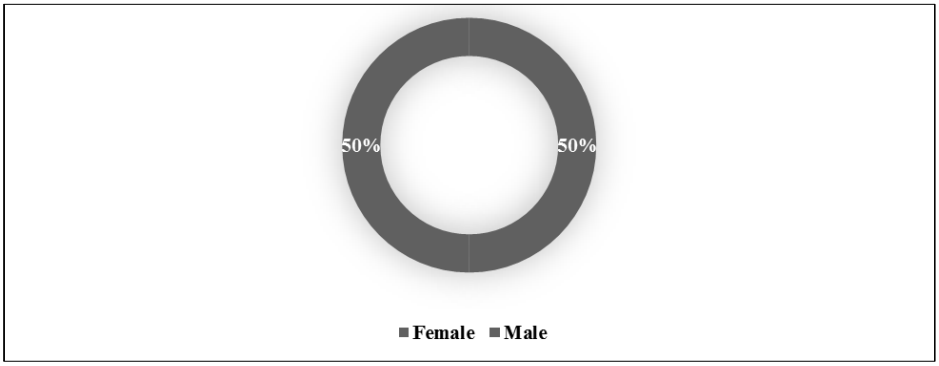

Figure 5: Gender distribution of household heads
Source: Author

6.1.3 Marital status

Figure 6 shows that the majority of household heads are married with a legal certificate (42%), followed by single (29%) and windowed (19%) household heads. It is concerning for widows and single heads of households (even though widows can be both male or female) as they are mostly regarded as vulnerable groups in communities who constantly require any form of assistance from either fellow community members or the Government to have the ability and support to cope with events such as drought and other catastrophes, hence they are at the verge of being susceptible to evolving shocks of all kinds.

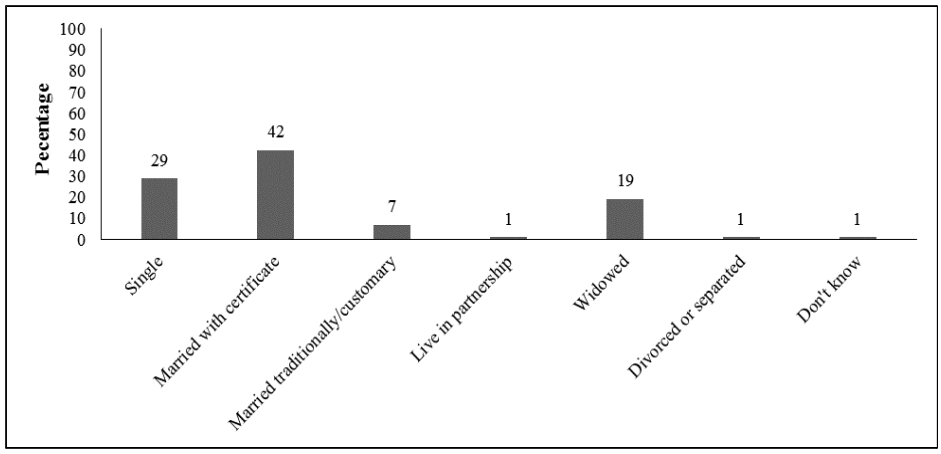

Figure 6: Marital status for household heads
Source: Author

Figure 7 shows that majority, 27% and 26% of household heads received primary and secondary education (old grading system employed in the country prior to independence of Namibia) as their highest level of education respectively. It is encouraging that majority of household heads in the community are educated as they are expected to interpret agricultural advices relating to communal farming and understanding early warning information on drought that is communicated to them. Furthermore, the fraction of educated household heads are expected to be well-equipped and conversant with knowledge on drought preparedness strategies, drought intervention strategies and drought recovery strategies.

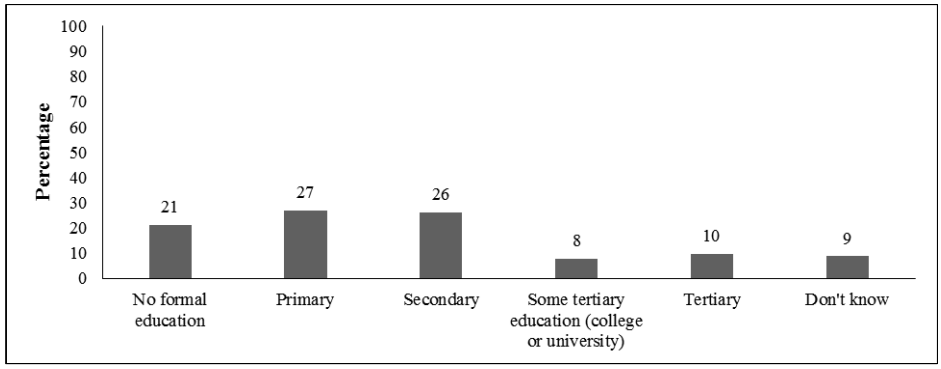

Figure 7: Highest level of education of household heads
Source: Author

6.2 Household income

Study results portrays that majority of communal households (70%) rely on pension and other social grants to sustain their livelihoods (Figure 8). This result is highly supported by the fact that 64% of household heads are over 60 years of age and therefore, this makes them automatically eligible to receive pension fund from the Government which is accorded to all senior Namibian

citizens. The second source of income for interviewed households is the engagement of household heads in full-time employment (15%). Income from full-time employment is mainly associated with the participation in day-to-day economic activities that operates in a strictly employment-related environment (NSA, 2015).

