# NAMIBIA

SYNTHESIS REPORT

## The Forecast-based Financing Southern Africa Project (FbF-SAP): A regional drought scoping study

NamibiaRedCross

UNAM

Climate Centre

510

German Red Cross

# SYNTHESIS REPORT

Proposed viable drought
Forecast-based Financing (FbF)
Early Action Protocol (EAP) scenarios

based on

An in-depth understanding of drought forecasts and drought monitoring systems as well as vulnerability exposure and impact data on drought in Namibia

part of

The Forecast-based Financing Southern Africa Project (FbF-SAP):
A regional drought scoping study – Namibia sub-chapter

by

University of Namibia (UNAM) &
Namibia Red Cross Society (NRCS)

with support from

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This report was copyedited by Sarah Tempest. It was designed by Eszter Sarody. Illustrations were developed by Rebeka Ryvola.

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# EXECUTIVE SUMMARY

Drought is one of the most costly hazards due to its widespread impacts and long duration. Forecast-based Financing (FbF) is an innovative mechanism in which early preparedness and community-level actions are based on credible forecasts and triggers, and are funded and implemented before the disaster strikes. The Red Cross Red Crescent (RCRC) is implementing FbF in various countries prone to recurrent climate-related shocks. The implementation of FbF Early Action Protocols (EAPs) – which has until recently focused on rapid-onset hazards such as floods, cyclones, heatwaves and volcanic eruptions – have now been expanded to include drought. This study scopes the potential for implementing drought FbF EAPs in Namibia and forms part of a larger sub-regional initiative, including Mozambique and Lesotho. Its objectives were to: assess historical drought events and their extent and impact in Namibia; gather and analyse relevant data and explore the current institutions and systems involved in drought monitoring, forecasting, mitigation and reduction in the country; and assist the Namibia Red Cross Society in formulating FbF actions for implementation in Namibia.

A research team from the University of Namibia (UNAM) carried out the study. The research followed an action research approach, conducted in three defined stages with frequent stakeholder engagement. In-country stakeholders included representatives from the Directorate of Disaster Risk Management in the Office of the Prime Minister as well as other government ministries, national agencies and regional councils; further assistance was offered by various offices of the United Nations (UN) and other international agencies. Track I identified the country's climate, drought risk, drought impact, socio-economic status, livelihood and other vulnerability-related data and compiled an inventory of Drought Vulnerability Indicators. Track II consisted of participatory assessments that were conducted in three communities in the Erongo, Kunene and Kavango West regions. The assessment used Enhanced Vulnerability and Capacity Assessment (EVCA) tools, with a focus on drought. In Track III, FbF EAP scenarios were proposed for three types of livelihoods.

Since 1990 (the focus period covered 1990–2020), Namibia has experienced several droughts with widespread negative impacts on food security, livelihoods, rainfed crop yields, livestock production, livestock mortality rates and water availability. The community visits revealed that the Kunene region is the most vulnerable overall, with a greater reliance on food aid than the other two regions. Households dependent on subsistence farming in the Kunene andKavango West regions as well as those in the Omusati, Ohangwena, Oshikoto and Kavango East regions are considered the most exposed to drought impacts, including food insecurity especially for children, expectant mothers and the elderly. EAP scenarios were proposed for subsistence crop farming, subsistence livestock farming and the game-based livelihood profiles of communal conservancies in Namibia. For the various EAPs, timelines, drought indicators and triggers as well as potential actions and actors were proposed. Several gaps in the data were, however, identified.

It is recommended that FbF EAPs are prioritized according to existing capacity and resources so that they reach the most needy, including those that are not covered by social safety net programmes. It will be important to identify and appoint a competent organization to host and manage the indicators used to trigger interventions. It is equally important that key institutions are fully involved and that coordination is harmonized for enhanced impact.

# 1. INTRODUCTION

The widespread impact and long duration of drought make it one of the most costly hazards. But the impacts of drought can often be lessened through preparedness and early action, aimed at decreasing community vulnerability and exposure. Forecast-based Financing (FbF) is an innovative mechanism in which early preparedness and community-level actions are pre-planned based on credible forecasts and triggers and are funded and implemented before the disaster strikes. These actions minimize the loss and damage caused by climate hazards and reduce the need for humanitarian assistance in their aftermath. The Red Cross Red Crescent (RCRC) is implementing FbF in various countries prone to recurrent climate-related shocks. This new paradigm allows RCRC national societies and their partners to access funds in anticipation of hazards through peer-reviewed Early Action Protocols (EAPs). The implementation of FbF EAPs has, until recently, mainly focused on rapid-onset hazards such as floods, cyclones, heatwaves, extreme winter conditions and volcanic eruptions, but is now expanded to also include drought.

Namibia is the most arid sub-Saharan country, experiencing very high evapotranspiration rates (Mendelsohn *et al*., 2002). Consequently, Namibia is exposed to recurrent droughts, with historic devastating consequences. A growing population, persistent poverty and climate change threaten even greater impacts in the future. This study scopes the potential for implementing drought FbF EAPs in Namibia and forms part of a larger sub-regional initiative by the German Red Cross to also develop FbF in Mozambique and Lesotho.

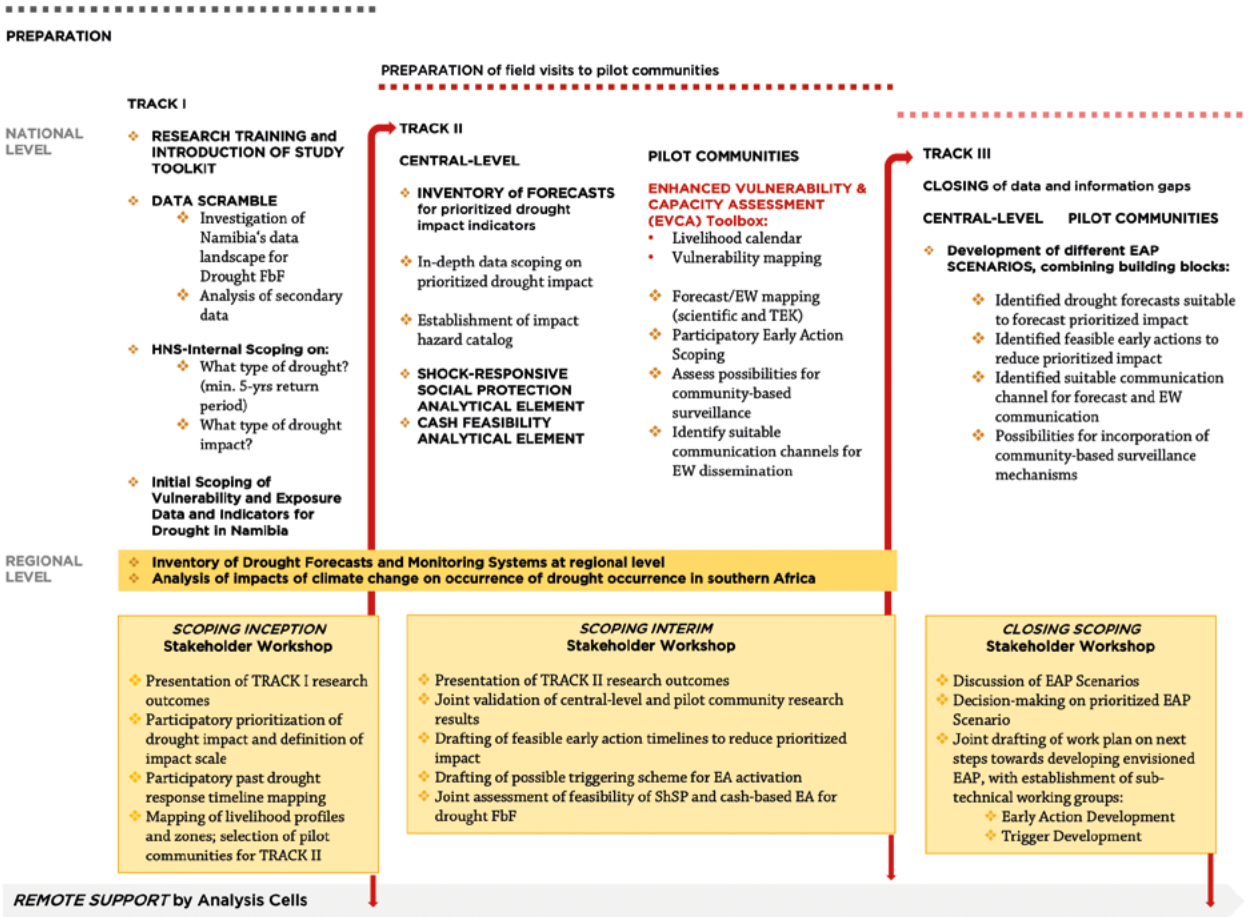
The Namibia Red Cross Society (NRCS) in partnership with the German Red Cross contracted the University of Namibia (UNAM) to conduct a Drought Scoping Study for Namibia. The overall objectives of this scoping study were to assess historical drought events, their extent and impacts in Namibia; and to gather and analyse relevant data and explore the current institutions and systems involved in drought monitoring, forecasting and early warning, mitigation and reduction in the country. A final objective was to assist the Namibia Red Cross Society to formulate FbF actions based on scientifically accountable vulnerability information, drought monitoring tools and trigger thresholds.

Activities should also be closely aligned with national priorities, leveraging local field expertise and building on existing coordination mechanisms. This will facilitate effective early action on drought in the future by allocating financial resources to carry out early actions before droughts occur, reducing the impacts of drought on vulnerable groups.

# 2. METHODOLOGY

The study was conducted in March to September 2021. It followed an action research approach that was carried out in three defined stages (Tracks I–III) with frequent stakeholder engagement (Figure 1). In-country stakeholders included representatives from the Directorate of Disaster Risk Management in the Office of the Prime Minister; government ministries (including the Ministry of Agriculture, Water and Forestry, the Ministry of Lands and Resettlement, and the Namibia Meteorological Service), Namibia Statistics Agency, representatives from regional councils and the Namibia Red Cross Society. Further assistance was offered by various offices of the UN and other international agencies, including the International Federation of Red Cross and Red Crescent Societies.

