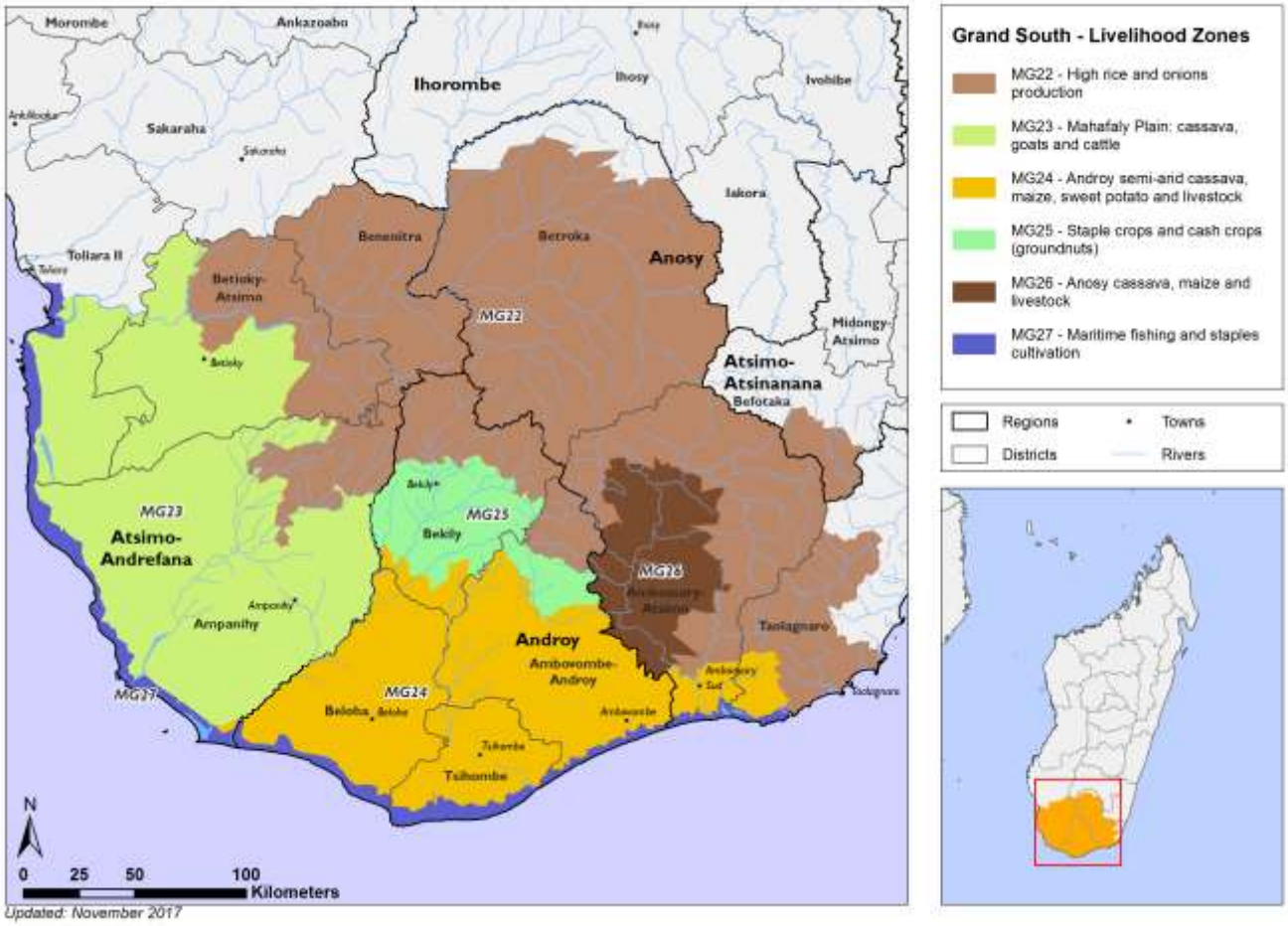
MADAGASCAR Grand South livelihood zones revision November 2017

GRAND SOUTH, MADAGASCAR - LIVELIHOOD ZONES



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ACRONYMS AND ABBREVIATIONS

ADRA	Adventist Development and Relief Agency
BNRC	Bureau National des Risques et Catastrophes
CARE	Cooperative for Assistance and Relief Everywhere
CRS	Catholic Relief Services
FEWS NET	Famine Early Warning Systems Network
fokontany	The smallest administrative unit, a territory including one or more villages
HEA	Household Economy Approach
MoA	Ministry of Agriculture
NGO	Non-Governmental Organization
USAID	United States Agency for International Development
WFP	World Food Programme

ACKNOWLEDGEMENTS

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The workshop was facilitated by Julius Holt, consultant from the Food Economy Group (FEG Consulting), who also contributed this report.

FEWS NET provided the technical and administrative lead to the data collection and analysis of the baseline information for the three targeted livelihood zones, with the support of the Food Economy Group, which was contracted to provide technical guidance and overall quality control.