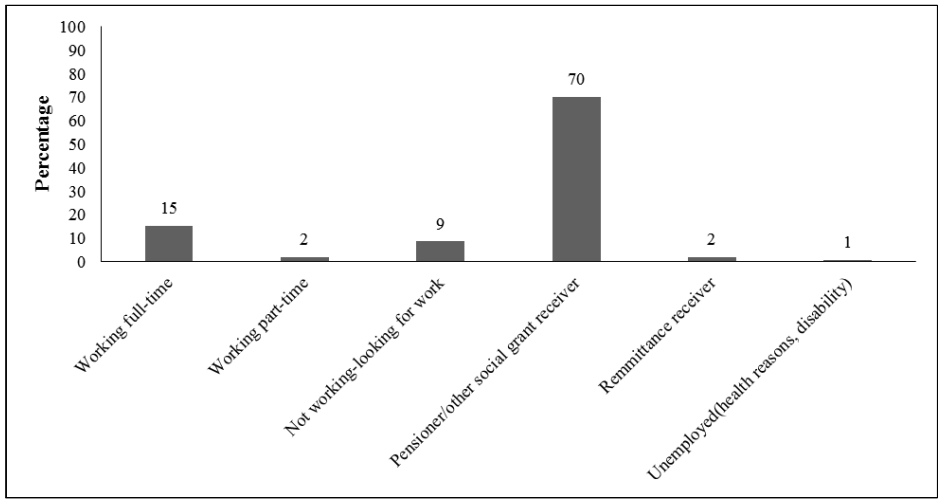

Figure 8: Main source of household income
Source: Author

6.3 Agricultural production

6.3.1 Size of agricultural land occupied by the household against size of arable land under agricultural production

Cross tabulation results in Table 4 exhibits that all 54 respondents specified that the specific land is used for agricultural purposes that falls within the range of 0-5 hectares. The results also show that 31 respondents indicated that of the land that is occupied by their household, 27 of them cited that it falls within the category of 0-5 hectares, while 4 respondents specified that it falls within the 5-10 hectares category. Results in Table 4 shows that most of the customary land sizes occupied in communal areas are within the range of 0-20 hectares as per the provisions of the Communal Land Reform Act, Act No. 5 of 2002.

Table 4: Cross tabulation of size of agricultural land occupied by the household against size of arable land under agricultural production

		Size of arable land under agricultural production (Hectares)				TOTAL NUMBER OF HOUSEHOLDS
		0-5	5-10	10-15	20-25	
Size of agricultural land occupied by	0-5	54	0	0	0	**54**
	5-10	27	4	0	0	**31**
	10-15	4	4	2	0	**10**
	15-20	1	5	0	0	**6**

the household (Hectares)	25-30	1	1	0	0	**2**
	30 and more	0	0	0	1	**1**
TOTAL		**87**	**14**	**2**	**1**	**104**

Source: Author

6.3.2 Average annual production of pearl millet

Results in Figure 9 concentrate solely on the production of pearl millet, and results show that pearl millet is the staple food for northern communal households as its production dominates other crops. Out of 100% mahangu production, 48% of households specified that yearly production are within the range of 0-499 kilograms, while 15% specified that their yearly productions are within the range of 500-999 kilograms. Interestingly, 38% impressively take pearl millet cultivation seriously as their substantial yearly production falls within the range of 1000 - > = 5000 kilograms.

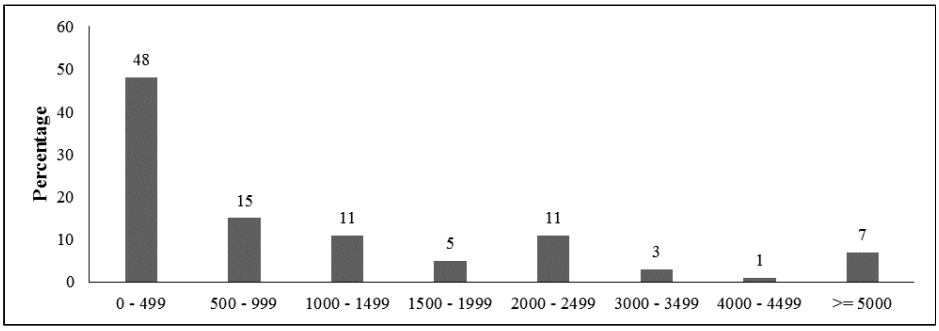

Figure 9: Average annual production of pearl millet
Source: Author

6.4 Marketing of crops and vegetables

Figure 10 shows that almost all respondents (99%) interviewed cited that portions of crops and vegetables produced are mainly for household consumption, while 80% stipulated that they do not market their crop produces. This is attributed by the reason that most households depend primarily on crop harvests from crop fields. Respondents expressed concerns towards marketing as they preserve harvest from previous seasons to cater for future prospects related to natural calamities that may arise like drought events and flash floods. It is worth noting that 12% are engaged in marketing of their crops and vegetables to raise money that will assist in improving livelihoods. As displayed in Figure 10 the majority of communal households that are marketing crops and vegetables opt for informal markets as there is a lack of formal markets, in the rural communities, and for those willing to opt for formal markets there are costs involved, such as transportation of crops and vegetables to nearest towns.