FIGURE 1.
A schematic of how the research was conducted in phases and how each complemented the overall study.



## 2.1 TRACK I – DROUGHT RISK ANALYSIS

Track I involved the collection of climate, drought risk, drought impact, socio-economic status, livelihood and other vulnerability-related data available online and from unpublished regional, national and international sources as well as actors.

Data gaps were complemented by online sources and data from global monitoring networks. An inventory of Drought Vulnerability Indicators was subsequently compiled. The period reviewed ranged from 1990–2020.

## 2.2 TRACK II – PARTICIPATORY FIELD RESEARCH

Track II consisted of field research conducted in three communities identified in the Erongo, Kunene and Kavango West regions. The research team included NRCS volunteers. The assessment used Enhanced Vulnerability and Capacity Assessment (EVCA) tools, with a focus on drought, namely: 1) focus group discussions; 2) historical drought profile; 3) seasonal calendar; and 4) community fact sheets. The choice of the tools was based on their relevance to the drought assessment, which was agreed with the RCRC focal teams.

## 2.3 TRACK III – DEVELOPMENT OF THREE EAP SCENARIOS

Following the findings from Track I and Track II, subsistence crop, livestock and game (wildlife) community-based livelihood profiles emerged as the most suitable for FbF interventions in Namibia. FbF EAP scenarios were subsequently proposed for these livelihood types. A spatial vulnerability analysis including population density, prevailing food insecurity and poverty patterns was also conducted as well as a validation of drought assessment data along with remote-sensed indicators.

# 3. RESULTS

## 3.1 RESEARCH TRACK I

### Potential data sources and types of data identified

The potential data sources and type of data identified are presented in Table 1. While considerable data are available with regards to drought, several gaps were identified and no centralized drought data and response programme's repository currently exists in Namibia.

A number of drought monitoring and forecasting indicators, including remote-sensing indicators, were identified for potential application in the development of an EAP or drought in Namibia.

TABLE 1: Data sources and type of data related to drought impacts, vulnerability, monitoring and forecasting identified for Namibia as part of Track I.

| DATA SOURCE | | | TYPE OF DATA |
|---|---|---|---|
| NATIONAL LEVEL | Office of the Prime Minister | Directorate of Disaster Risk Management (DDRM) | National drought mitigation, disaster risk management policy, drought response plans, livelihoods and vulnerability assessment data |
| | | Namibia: Vulnerability Assessment Committee (NamVAC) | National drought vulnerability reports |
| | Ministry of Agriculture, Water and Forestry | Directorate of Agricultural Production, Extension and Engineering Services | Crop and livestock production, animal diseases and mortalities |
| | | Directorate of Planning and Business Development | Drought policy, agricultural policy |
| | | Directorate of Research and Development | Drought tolerant crops and livestock research |
| | | Directorate of Land Reform | Land use plans |
| | | Directorate of surveying and mapping | Agricultural land, Geographic information system (GIS) data |
| | | Directorate of Regional Programmes and Implementation | Land use plans, drought Policy, agricultural policy |
| | Ministry of Environment and Tourism | | National climate change policy, climate change data |
| | Ministry of Works, Transport and Communication | Namibia Meteorological Service | Weather forecast and historic rainfall data, climate data |
| | National Planning Commission of Namibia (NPC) | | Population and socioeconomic data |
| | | | Drought, food and nutrition insecurities in Namibia |
| | Namibia Statistics Agency (NSA) | | GIS data and population statistics, atlas on poverty, NSDI Policy 2015 |
| | Namibia Earth Observatory Solutions (NEOS) | | GIS data, spatial technology, agriculture information and integrated natural resource management |
| | Namibian Association of Community Based Natural Resource Management (CBNRM) Support Organisations (NACSO) | | Natural resource management GIS data |
| | Namibia Water Corporation Ltd (NamWater) | | Water-related information, water scarcity and availability |
| | National Commission on Research, Science and Technology (NCRST) | | Drought research data |

| DATA SOURCE | | TYPE OF DATA |
|---|---|---|
| REGIONAL LEVEL | United Nations Namibia | |
| | Food and Agriculture Organization (FAO) | Food security and drought information, FbF models |
| | United Nations Development Programme (UNDP) | Drought and poverty data |
| | United Nations Population Fund (UNFPA) | Segregated population data |
| | United Nations Industrial Development Organization (UNIDO) | National poverty reduction data, industrial development and environmental sustainability |
| | World Food Programme (WFP) | Drought mitigation programme, food assistance in emergencies programme, resilience building programme, FbF |
| | World Health Organization (WHO) | National health data and programmes |
| | United Nations International Children's Emergency Fund (UNICEF) | Drought mitigation and response programmes for children |
| | Southern African Development Community (SADC) | Meteorology, climate outlook, climate change adaptation and mitigation data |
| | Southern African Science Services Centre for Climate Change and Adaptive Land Management (SASSCAL) | Climate change and adaptive land management data |

| DATA SOURCE | | TYPE OF DATA |
|---|---|---|
| INTERNATIONAL LEVEL | United States Agency for International Development (USAID) | Agriculture and food security data |
| | International Federation of Red Cross and Red Crescent Societies (IFRC) | Food security, disaster risk management data, world disaster reports |
| | Red Cross Red Crescent Climate Centre | FbF |
| | United Nations Office for the Coordination of Humanitarian Affairs (OCHA) | Information on humanitarian work worldwide, FbF designs |
| | United Nations Office for Outer Space Affairs (UNOOSA)) | Space-based information for disaster management and emergency response |
| | European Union (EU) | Disaster response and mitigation programmes, FbF |
| | United Nations Office for Disaster Risk Reduction (UNDRR) | Disaster risk reduction information |
| | GIZ Namibia | Climate change adaptation and mitigation, drought resilience research data |
| | German Red Cross | Forecast-based Financing Practitioner's Manual |
| | Southern African Science Services Centre for Climate Change and Adaptive Land Management (SASSCAL) | Climate change and adaptive land management data |

### Historical drought impact in Namibia

Drought is Namibia's most widespread and devastating natural hazard. Since 1990, Namibia has experienced at least 12 years in which half of the country received below average rainfall (Figures 2 and 3), resulting in meteorological droughts. Available data reveal that national disasters were subsequently declared during the 1992/1993, 1995/1996, 2012/2013, 2013/2014, 2015/2016 and 2018/2019 seasons in accordance with the Disaster Risk Management Act (2012). The 2012/2013 and 2018/2019 droughts are perceived as particularly bad and widespread (Nakanyete *et al.*, 2020).

### Drought impacts on agriculture

Agricultural droughts result in reduced harvests or crop failure, low grazing availability, emaciated livestock, livestock losses and poor market prices. These impacts lead to food insecurity in the short-term and vulnerability in the long run. A large proportion of the Namibian population depends on subsistence farming of rainfed crops and/or livestock, which are both vulnerable to drought (NSA, 2011).

Agricultural and hydrological drought, affecting crop and livestock subsistence farming, poses the biggest potential humanitarian crises caused by natural disasters in Namibia. In rural areas, more than 235,000 households (30 per cent) derive their main income from agriculture (NSA, 2011), of which about 57 per cent are involved in crop farming. White maize and pearl millet (mahangu) are the staple food for human consumption and both are controlled products (prices, imports and exports are regulated by the government) and mainly produced in the northern regions, excluding the Kunene (NAB, 2013). Failed crops during droughts cause food insecurities and, during the 2013/2014 drought, more than 330,000 people (14 per cent of the population) were food insecure while about 463,000 people were classified as moderately food insecure (GRN, 2013). During the 1991–1993 drought, only 33,800 tonnes of grain were harvested (29 per cent of the previous year's total)(Sweet, 1998). A shortage in local grain outputs results in increased domestic grain prices, fuelled by increased imports of maize and pearl millet (NAB, 2019). This increases the food-insecurity of subsistence farmers and their dependents.

Livestock production in Namibia is divided in a commercial sub-sector (±4,500 farmers on title deed land) and communal farmers (±120,000 farmers on non-title state land)(Mendelsohn *et al.*, 2002). Communal land supports approximately 64 per cent of the total cattle population, 72 per cent of the goats and 17 per cent of the sheep (FAO, 2020; Meatco Foundation, 2019; MBN, 2016).

Farming in the communal areas is mostly at the subsistence level and is, therefore, more vulnerable to climatic and economic shocks. Droughts decimate livestock numbers in communal areas, in part because of overstocking and rangeland degradation, e.g., in October 2015–May 2016 more than 160,000 (conservative figure) drought-related livestock deaths were reported by farmers (MAWF, 2016).