Lastly, a well-deserved appreciation and thanks to the communities visited during the baseline exercise.

INTRODUCTION

The Famine Early Warning System Network, known by its acronym FEWS NET, is a worldwide project financed by the United States Agency for International Development (USAID). In cooperation with international, regional, and national partners, it provides timely and ample early notice of probable food security trends. FEWS NET works in over 25 countries around the world and remotely monitors 11 additional countries from its three regional offices.

In April 2013, FEWS NET held a workshop in Antananarivo to determine the rural livelihood zones in the whole country, and a further special workshop for the south in Fort Dauphin (Taolagnaro), with the close involvement of the Government of Madagascar, WFP, CRS, CARE, ADRA and LOL.[1] A rural livelihood zone is defined as a geographical area where households share the same ecology and systems of production, the same choices of suitable crops and livestock, the same market conditions, and the same options for generating cash income. Within a livelihood zone various social and other factors determine differences of wealth between households, i.e. differences in the degree to which they are able to gain from the prevalent livelihood factors.[2]

The map resulting from the workshops (Figure 1) shows 24 livelihood zones from north to south, of which three comprise the southernmost area known as the 'Grand Sud' (Figure 2).

Figure 1: National livelihood zones map 2013

Figure 2: The three livelihood zones of the Grand Sud (2013)

MG22 - Centre-south: staple crops, industrial sisal, zebus
MG23 - Mahafaly Plateau: cassava
MG24 – Extreme South: cassava, maize, livestock rearing

Between 2013 and 2016, the southern zones experienced successive, severe droughts, completing as much as a decade of irregular or reduced rainfall. As a result, the Grand Sud became a focus of increased emergency aid, especially food aid. Early in the course of delivering this aid and developing surveillance information, WFP in particular felt the need for a more nuanced zoning template for the Grand Sud than was provided by the national map, which would be of particular use to the national early warning system (SAP) should it be revived after a period without funding support. From mid-2013 they commissioned the Geosystems company, based in Antananarivo, to undertake a field inquiry into the issue. Their method encompassed a general livelihoods framework and so was in principle reasonably compatible with the FEWS NET approach.

[1] The report of this exercise is available at www.fews.net
[2] http://v4.fews.net/docs/Publications/Guidance_Application%20of%20Livelihood%20Zone%20Maps%20and%20Profiles_final_en.pdf

The exercise identified 11 'sub-zones' which together comprise the three livelihood zones of the Grand Sud, but left out most of the north of MG 22, namely the districts of Betroka in Anosy region and Benenitra in Atsimo-Andrefana region. This was likely because it was understood that there was a consistency of livelihoods across these areas and/or they had been less prone to severe crop failures, as the zone in general is considered the rice-bowl of the south. However, it is less clear the guidelines worked on in terms of the minimum appropriate size of a zone, given that there must be some consideration of the use of the template and the likely capacity of WFP or the Early Warning System to undertake surveys or regular seasonal surveillance of a multiplicity of zones. Figure 3 below illustrates this point: it shows in green a part of the vast overall MG22 zone, identified as sub-zone MG22A and named *Cereals (rice maize), Tubers (cassava), Dry pulses (groundnuts), Trade (planks, artisanal gold prospecting)*; in yellow a substantial sub-zone MG22B named *Tubers (cassava), Livestock rearing (cattle)*; and in pink a very small sub-zone MG22C named *Cash crop (sisal)*.

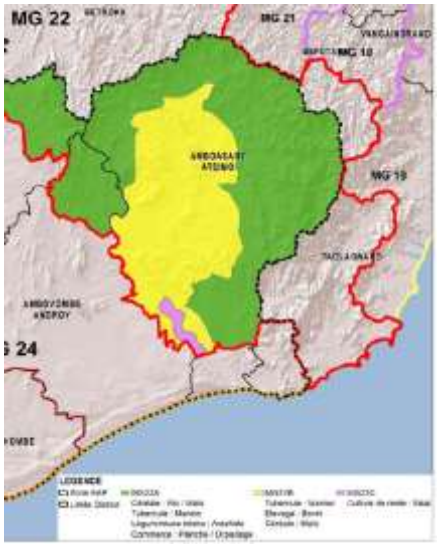


Figure 3: Three of the 11 subzones
(Source: Geosystems, Antananarivo)