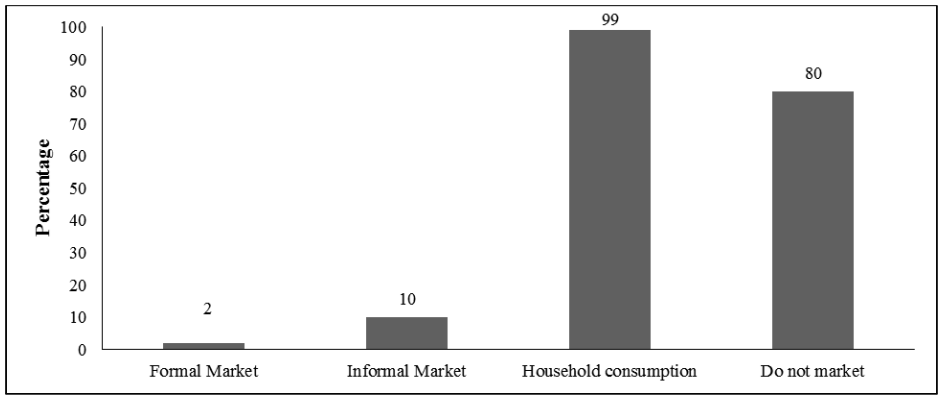

Figure 10: Marketing of crops and vegetables
Source: Author

6.5 Marketing of livestock

Figure 11 shows that 76% of households specified that they do not market their livestock, but prefer to keep them for household consumption (94%). Respondents cited that livestock ownership is highly regarded as a symbol of wealth, reputable and respected social status in the community, and supplements food supply particularly especially during natural disasters such as droughts and floods. Moreover, communal households' stated that livestock ownership acts as collateral against natural disasters, a source of manure for crop fields and an essential source of ox/donkey-draught power for cultivation of crop fields and transportation. As per the results in Figure 11, 14% opted to market their livestock in the informal market set-up, and this strengthens relationships among communal farmers, payment transactions are easy and the lack of reliable information on the formal market procedures drives communal farmers to opt for informal markets.

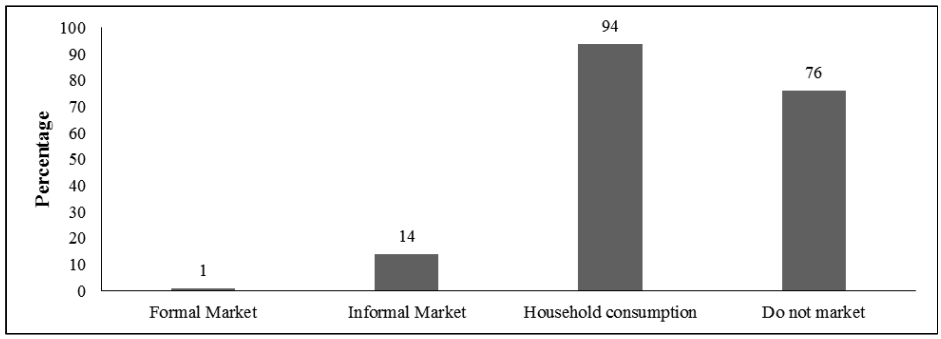

Figure 11: Marketing of livestock
Source: Author

6.6 Impact of the 2018/2019 drought

6.6.1 Duration of the 2018/2019 drought

As per the results in Figure 12, 83% of households indicated that the 2018/2019 drought duration lasted for a period of 8-12 months, which translates to a one (1) year duration. These findings are supported in the study by Shikangalah (2020) as results shows that as from the onset of the rainy

season towards the end of 2018 that stretches into 2019, the overall rainfall across Namibia was extremely poor, associated with sporadic and erratic rainfall patterns that are accompanied by scorching high temperatures and evaporation leading to low soil moisture levels.

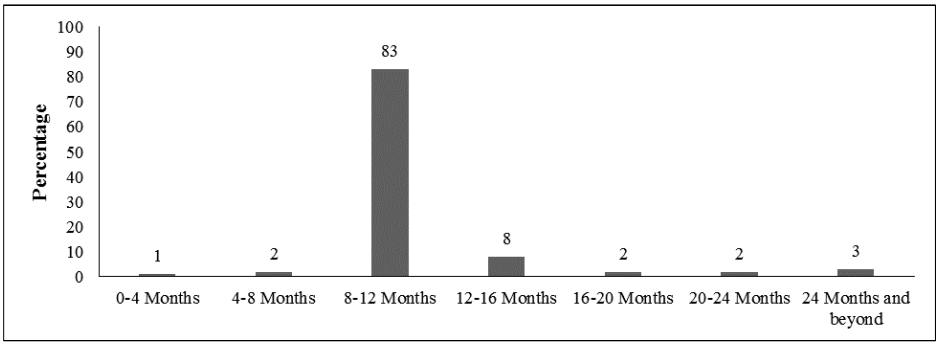

Figure 12: Duration of the 2018/2019 drought in the community
Source: Author

6.6.2 Grazing conditions before and during drought

Study findings as displayed demonstrates that majority of households specified that the grazing condition in the community before the drought average (49%) whereby the quantity and quality of forage available was fair and reasonable, while furthermore 35% of households rated grazing conditions as good (Figure 13). In contrary, 88% of households rated that the grazing conditions in the community were very poor, which means that quantity and quality of forage was extremely very poor.