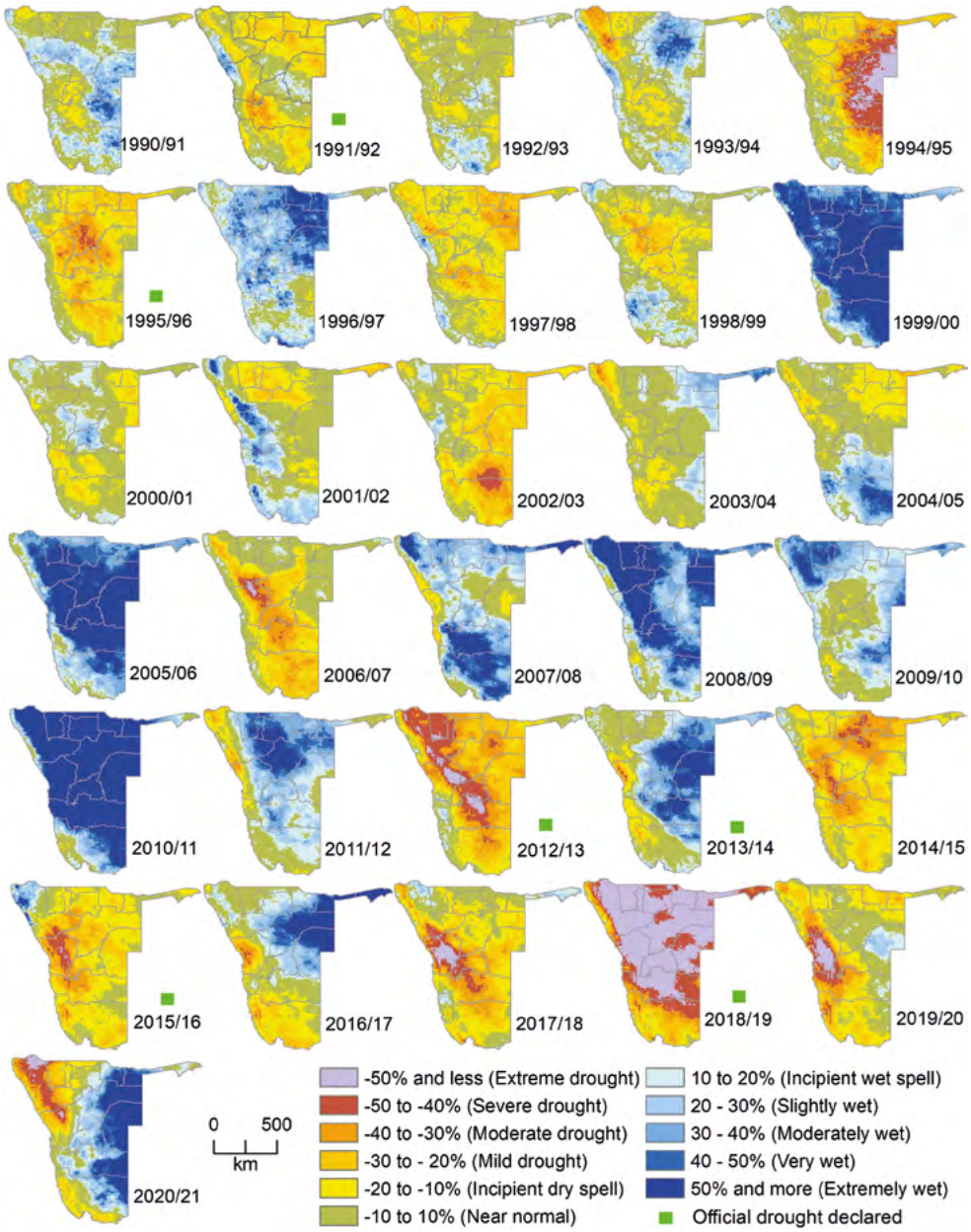



FIGURE 2.
Spatial distribution of annual rainfall deviation from the long-term mean between 1990/91 and 2020/21 and years in which drought was officially declared. (Rainfall data based on Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS).

Moreover, the livestock that survive may lose body condition while their reproduction and growth can be suppressed. Available data show that cattle prices have fluctuated in the last few years, with the lowest price per kilogram observed in 2017 and the highest in 2020. These price fluctuations can be attributed to the condition of the livestock, due to drought; but also to improved market prices due to demand versus supply issues caused by lucrative exports to markets in the European Union, China and the United States of America that influence supply locally (Meat Board of Namibia, 2020).

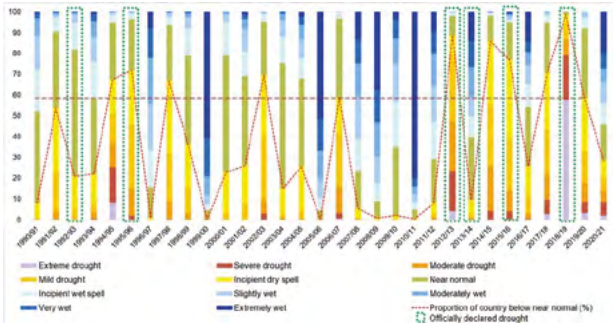



FIGURE 3.
Proportion (%) of the country in relation to annual rainfall deviation from the long-term mean for 1990/91 to 2020/21 and years in which drought was officially declared. The thin dotted line in red represents the total area of the country falling below near-normal average rainfall.

## Drought impacts on agriculture and water supplies

Hydrological droughts reduce water availability for domestic, industrial and agricultural uses, with socio-economic ramifications. Potable water supply in Namibia is relatively good, covering up to 93 per cent of the urban population and 83 per cent in rural areas. However, sanitation coverage is lower. It stands at 65 per cent in urban and 25 per cent in rural areas (NSA, 2011). Access to clean water and sanitation services enables especially the vulnerable (children under 5 years old, the elderly and HIV/AIDS patients) to be protected from water-borne illnesses.

Groundwater is the most reliable water supply source in Namibia, covering approximately 57 per cent of the water demand, while the remaining 43 per cent is supplied from surface water resources (20 per cent from surface water storage schemes in ephemeral rivers and 23 per cent directly from flow in the perennial rivers)(De Bruine and Rukira, 1997). Available data on water storage in four historically large dams in the country show that the 1996/97 and 2016/17 seasons were the worst during 1990–2017. Water volume in those years fell below 20 per cent of their capacity (Figure 4). However, 1996/97 was classified as a wet year, but has been preceded by a very dry 1994/95 and dry 1995/96 rainfall years. Most dams had water levels below 30 per cent of their capacity during the 1991/1992 and 1992/1993 droughts.

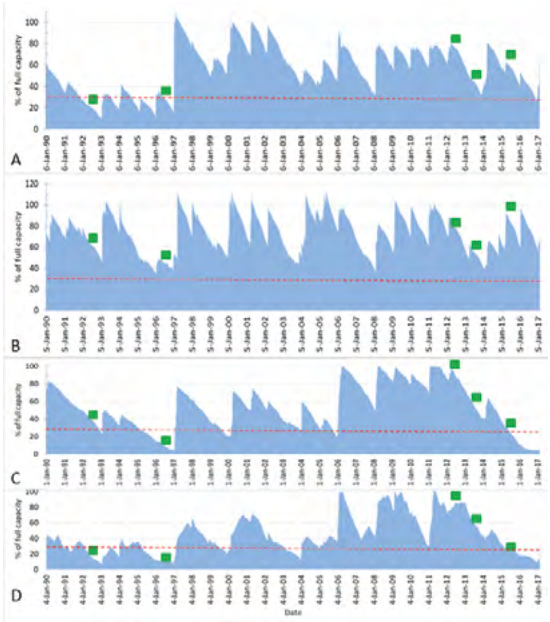



FIGURE 4.
Water Storage levels (%) in 1990–2017 at four historically major dams in the country:
A) Hardap Dam;
B) Naute Dam;
C) Swakoppoort;
and D) Von Bach Dam. The 30% threshold is denoted by a red line, while official drought was declared at dates with a green square. Data Source: NamWater.

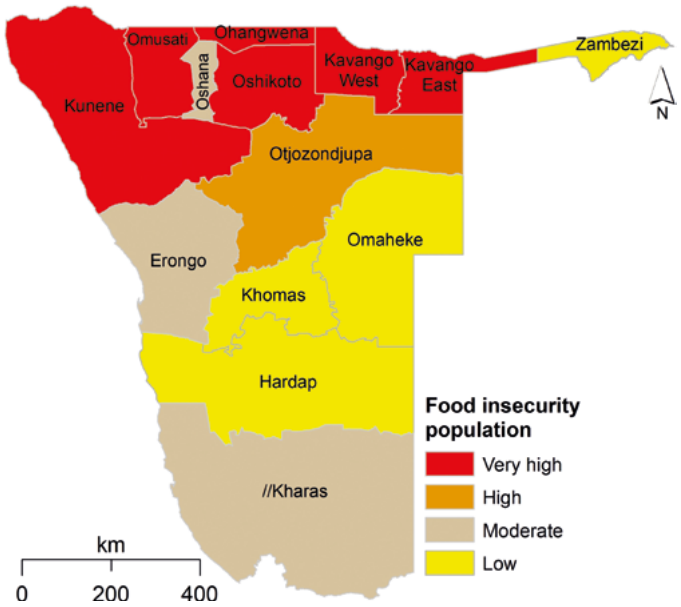
Water demand is set to increase exponentially by the year 2030 (500 cubic metres per annum (mm3/a) for irrigation and 90 mm3/a for livestock), while the most reliable source (groundwater) will not increase, despite these sectors depending heavily on groundwater resources (De Bruine and Rukira, 1997). Expected changes in rainfall and runoff in Namibia suggest that groundwater recharge may suffer a reduction of 30–70 per cent across the country, while surface water flows are predicted to decline by up to 15 per cent in the Orange River system to the south, 10 per cent in western ephemeral rivers and around 20 per cent in the Okavango River (Barnes *et al.*, 2012). Such changes would not only impact key economic activities that employ a majority of the population, but would further expose rural populations to consuming compromised water and affect small-scale irrigation and livestock watering which provide economic security.

Reduced water availability increases poverty as well as malnutrition and other diseases, which burden poor households and health services. Increasing temperatures and floods further contribute to the spread of vector- and water-borne diseases like malaria and cholera (Zeidler, 2010).

### Vulnerable groups, food insecurity and drought-prone regions and livelihoods

The rural population is the most exposed to drought impacts and includes the most vulnerable groups. About 52 per cent (1.2 million) of the Namibian population resides in rural areas where their livelihoods are dependent on subsistence farming (NSA, 2017). Of the rural population, 52 per cent of the population are female and about 6 per cent live with disabilities (NSA, 2017). Orphans (13 per cent of the population aged 18 years or below) are more prevalent in rural areas than in urban centres. In addition, 6 per cent of rural households are headed by orphans. The number of households headed by disabled persons increased from 10.9 per cent in 2011 to 11.5 per cent in 2016, while 30 per cent of rural households are headed by persons aged above 60 years. The prevalence of women, orphans, the elderly and disabled people in rural areas, coupled with their dependence on subsistence farming, increases their vulnerability to agricultural and hydrological droughts. In rural areas, water scarcity also affects women more than men due to the scope of women's responsibilities including field cultivation, caring for livestock and tending to the elderly, sick and children. Children, expectant mothers and the elderly are the most vulnerable during droughts due to deteriorating hygiene associated with low water availability and malnutrition. In pastoral communities, children often drop out of school when families migrate in search of pasture and water, and conflicts can also escalate when competition for water and grazing intensifies.

FIGURE 5.
Classification of regions prone to food insecurity in relation to drought impact. (Data source: NSA, 2017)




The Kunene, Omusati, Ohangwena, Oshikoto, Kavango West and Kavango East regions are considered most exposed to drought and, subsequently, food insecurities (Figure 5). Following a decreasing aridity gradient, the exposure to meteorological drought increases from east (Kavango East) to west (Kunene). These regions are the most reliant on dryland crop and/or livestock subsistence farming and tend to have a high human density (central regions) as well as a high livestock density causing land degradation. The Otjozondjupa region is also considered highly prone to droughts and food insecurities, while the Oshana, Erongo and //Kharas regions are classified as moderately prone to droughts. Relative to other regions, the Khomas, Zambezi, Hardap and Omaheke regions are less prone to droughts. Nevertheless, these are generalizations, and marginalized, vulnerable groups may occur in any region.

The livelihood zones of the Namibia Livelihood Baseline Profiles (Office of the Prime Minister, 2010) mostly overlap with the drought exposed regions and consist of: 1) North Central Upland Cereal and Non-Farm Income; 2) Northern Border Upland Cereal and Livestock Zone; 3) Kunene Cattle and Small Stock Zone; 4) Erongo-Kunene Small Stock and Natural Resources Zone; and 5) the Omusati region parts of the Omaheke and Otjozondjupa Communal Cattle Ranching Zone (NamVAC, 2010; Figure 6).

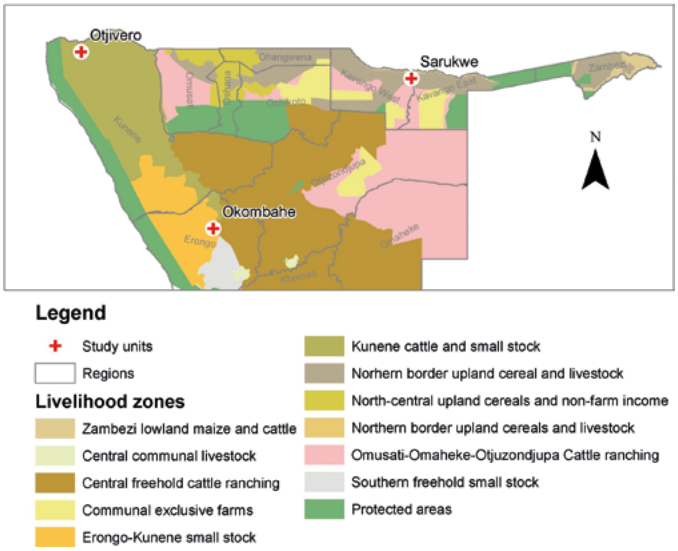



FIGURE 6.
The livelihood zones in the northern parts of Namibia based on profiles supplied by the Office of the Prime Minister (2010). The community case study areas and regional boundaries are also shown.

## Climate change effects

Projections for the Namibian climate predict a drop in the amount of rainfall and an increase in rainfall variability, while temperature is predicted to increase by 1.2°C in the south-west and by 2.8°C in the north-east for 2036–2065 (Davis, 2011). This will result in drier conditions and further water shortages, a likely reduction in rainfed crop yields and a decline in carrying capacity in Namibia (Barnes *et al.*, 2012).

For livestock, climate change is also predicted to increase heat and water stress, the spread of diseases and land degradation, which will collectively reduce livestock production throughout Namibia (Reid *et al.*, 2007).

Since 1990, the rainfall trend in Namibia has decreased to slightly below the long-term average in the Erongo and //Kharas regions, while it is up to 12 per cent higher than long-term mean in the eastern Otjozondjupa region (Figure 7).

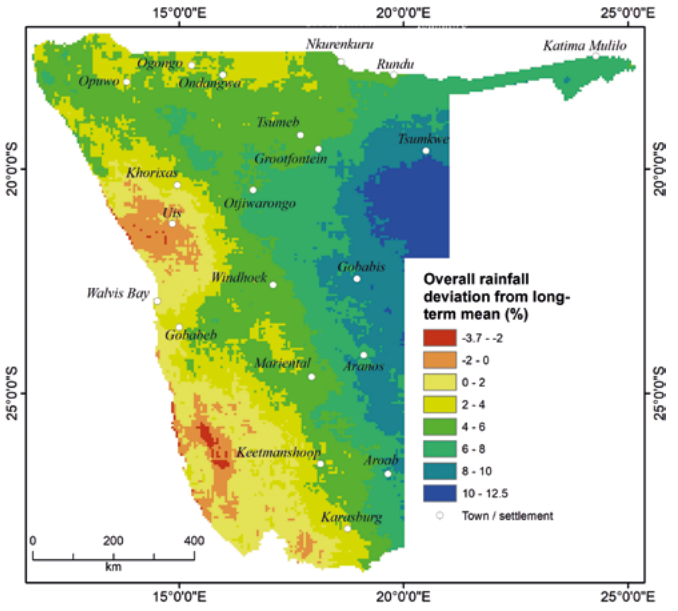



FIGURE 7.
Overall rainfall trend from 1990/1991–2020/2021 in relation to the long-term mean.

### Drought forecasts and drought monitoring systems in Namibia

Namibia does not currently have a dedicated drought monitoring system hosted in a single ministry. Nevertheless, the Namibia Early Warning and Food Information Unit (NEWFIU) system is hosted in what is now the Ministry of Agriculture, Water and Forestry (Kapolo, 2014), which collates information from other government bodies, such as the Namibia Meteorological Service, the Ministries of Health and Social Services, and the Directorate of Disaster Risk Management. The system collects and processes information including: household food security at the local level; nutrition status monitoring through the health information system; rainfall patterns, weather forecasting and water resources; and grazing, crop development and yield monitoring. The NEWFIU unit reports to the National Emergency Management Committee (NEMC), which is mandated to issue regular bulletins as drought disaster conditions approach. It further recommends to the Cabinet the declaration of drought emergencies.

### Drought actors in Namibia

The following government institutions are involved in drought monitoring, early warning and assessments, risk reduction or drought relief:

- Namibia Early Warning and Food Information Unit, whose system is hosted in the Ministry of Agriculture, Water and Forestry
- National Emergency Management Committee
- Namibia Meteorological Service
- Ministries of Health and Social Services
- Directorate of Disaster Risk Management.

Overall, Track I revealed that there are critical data gaps, particularly pertaining to drought impacts on humanitarian, water, livestock and crop activities.

## 3.2 RESULTS - TRACK II

Track II assessed secondary drought information and data to establish drought impacts on key livelihoods. To complement secondary data, primary data was further collected through participatory community studies in the Kunene, Erongo and Kavango West regions, which represented different livelihood zones (Figure 6). Information about these communities with respect to livelihoods, biophysical and socio-economic conditions, and drought vulnerabilities, impacts and potential interventions to reduce vulnerability is compared in Table 2.

TABLE 2: Comparison of visited areas in terms of bio-physical, socio-economical, drought impact and vulnerability characteristics.

| CATEGORY | VARIABLE | OTJIVERO COMMUNITY | OKOMBAHE COMMUNITY | SHARUKWE COMMUNITY |
|---|---|---|---|---|
| BACKGROUND | Mean annual rainfall Rainfall coefficient of variation | 65 mm/yr 35% | 169 mm/yr 41% | 555 mm/yr 27% |
| | Infrastructure available | None, 150km from the nearest town | Clinic, schools, government offices, churches | Clinic, churches |
| | Description of livelihood profile | • Population size = 130<br>• Mostly a pastoral existence but also have gardens on Kunene river floodplains.<br>• Part of Marienfluss communal conservancy with benefits, but few employment opportunities. | • Population size = 1,093<br>• Subsistence farming with livestock and some small-scale irrigation gardens.<br>• Small-scale mining and employment at mines, towns, farms and lodges nearby. | • Population size = 1,561<br>• Subsistence farming with crop farming and livestock area.<br>• Women are the dominant gender, because men look for employment elsewhere. |
| MEETING INVOLVEMENT | Members involved in participatory meetings | • 25 females, 15 males, 10 youth | • 17 females, 18 males | • 28 females, 7 males |
| | Stakeholders involved | • NRCS | • Okombahe Settlement Office, Traditional Authority, Tsiseb Communal Conservancy, NRCS | • Kavango West Regional Council NRCS |

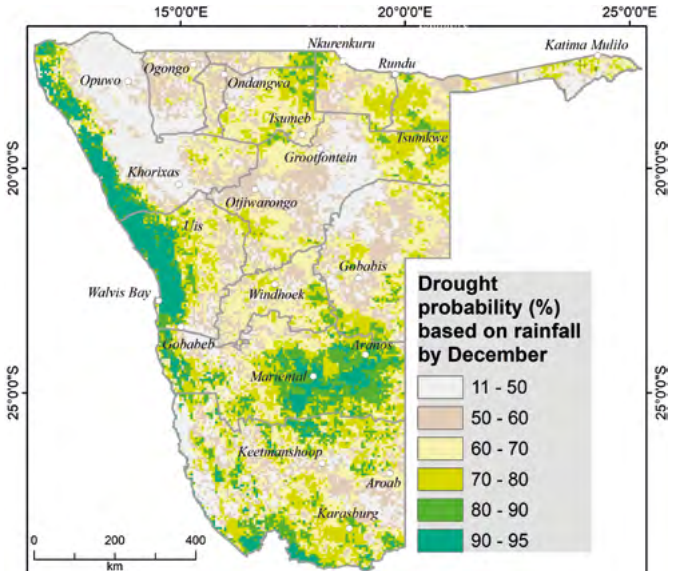
| CATEGORY | VARIABLE | OTJIVERO COMMUNITY | OKOMBAHE COMMUNITY | SHARUKWE COMMUNITY |
|---|---|---|---|---|
| DROUGHT IMPACTS, VULNERABILITIES AND COPING MECHANISMS | Historic drought impacts on community | • **Droughts:** 2017–2021, 2013, two droughts long ago.<br>• **Impacts:** Livestock mortalities (cattle, goats, sheep); food shortage; water shortage; no gardening; children taken out of school; migration with cattle to better grazing; malnutrition (children hospitalized and deaths occurred); cholera outbreak. | • **Droughts:** 2011–2019 (2016 especially bad), 1993, 1985.<br>• **Impacts:** Loss of livestock; grazing deteriorated; malnutrition and starvation; water scarcity and problems; gardening suspended; conflict among people. | • **Droughts:** 2017–2019, 2002, 1998–1999, 1994–1996, 1990.<br>• **Impacts:** Poor crop yield translating into immediate hunger; livestock mortality while some of them strayed; wildlife conflicts (mainly wild dogs); forced to eat wild fruits; people got sick from eating meat of livestock that died from drought effects. |
| | Specific vulnerabilities of community | Poorly developed infrastructure and services; far from markets and food stores; few employment opportunities; high food prices. | Low and erratic forage production; bush encroachment that reduces livestock carrying capacity; reliance on Omaruru River flooding to recharge water levels in boreholes used for irrigation, livestock and domestic use. | Pests such as locusts, mice, birds and worms contribute to food insecurity during drought; local flooding also results in poor crops. |
| | Positive coping mechanisms | Moving with their cattle to better grazing; social grants. | Using pods of Prosopis spp. and Ana trees (Faidherbia albida); covering gardens with shade nets for heat protection. | Gathering of wild fruits; remittances from family members working in towns; milk from cattle; gardening along the valley; social grants. |
| | Negative coping mechanisms | Eating mopane tree bark (causes vomiting) and slaughtered animal skins; parents skipping meals. | | Gathering worms; food relief from the government and Red Cross; consuming low-grade maize meal; eating meat of perished animals. |