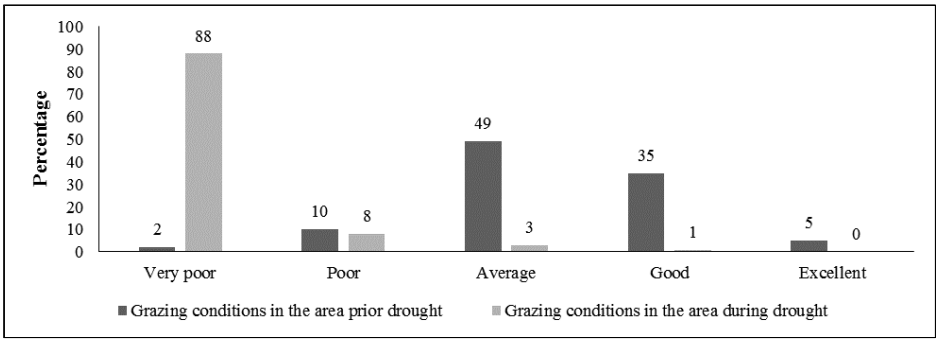

Figure 13: Grazing conditions in the area before and during the drought
Source: Author

6.6.3 Water situation in the area before and during the drought

Results as displayed in Figure 14 shows that the majority of households expressed their contentment as good (49%) and average (42%) pertaining to the water situation before the drought, and it clearly means that there was no scarcity of water in most villages as it was readily available through the ongoing GRN initiatives and water programmes as supported by Medium Term Expenditure Framework 2022/2023 – 2025/2026 Financial Year (National Planning Commission,

2022). On the other hand, the majority of households specified that the water situation was very poor (70%) during the drought as most water catchment areas and available water sources dried up (Figure 14).

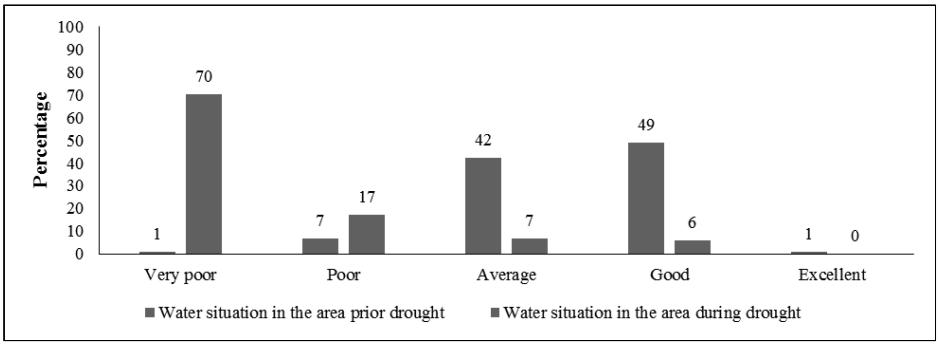

Figure 14: Water situation in the area before and during the drought
Source: Author

6.6.4 Crop production losses before and during the drought

Figure 15 shows that prior to the occurrence of the drought, 66% of communal households specified that crop production losses were moderate and this is supported by the reason that the intensity of the drought was still in the prime phase and not very severe. At this stage, communal households were still optimistic and hopeful that a prospect harvest will be attained after the GRN through the MAWLR assisted households with subsidies that were aimed at assisting crop producing households in communal areas to afford agricultural inputs and services while addressing food security at rural household level (MAWF, 2019). However, 77% specified that crop production losses were very severe during the drought (Figure 15).

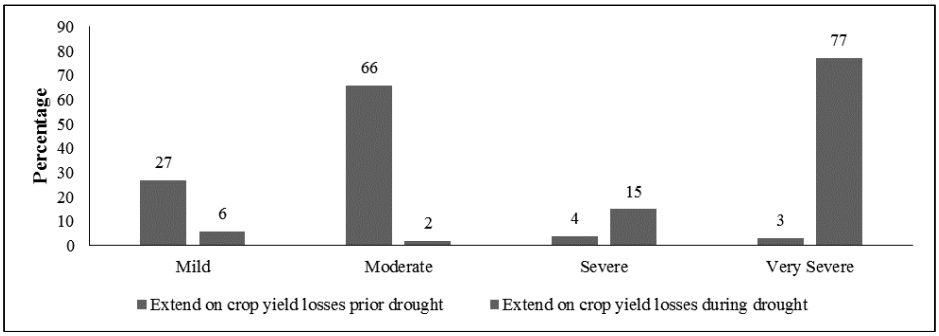

Figure 15: Extent of crop production losses before and during the drought
Source: Author

6.6.5 Impacts of drought on the environment

As per the findings of this study, Figure 16 shows that the majority of households (91%) specified that the main impact of drought on the environment was the lack of drinking water for livestock and human consumption. These finding resonate with the results of a study by Shikangalah (2020)

and the assessment commissioned by MAWF (2019). Death of vegetation and trees (75%) was observed because of water scarcity in the community. Respondents revealed that other environmental impacts such as reduction of water levels in water sources (58%); reduction of fish in water sources (43%) linked to poor inflow of water in streams and lack of breeding habitants for fish kind; increased quantity of dust (34%) that is nurtured by the dry spell especially the expose of the topsoil; degradation of natural animal habitants (33%) as vegetation were animal seek refuge and as breeding hosts dries up and eventually dies, and reduced soil quality (33%) as the topsoil that is rich in plant growing nutrients is lost.

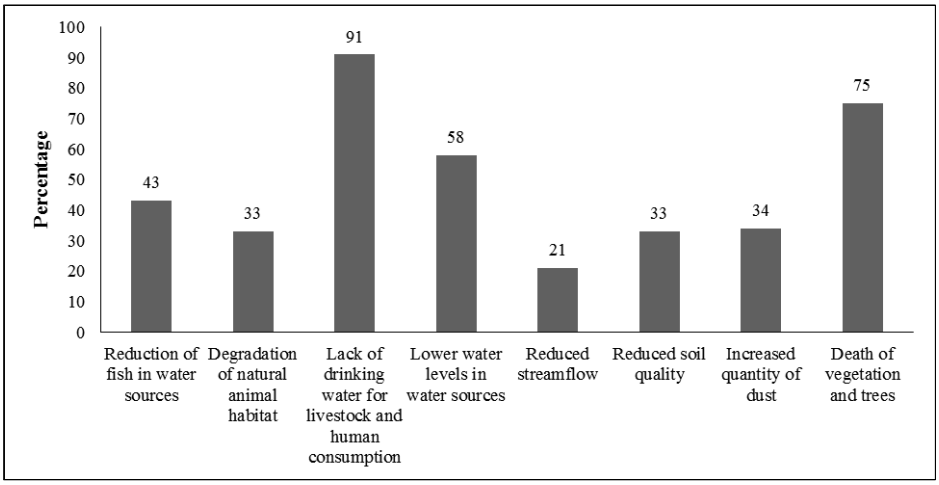

Figure 16: Impacts of drought on the environment
Source: Author

6.7 Drought readiness

6.7.1 Readiness strategies for drought effects on livestock production

Respondents cited that preparedness was performed based on the early warning information received on an imminent drought provided to households. Communal households (90%) practising livestock farming ensured that livestock supplementary feeds were available for livestock during the drought (Figure 17). Destitute households preserved crop remains from the previous growing season and rotated grazing of livestock in existing camps situated in a 'Ekove' (an area privately-owned land, fenced-off and that is part of the customary land right of a specific household, and it serves as a grazing unit during the dry season). A marginal number of households (28%) opted to rear indigenous livestock breeds (Sanga cattle) that are well adapted to most arid conditions of northern Namibia, and are more resilient to dry conditions. As per the results in Figure 17, livestock relocation (26%) and destocking (17%) were other substantive measures employed.

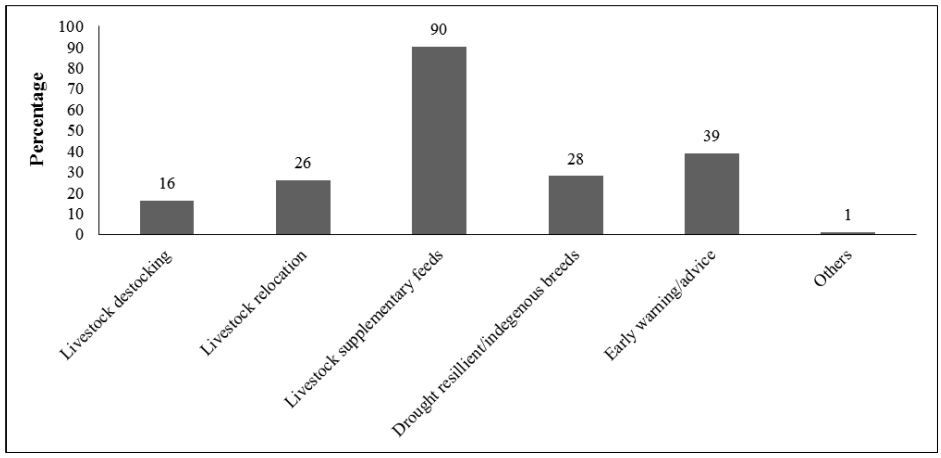

Figure 17: Measures employed as readiness to drought on livestock production
Source: Author

6.7.2 Readiness strategies for drought on crops and vegetable production

Communal farmers cited that they acted after receiving early warning information and advice from the Namibia Metrological Services as information was conveyed by means of televisions, radios, mobile phones and community meetings with Traditional Leaders. Study results in Figure 18 show that communal households chosen the approach of planting common drought resistant crops (58%), mainly pearl millet and sorghum. Drought resistant crops are considered effective by communal households as they are improved seeds that are normally acquired from the MAWLR – RDCs and private retailers. Households specified that after receiving early warning and advice, they applied the dry and early planting (53%) approach as early as possible. Mixed cropping approach was employed by 49% of households to attain a diverse yield (Figure 18). Several other measures employed by communal households in the preparedness phase were noted by this study, such as the weeding (37%); while 30% employed a reduction of seed and seedling density. Commendably, 16% established irrigable backyard gardens as per the agricultural advice from agricultural officials of the MAWLR.

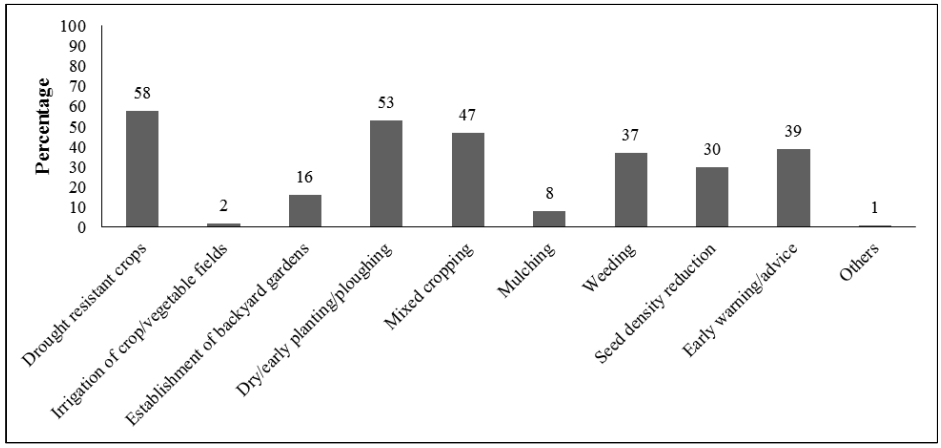

Figure 18: Measures employed as readiness to drought on crops and vegetable production