| CATEGORY | VARIABLE | OTJIVERO COMMUNITY | OKOMBAHE COMMUNITY | SHARUKWE COMMUNITY |
|---|---|---|---|---|
| VULNERABILITY REDUCTION/FbF | Potential interventions to reduce vulnerability | Community garden with irrigation; improved livestock marketing; cheaper staple food availability; Vocational training; infrastructure upgrades – roads, clinic, schools, communication; improved water point and rangeland management. | Improved local livestock marketing; expansion of bush-to-feed projects; development of water sources; local vocational training for especially women and youth. | Agricultural inputs to boost crop production; drought-resistant crops; employment; microfinancing; market infrastructure upgrade; improved veterinary services. |

In summary, of the three communities, Otjivero is considered the most vulnerable to drought impacts and has a greater reliance on food aid than the other two communities. The Okombahe community has the advantage of a relatively well-developed infrastructure, small-scale mining opportunities and close proximity to commercial farms, tourism establishments and towns for employment (although currently affected by the Covid-19 pandemic). The Sharukwe community is fortunate to have a relatively high average rainfall but suffers from pests and livestock diseases and conflict with wildlife.

## 3.3 RESULTS – TRACK III

Based on the research results of Track I and II, Track III outlines the most feasible EAP scenarios identified for Namibia, namely subsistence crop farming, subsistence livestock farming and a game-based livelihood.




Trigger thresholds for these scenarios are imperative. A trigger threshold halfway in the rainy season was pursued in this study using the CHIRPS hybrid rainfall data. Results suggest that a rainfall below - 10 per cent of the long-term average rainfall during the growing season (October to December) around Mariental has a high probability (over 90 per cent) of predicting drought by the end of the rainy season (Figure 8). The influencing factors are not clear at this stage regarding why the Mariental area yielded the highest probability for drought prediction in the summer rainfall region in the country. However, Mariental is also on record for having the highest and lowest average temperature in Namibia (Mendelsohn *et al.*, 2002). It is, therefore, theorized that the climatic and environmental conditions that influenced these temperature variations may also be at play for the high probability of predicting a failed rain season based on cumulative rainfall received by December.

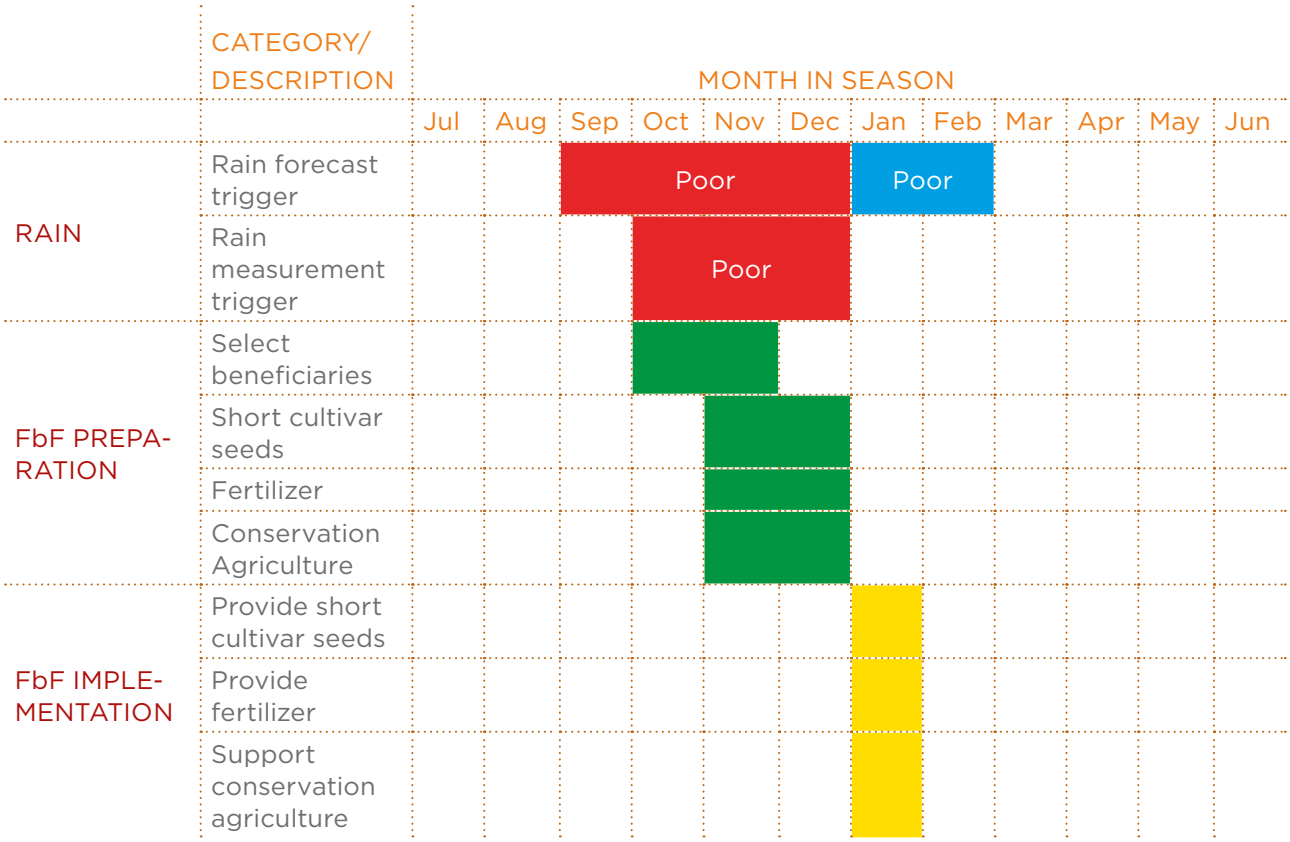
The proposed scenarios are discussed in more detail below:

### EAP Scenario I – Crop livelihood

| HAZARD | DROUGHT |
|---|---|
| **Potential high-risk areas where the FbF mechanism could be activated** | The areas mapped as high and moderate vulnerable areas (Figure 9A) in the Omusati, Oshana, Oshikoto, Ohangwena, Kavango West, Kavango East and Zambezi regions. |
| **Objective** | Mitigate food shortages and malnutrition of vulnerable households dependent on rainfed crop farming. |
| **Prioritized risks/impacts to be addressed by early actions** | 1. Food shortage<br>2. Malnutrition<br>3. Depletion of reserve fund |
| **Proposed Early Actions by respective Areas of Focus (AOF)** | 1. Provision of short growth season cultivar seeds<br>2. Promote Conservation Agriculture (CA) practices that conserve soil moisture and improve water holding capacity<br>3. Implement conditional or unconditional cash transfers (seasonal drought)<br>4. Promote small-scale irrigation and other activities such as chicken rearing |
| **Potential number of households to be reached** | **Minimum** of 2,000 households (8,000 people) |
| **Sources of forecast information** | National: NMS |
| **Trigger statement** | **1. Late rainfall scenario:** In September, the rainfall forecast for October to December is below average, but normal levels of rainfall are forecast for January and February. If the actual cumulative October to December rainfall is normal or above (>-10% anomaly), only the provision of short growth season cultivar seeds, good plant nutrition and moisture-conserving practices may be triggered.<br>**2. Failed season scenario:** In December, the rainfall forecast for January to March is below -10% of long-term rainfall, which triggers preparation for actions.<br>A cumulative January to March rainfall below -10% triggers the activation of FbF activities. If the cumulative January to March rainfall is above -10% of the long-term mean, activities are scaled down or cancelled. |
| **Expected lead time for activation** | **1 month** |
| **Responsible focal point for this EAP** | National Disaster Risk Management Committee in OPM (NEMC & NRCS) |
| **Governmental coordinating agency** | NEMC |

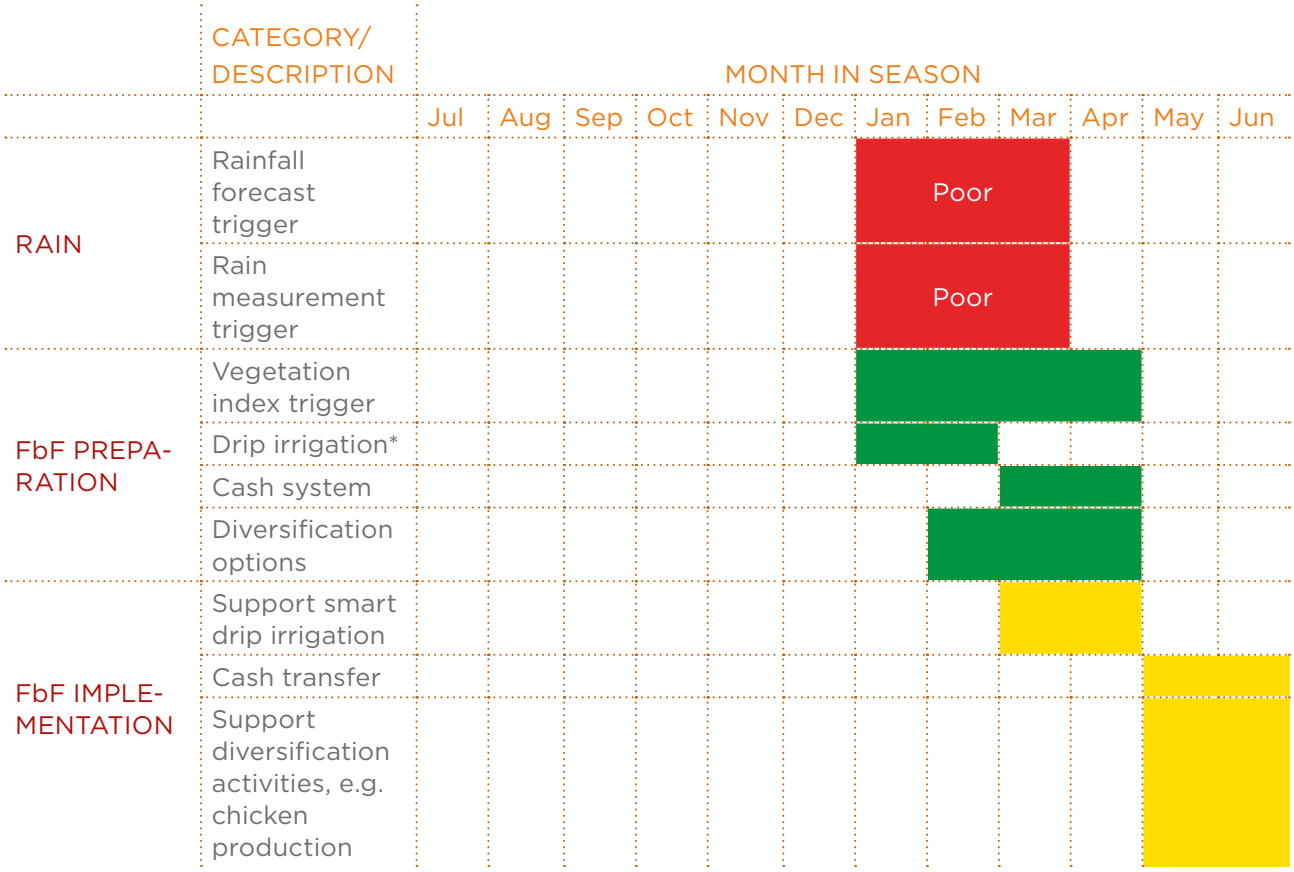
### Activation timeline EAP I – Late rainfall scenario

In this scenario October to December is dry, but normal rainfall for January and February is forecast. Promoting short-season cultivars, good plant nutrition and moisture-conserving practices can still result in adequate harvests, if implemented in time.



**Activation timeline EAP I – Failed season**

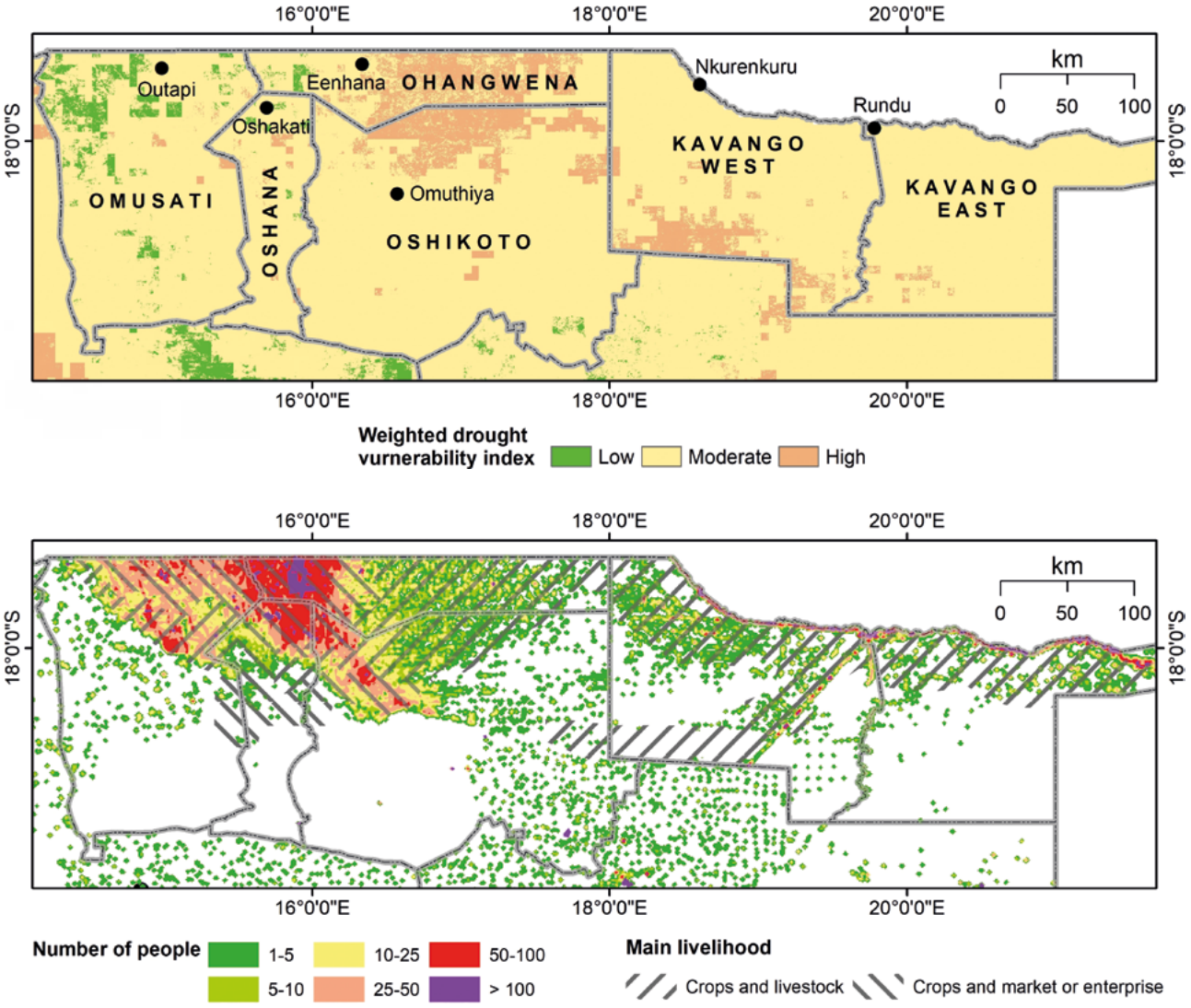
The rainfall during the latter part of the cropping season (January to March) is below -10 per cent of the long-term rainfall, resulting in a reduced or failed harvest. FbF activities focus on cash transfers and income diversification.



## Beneficiary selection

The primary beneficiaries to be targeted by FbF should be subsistence communal crop farmers in the northern regions, as shown in Figure 9. The selection of beneficiaries should be jointly conducted with representatives from the Ministry of Agriculture, Water and Forestry, Ministry of Gender Equality and Child Welfare, Regional Councils, Constituency Council, Traditional Authority and Village Development Committees of the affected regions and communities. Selection criteria could include poor households who have no access to assets such as livestock, households who have limited income and/or are highly dependent on government social protection programmes, and women- and children-headed households.

FIGURE 9: Drought vulnerability (A) and number of people and main livelihood (B) in the western part of the rainfed agriculture proposed for FbF. (Livelihood data source: Office of the Prime Minister, 2010; population data source: Mendelsohn et al. 2002).



### Supporting scientific evidence for EAP Scenario I

The recorded historic drought events and seasonal calendar for Sharukwe (Kavango West) indicated that below normal average rainfall experienced during the first three months (October to December) of the growing season, results in a failed or reduced harvest.

### Scenario shortcomings and information/data gaps

Rainfall monitoring is proposed based on weather station data from the NMS. Weather stations are, however, sparsely distributed in Namibia and may not provide sufficient spatial resolution to capture localized drought conditions, e.g., rainfall measured at the Rundu weather station may not correlate with rainfall at Sharukwe. Other rainfall data, e.g., CHIRPS, may be considered to complement the NMS data.

The viability of drip irrigation as an FbF activity requires more research and quantification of the costs and benefits. Drip irrigation schemes should benefit entire communities, but would require suitable soil, reliable water and management structures and skills to be effective.