Source: Author

6.8 Drought interventions

6.8.1 Interventions employed by households to cope during the drought period

Results in Figure 19 shows that 78% of households primarily relied on existing food reserves with harvests from past years as a means of food supply during the drought. This resembles with the section on crops and vegetable grown by rural households, as results shows that pearl millet is dominating. Drought relief parcels were given to 54% of households from the GRN to ensure that basic dietary needs are available, especially for the most vulnerable households. The African Development Bank rendered humanitarian assistance to Namibia at an estimated amount of US$ 1,000,000 (African Development Bank, 2019). As emergency assistance was late, 49% of the most destitute households were forced to resort to the food seeking approach. Households cited that drought relief food parcels were extremely late in being received by the community because of poor coordination. Dietary reduction was another strategy employed by 34% of households, aimed at lessening the quantity of meals prepared per day.

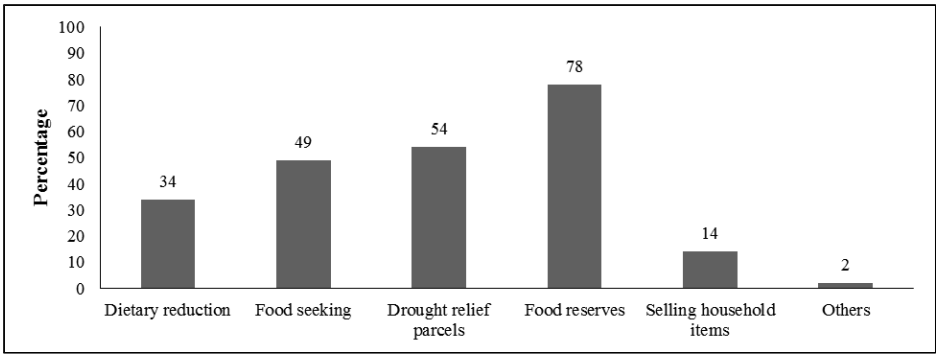

Figure 19: Drought coping interventions employed by households
Source: Author

6.8.2 Strategies employed by households on soil and water management during the drought

Findings in Figure 20 shows that more emphasis by households was laid on conservation of present water resources (69%). Controlled litter disposal is another approach that is noted to be practised by 41% of households, as they indicated that an appropriate waste management system at household level is encouraged with the ultimate aim of ensuring that the environment is free from litters, especially the non-degradable wastes. Creditably, 22% of households specified that the establishment of backyard gardens is essential in conserving soil water moisture and played a role in soil management as garden establishment assisted with maintaining an ecological balance by fostering biodiversity in the ecosystem (Figure 20). The setting up of irrigation systems (14%) was minimally applied, as only a few households are engaged in horticultural production.

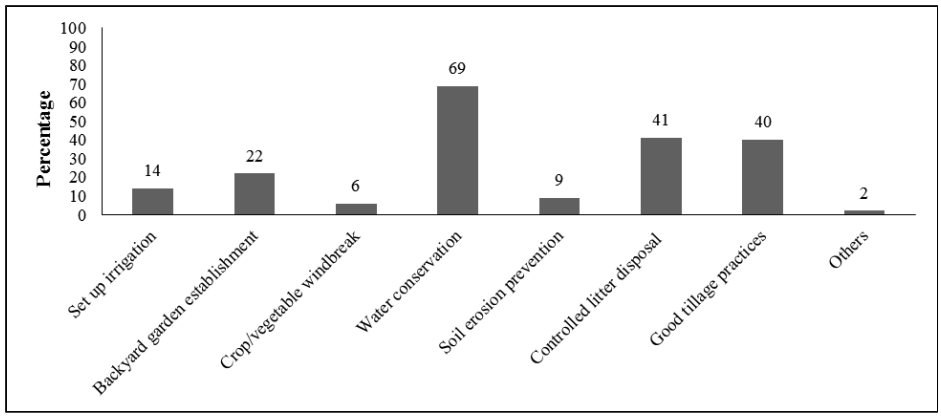

Figure 20: Soil and water management strategies employed by households during the drought
Source: Author

6.8.3 Strategies employed by the household on livestock management during the drought

Results as displayed in Figure 21 shows that the leading strategy that was employed during the drought was the access to supplement fodder for livestock (82%). Most households accessed supplement fodder through private procurement and existing livestock feed reserves of crop remains, while others received emergency assistance from GRN. Therefore, 55% of households indicated that parasite control was another key activity employed since drought conditions made internal parasite infections among livestock more severe and livestock were already stressed as there was minimal grazing and quality of the forage available was very low. The procurement of lick supplements for livestock by GRN was part and parcel of GRN efforts whereby USD 230,000 was reserved for such acquisition in safeguarding survival of livestock, maintained and is in line with the findings of this study that a significant number of households (49%) for this approach (Figure 21). Since there was a shortage of water in communities, 24 % of households implemented the approach of establishing new water points, while their efforts are complemented by GRN initiatives. Strategies such as herd separation (19%) and destocking (14%) were not fully embraced and employed mainly by households, as grazing conditions were poor across.