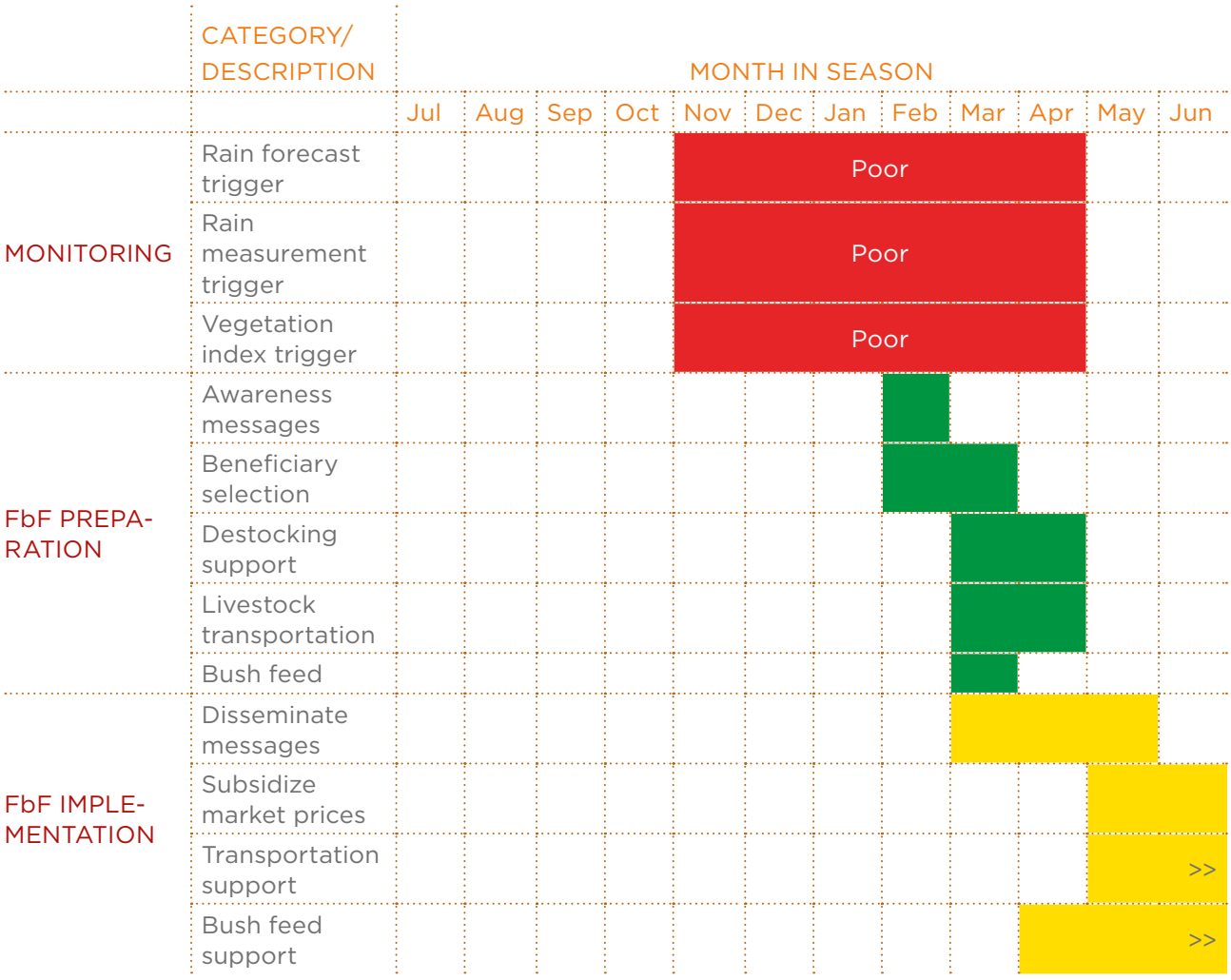
### EAP Scenario II – Livestock livelihood

For livestock, the onset of drought impacts tends to be slower than for crops, with multi-seasonal droughts having cumulative impacts as forage and water resources dwindle. Therefore, a single-season and multi-season drought requires different activities as well as the timing of those activities.

| HAZARD | DROUGHT |
|---|---|
| **Potential high-risk areas where the FbF mechanism could be activated** | The areas mapped as highly and moderately vulnerable are in the Erongo, Kunene, Omusati, Oshana, Oshikoto, Ohangwena, Kavango West, Kavango East, Zambezi, Otjozondjupa, Omaheke, Hardap and //Kharas regions |
| **Objective** | Mitigate drought-induced livestock asset loss, food shortages and malnutrition due to reduced milk and meat production in vulnerable, subsistence pastoralist groups in communal areas. |
| **Prioritized risks/impacts to be addressed by Early Actions** | 1. Livestock mortalities, thus livestock asset loss.<br>2. Reduced milk and meat production, leading to food shortages and malnutrition.<br>3. Reduced income due to low market value of emaciated livestock and reduced demand. |
| **Proposed Early Actions by respective Areas of Focus (AOF)** | 1. Awareness and early warning messages (radio, TV, extension officer, printed media, social media and farmers unions).<br>2. Encourage farmers to destock their livestock, e.g., provide monetary market incentives.<br>3. Subsidize transport to markets for animals to be sold or put to emergency grazing.<br>4. Promoting forage supplementation practices – bush feed (haymaking, silage and reserved grazing camps should also be promoted for risk reduction).<br>5. Buy livestock in drought-stricken areas at subsidized prices and distribute the meat to the most vulnerable communities. |
| **Potential number of households to be reached** | **Minimum** of 2,000 households (8,000 people) |
| **Sources of forecast information** | National: NMS |
| **Trigger statement** | **12. Single-season drought:** When the cumulative rainfall and/or vegetation index (e.g., Vegetation Condition Index (VCI)) for the November to end of April period ends below -10% for rainfall and < 0.2 in western and southern parts and < 0.35 in the rest of Namibia for VCI, combined with a poor outlook for May/June. If the outlook is wrong, some activities need to be scaled down or cancelled (see below).<br>**2. Multi-year drought:** Any time after the end of November when the cumulative rainfall and vegetation index are below -10% and < 0.2 in western and southern parts and < 0.35 in the rest of Namibia, respectively, coupled with a poor outlook for the rest of the season. If the outlook for the season is wrong, activities may need to be postponed or cancelled (see below). |
| **Expected lead time for activation** | **1 month** |
| **Responsible focal point for this EAP** | National Disaster Risk Management Committee in OPM (NEMC & NRCS) |
| **Governmental coordinating agency** | NEWFIU, Ministry of Agriculture, Water and Forestry |

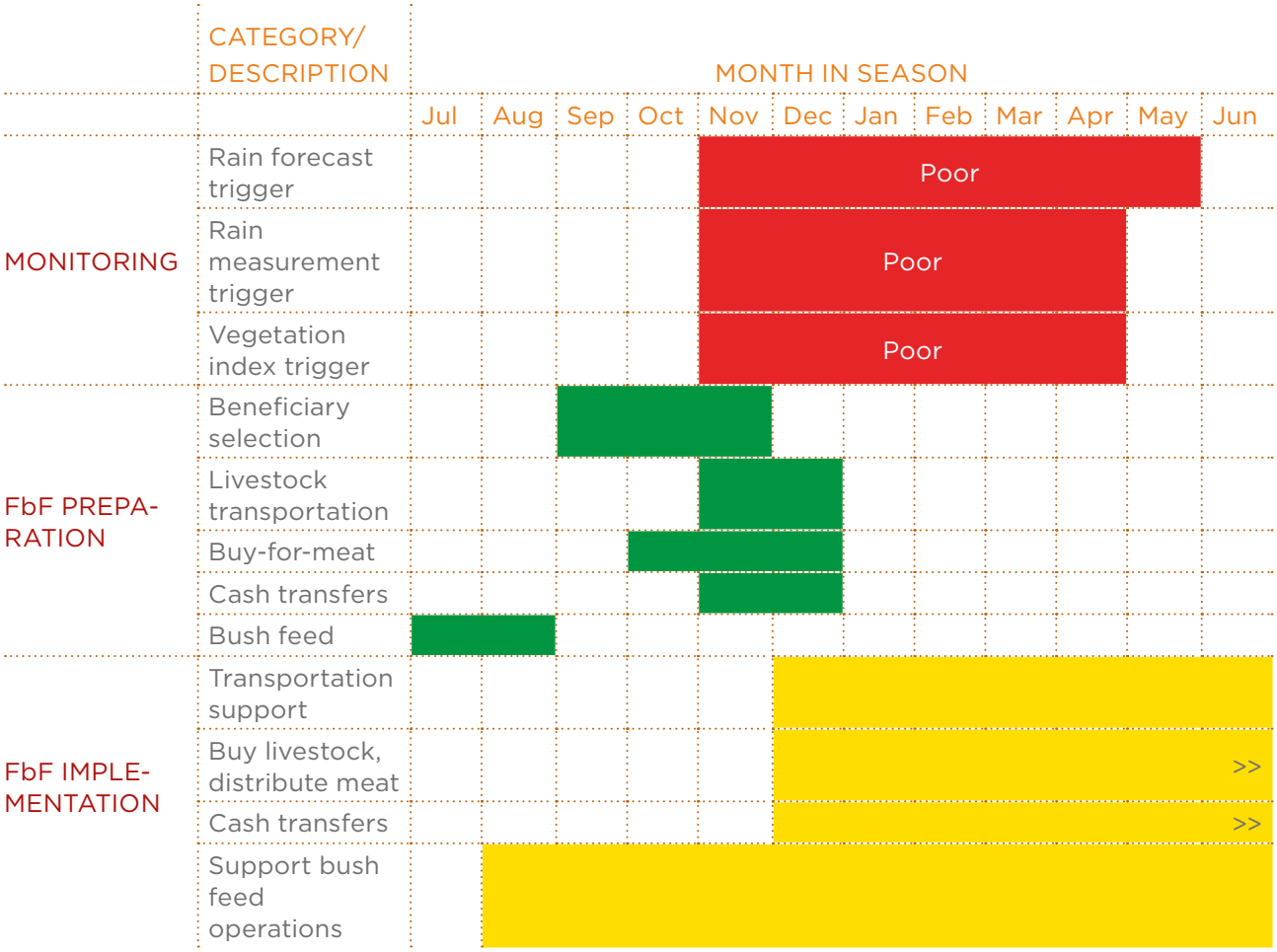
**Activation timeline EAP II –**
**Single-season drought (previous season was normal or above normal)**

If the preceding season was average to above average, early actions, except for awareness messages, should be delayed until April/May, because late rains may still rectify the situation. Especially for marketing incentives, it is prudent that animals should be marketed as soon as possible at the end of the rainy season when the animals' condition is still acceptable. Early marketing also means that farmers are likely to find markets for their livestock, get better prices, and more resources are available for the remaining animals. The situation should, however, be carefully monitored because intense drought situations may require earlier activation of FbF activities (e.g., March), hence preparations should start early.



### Activation timeline EAP II – Multi-year drought

If the preceding season was below average (-10 per cent of the long-term average rainfall), the new season starts with low forage availability and animals in a vulnerable condition. If the forecast for the current season is also poor (e.g., multi-season drought) and this is borne out by the cumulative rainfall and vegetation index data, preparation for early actions are initiated and may be triggered from December onwards. If conditions improve due to good rainfall received from March to May, activities should be reassessed. If the drought persists, continued support beyond June will be necessary for vulnerable groups.