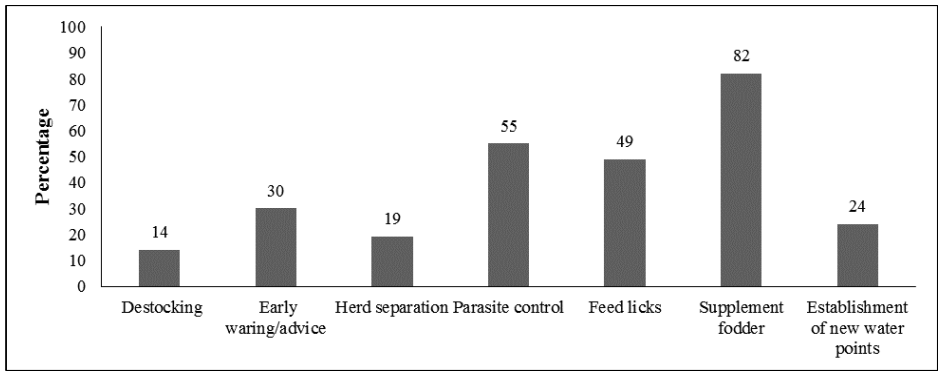

Figure 21: Strategies employed by households on livestock management during the drought

Source: Author

6.9 Post-drought recovery strategies

Results in Figure 22 shows that the most dominating post drought recovery strategy implemented by 72% of communal households is the re-building of livestock herds as households indicated that they suffered high livestock mortalities and this was also reported by the MAWF (2019) that 88,219 livestock mortalities were experienced nationally as from the beginning of October 2018 towards the end of September 2019. Matthys (2021) stated that drought resulted in building livestock herds that continued in 2021, as more than 1,362,364 million cattle marketed during the period of 2017-2019 associated with a decline of more than 50% was recorded in 2020. Matthys (2021) emphasised that with the continued herd-rebuilding by Namibian farmers, an additional decline in livestock marketing, especially cattle was projected in 2021, whereby the Meat Board of Namibia forecasted a formal slaughtering at local abattoirs of less than 53,000 cattle for the year. As of February 2021, a total of 7,775 cattle were slaughtered in the formal market.

Since communal households are mainly practising farming at a subsistence level, all leading post-recovery arrangements were mainly focusing on recovery and advancement of subsistence farming. Globally, there are widely recognised sustainable management practices for agricultural crops geared towards maximising production (Adom, 2019). Adom (2019) stressed that communal households should pay attention to issues of agricultural crop management aspects that would in turn intensify crop production, improve soil quality, ensure biodiversity and management while at the same time reducing general environmental costs. Past experiences of severe impacts encountered throughout the drought led to communal farmers being engaged in better crop management practices (49%) for the future. On crop management, respondents signalled out that they make use of cover remains generated from previous harvest, crop rotation and intercropping, agroforestry by the help of community tree planting projects, sustainable water and irrigation management systems (horticultural producers), inorganic fertiliser, mainly animal manure sourced from kraals and practising good tillage practices.

An interesting recovery measure employed is agricultural diversification, whereby 28% of households specified that they are engaged in diversifying agricultural farming activities. As illustrated in Figure 22, the study notes of other drought recovery measures which are not commonly implemented by households such as provision of new water points (13%); drought resistance seeds from GRN (11%); access to conservation agriculture training (8%); compensation by GRN (5%); access to other emergency funds (3%); capacity building of communal farmers (2%) and debt repayment extension from financial institutions (1%).

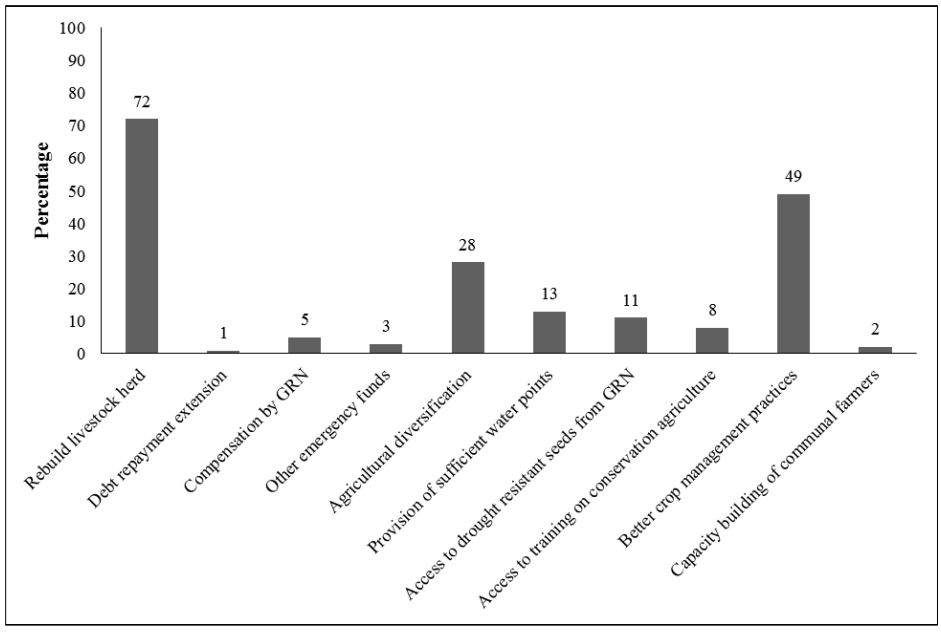

Figure 22: Strategies employed by households for post drought recovery
Source: Authors

6.10 Hypotheses testing and interpretation

This study hypotheses tested the association that exists between independent variables of interest (gender, marital status and educational level) and dependant variables (drought preparedness, response and recovery strategies). Research hypotheses are as follows:

H_0 There is no association between independent variables of interest (gender, marital status and level of education) and the choice of drought preparedness strategies.

H_0 There is no association between independent variables of interest (gender, marital status and level of education) and the choice of drought intervention strategies.

H_0 There is no association between independent variables of interest (gender, marital status and level of education) and the choice of post-drought recovery strategies.

Cross-tabulation and Chi-square test results were performed, results were generated and interpreted accordingly as per the applicable statistical guidelines. All these tests were performed with the aim of explaining the statistical association that exists amongst the defined dependent variables and independent variables of the study. Generally, hypotheses test results illustrate that there is a statistical association between gender and all dependent variables of interest, hence this signifies that gender basically influences the choice of drought management strategies at all stages investigated. However, there is only a few statistical associations between independent variable of interest (marital status & educational level) and dependant variables (drought preparedness, response & recovery strategies).

7. Conclusion

Despite the minimal contribution to the country's GDP, the whole agricultural sector remains a key source of livelihoods for majority of the inhabitants, particularly those that live in communal areas where agriculture is practised on a subsistence farming level. Agriculture supports most Namibian livelihoods either directly or indirectly, as the agricultural sector is distinctively divided into sub-sectors namely: capital intensive subsector that is fairly well-developed and mostly an export oriented subsector that is also known as commercial farming; and the subsistence-based subsector that is characterised by high-labour intensive and low-technology sub-sector that is known as communal farming.

The study area of Eengolo settlement in Outapi Constituency is one of many settlements in Omusati Region. In the past years, the area has been prone to drought events as it continues to receive sporadic and erratic rainfall patterns. Since the majority of inhabitants depend predominantly on subsistence agricultural farming where rainfall is the source of water, the minimal rainfall that has been received over the past years has significantly affected crop production (rain fed crops) and reduces the ability of the rangeland to support and sustain livestock reared in communal areas. All this equally negatively impacted food security and, in turn, livelihoods as rural households are not capable of realising their household food necessities year in and year out. In the past years, Namibia experienced several drought events as from 1980 to 1984, 1992/1993, 2012/2013, 2015/2016 and 2018/2019 of which the 2012/2013 was described as the worst of all as 42 percent of all Namibians experienced food insecurity.

The study learned that the 2018/2019 drought was associated with severe negative impacts such as high crop failure, high livestock mortalities instigated by lack of water and poor grazing and this subsequently deteriorated household's livelihoods as 71% of households relied primarily on pension, other social grants and subsistence farming to sustain their livelihoods. The majority of communal households (90%) relied on livestock supplementary feeds, well-preserved crop remains and rotational grazing systems as livestock drought preparation mechanisms as a way of supplying food for livestock. All these measures were implemented with early warning information. The majority of households (58%) selected drought resistant crops (pearl millet and sorghum) that strive best in harsh conditions as a mechanism in crop and vegetables drought preparation.

Communal households employed interventions to strengthen coping capacities for the household, whereby 78% primarily relied on existing food reserves. Conservation of soil and water management is key, whereby 69% of households employed appropriate water management strategies, while on livestock management, 82% of households relied on livestock supplement

fodder that was sourced privately and emergency support by the Government. Post-recovery measures employed by communal farmers were mainly on rebuilding livestock herds, as specified by 72% of households and 49% applied better crop management practices. Structural support systems play a role in community service delivery, whereby 96% of households acknowledge services conveyed by GRN and affiliated institutions. Communal households (44%) confirmed that early warning information systems present in the community are reliable with drought preparedness, response and recovery.

8. Recommendations

This paper deliberated on the key issues related to the drought readiness, response and recovery efforts of communal farmers at Eengolo settlement, Outapi Constituency in Omusati region, with implications, the paper further highlights recommendations to communal farmers and key stakeholders regarding policy strategy and supplementary sustainable strategies that are aimed at addressing identified implications. Recommendations will assist communal farmers of Eengolo settlement and allied stakeholders in strengthening household drought coping capacity, institutional response, recovery and building resilience. They are as follows:

- Market access of crops, vegetables and livestock for communal farmers as majority specified they lack market related information and expressed their willingness to market, but lack of market access is a challenge.
- Livestock destocking by communal farmers as past experiences such as the occurrence of this particular drought has largely contributed to high livestock mortalities, hence the need to rear reasonable herds as they are easier to maintain with minimal resources in cases of eventualities.
- Strengthen institutional coordination on Disaster Risk Management.
- Establishment of water harvesting infrastructures in the community as lack of water was the key challenge encountered during the drought era.
- Review and finalise the National Drought Policy and Strategy of 1997 as this will assist with an effective, reasonable and sustainable approach to drought response at the national level.
- Creation of a fodder bank by communal households to ensure that surplus and nutritious feed for livestock is readily available during drought periods.
- Post-drought evaluation assessment by GRN to ensure that a full assessment of the drought's climatic and environmental components, associated economic and social impacts and the degree at which drought preparedness planning was valuable in enabling relief to the most impacted communities.
- Development of a GRN drought recovery programme for communal households to assist households in building their livestock herds.

During the commissioning of this study, it emerged that there is a need to understand more representative dynamics of variables investigated by broadening the study area and investigating other common natural disasters such as floods, as this will assist communal households in several parts of the country to implement appropriate strategies which are applicable to their geographical set-ups. The above-mentioned needs were beyond the scope of the study objectives and were underlined to be considered as areas of future research.

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