The primary beneficiaries to be targeted by the FbF are subsistence livestock farmers in communal areas, such as those indicated in Figure 10. Similar to the crop FbF scenario, the final selection of beneficiaries should be conducted with the relevant authorities (see EAP I). Additional criteria could include farmers with small herds, e.g., less than five cattle or less than ten sheep or goats.

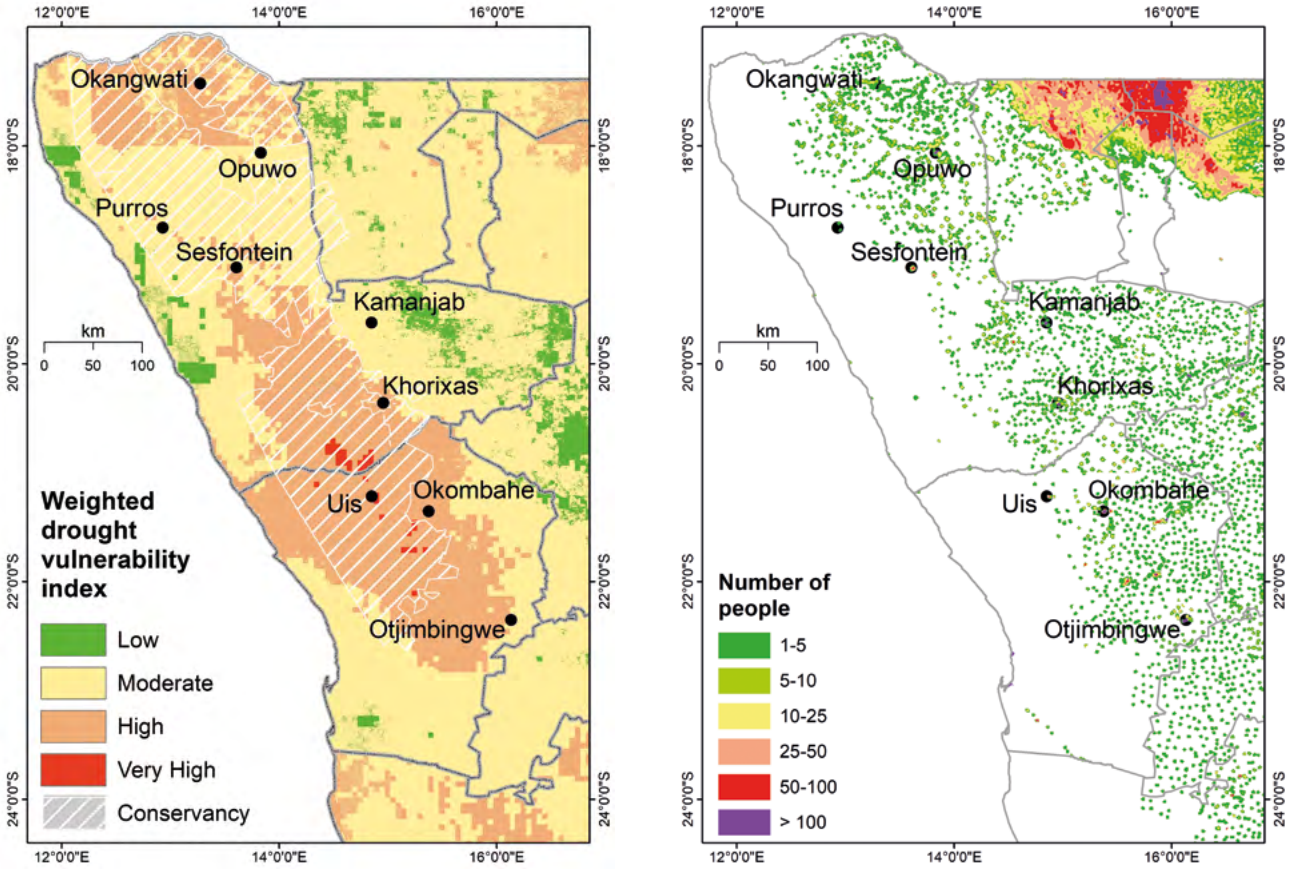



FIGURE 10. Drought vulnerability of subsistence livestock farmers in communal areas proposed for scenarios 2 in Erongo and Kunene regions and the distribution of people (population data source: Mendelsohn et al., 2002).

**Supporting scientific evidence for EAP Scenario II**

The Normalized Difference Vegetation Index (NDVI) anomaly and/or Vegetation Condition Index (VCI) have been used to monitor rangeland conditions in relation to the looming impact of drought in Namibia. The Rangeland Early Warning and Monitoring project (http://www.namibiarangelands.com/) of the 10th European Development Fund (EDF10) piloted the NDVI anomaly (deviation from long-term mean) as well as the VCI for Namibia. Locally adapted VCI thresholds for drought and its impact on rangelands were established, based on the correlation between VCI and drought assessments carried out under the Community Based Rangeland and Livestock Management (CBRLM) programme of the Millennium Challenge Account–Namibia. Grazing conditions were assessed in April and May 2013 in 40 grazing areas scattered over the Northern Communal Areas. The assessment was triggered by the drought conditions experienced during the 2012/2013 season, resulting in low forage production in certain areas. The VCI was calculated using the mean November to May seasonal NDVI for the 2012/2013 season in relation to the minimum and maximum seasonal (November to the following May) NDVI for the 2002/2003–2020/2021 period. In addition, a drought severity classification of farms was done for the Dare-to-Care fund (Smit, 2019). Farms eligible for drought assistance were subsequently identified based on the calculated VCI for the February to early May period. Leader farmers validated the results.

### Potential shortcomings and gaps associated with EAP Scenario II

There is no government institution in Namibia at present that hosts NDVI and/or VCI products. However, there are local initiatives that can provide such support.

Finding exact trigger thresholds for drought impacts on livestock is complicated by the variable responses of vegetation to rain, as well as factors that may exacerbate meteorological drought effects, e.g., bush encroachment and poor rangeland management, including over-stocking. Threshold values may also need to be adjusted geographically, according to the frequency and intensity of drought events, e.g., cumulative VCI < 0.2 in western and southern parts and < 0.35 in the rest of Namibia.

Many sophisticated vegetation indices exist, which could potentially be better indicators of drought conditions for livestock and game livelihoods than, for example, the VCI used in this study. These could be investigated in future. A shortcoming is that data for calibration and validation (e.g., livestock condition, mortality, rangeland condition) is scant in the Namibian context.

### EAP Scenario III – Game livelihood

Community conservation covers about 59 per cent (180,000 square kilometres (km2)) of all communal land (about 21 per cent of Namibia) and involves an estimated 228,000 residents. Of this area, the 83 registered conservancies manage 166,000 km2 (20 per cent of Namibia; MEFT/NACSO, 2017).
As a result of rural conservation, significant jobs related to tourism contribute to rural livelihoods, although this has been negatively impacted by the Covid-19 pandemic.

| HAZARD | DROUGHT |
|---|---|
| **Potential high-risk areas where the FbF mechanism could be activated** | The areas mapped as highly and moderately vulnerable areas and with registered conservancy in the Erongo, Kunene, Omusati, Oshana, Oshikoto, Ohangwena, Kavango West, Kavango East, Zambezi, Otjozondjupa, Omaheke, Hardap and //Kharas regions. |
| **Objective** | Mitigate drought-induced failed rangeland condition or significant poor grazing potential for vulnerable communities with registered conservancy and located in areas most vulnerable to drought. |
| **Prioritized risks/impacts to be addressed by early actions** | 1. Poor forage resources<br>2. Decline in number of game and species<br>3. Mortality of wildlife (due to starvation)<br>4. Loss of income (due to impacts on tourism potential of an area) |
| **Proposed Early Actions by respective Areas of Focus (AOF)** | 1. Awareness messages (radio, TV, extension officer, print media and farmers union)<br>2. Drill new boreholes in areas where some grazing still exists as an emergency measure.<br>3. Diversify wildlife and tourism-based income opportunities. |
| **Potential no. of households to be reached** | **A minimum** of 2,000 households (8,000 people)(note that 8,000 people is 3.5% of the estimated 228,000 residents in communal conservancies) |
| **Sources of forecast information** | National: NMS |
| **Trigger statement** | 1. When below normal rainfall is recorded for all the first five (5) months (October–February) resulting in a failed rangeland season.<br>2. When below-average rainfall (less than -10%) is recorded between October and December, and the same trend is predicted for the next three (3) months (January–March). |
| **Expected lead time for activation** | **1 month** |
| **Responsible focal point for this EAP** | National Disaster Risk Management Committee in OPM (NEMC & NRCS) |
| **Governmental coordinating agency** | NEWFIU, Ministry of Agriculture, Water and Forestry |

### EAP Scenario III: Activation timeline

The activation timeline for below rainfall is identical to that of livestock discussed in scenario II.

### Supporting scientific evidence for EAP Scenario III

The supporting scientific evidence presented under scenario II is also applicable under scenario III.

### Potential shortcomings and gaps associated with EAP Scenario III

Like in Scenario II, the absence of government institutions in Namibia hosting NDVI and/or VCI products at present needs addressing or alternative arrangements made with local experts. In the same vein, exact trigger thresholds for drought impacts on wildlife are compounded by the variable responses of vegetation to rain and factors that may exacerbate low rainfall effects, e.g., bush encroachment and poor rangeland management.

## 4. DISCUSSION AND NEXT STEPS

It is recommended that the NRCS prioritizes FbF EAPs based on existing capacity and resources with a focus on FbF EAPs that reach the needy, including those that are not covered by social safety net programmes or become vulnerable when drought occurs. There is a need for identifying and appointing a competent organization to host and ensure that requisite early warning information regarding triggers and indicators is provided effectively and in a timely way. The NRCS will further benefit from establishing a technical reference group where key technical institutions and service providers can access technical capacity and support critical decision-making to adequately implement FbF. It is important that the FbF is embedded in key institutions and that its coordination is harmonized for enhanced impact. Such cooperation could result in synergies where increased preparedness and FbF reduce future drought impacts in vulnerable sectors. Furthermore, Namibia's Drought Policy and Strategy for Namibia is currently under review and it is important that FbF EAPs are aligned with this document.

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Forecast
based
Financing
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NAMIBIA