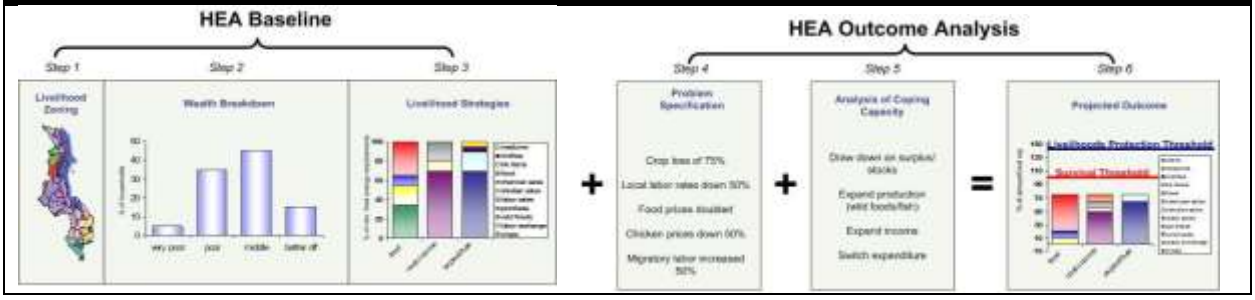
FEWS NET wished to review the 11 sub-zone map using FEWS NET's livelihood zoning criteria. Any changes to the map (and therefore at the same time to the original national zones map) would be done by building consensus among partners and relevant stakeholders. To this end a 3-day workshop was held at Tuléar 5-7 October 2017 with the participation of FEWS NET, the focal point officer of the government's Bureau National des Risques et Catastrophes (the home of the putatively resumed early warning system), WFP and NGO partners. The revised livelihood zones map was used to guide FEWS NET's HEA livelihoods baseline survey exercise that followed immediately, covering three livelihood zones selected from the six finally identified for the Grand Sud. A detailed overview of the process for the workshop is included in the Annex.

THE HOUSEHOLD ECONOMY ANALYSIS

The Household Economy Analysis (HEA) was developed in the early 1990s as an approach that measures and predicts short-term changes to food access. Since this time, HEA has focused on how households make ends meet from one year to the next and the assets they rely on that enable them to do so. This includes how they survive, or fail to survive, through difficult times. Understanding local livelihoods provides insight on how to appropriately address short-term food and livelihood security needs, as well as inform decision-makers on whether or not medium- or long-term interventions will support or undermine existing strategies. HEA's evolution has led the way to expand HEA's application across the development and humanitarian spectrum. HEA has been used to address questions related to disaster response, resilience and rehabilitation, early warning and scenario analysis, development planning, and

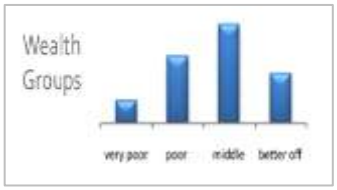
monitoring and evaluation.

Figure 1: The Household Economy Analysis Framework

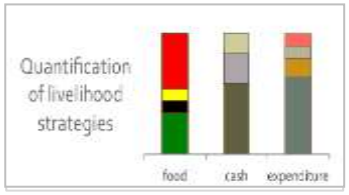


In practice, the HEA analytical framework comprises two components: the baseline component and the outcome analysis component, as described in Figure 2 above. The baseline component has three steps: a **livelihood zoning**, a **wealth breakdown** and an **analysis of livelihood strategies** for each of the identified wealth groups.

Livelihood zoning is the process of dividing geographic areas within which people broadly share the same patterns of access to food (e.g. they grow the same crops, keep the same types of livestock). They also broadly share the same access to markets. Patterns of livelihood clearly vary from one area to another. Local factors such as climate, soil, access to markets, etc. all influence livelihood patterns. Therefore, the first step in the HEA is to prepare a **livelihood zone map**.



Where a household lives is one factor determining its options for obtaining food and generating income. Another factor is wealth, which dictates a household's ability to exploit the available options within a given zone. Generally, households that cultivate 1 hectare of land harvest more than their neighbors who only cultivate 0.25 hectares. In pastoral areas, households that own 50 heads of cattle have greater access to milk than those that own five heads of cattle. Defining the different wealth groups in each zone is the second step in the HEA, the output from which is a **wealth breakdown.**[3]



The **analysis of livelihood strategies,** the third step, generates a quantified account of food, income and expenditure patterns for typical households in each group for a defined reference or baseline year. Food access is expressed as a percentage of minimum energy requirements, taken as an average food energy intake of 2,100 kilocalories (kcals) per person per day. Annual income earned by the household is balanced with expenditure, allowing the interview to capture a reliable account of the different income activities in which each household is engaged.

A central aspect to HEA is that quantification takes place by converting all food and cash sources to a standard measure. It adds up all the sources of food and all the sources of cash income that households generate in the reference year and uses either a food or cash equivalent to express the total value. This composite of food and cash income is referred to as **total income**. By converting to a common currency, such as calories, we are able to compare food access across wealth groups, livelihood zones, and even countries.

[3] In HEA, wealth is considered in relative (and local) terms. Statistical data may indicate that 80 percent or even 90 percent of the population in a particular area lives below the national poverty line, but this is measuring poverty on a national, absolute scale. In a livelihoods analysis we are interested in understanding the differences in the ways that people within a livelihood zone obtain access to food and cash income and the reasons for these – in which case it is not particularly useful to lump 80 percent or 90 percent of the population together into one group, especially if there are differences in terms of food and cash income access within that larger group.

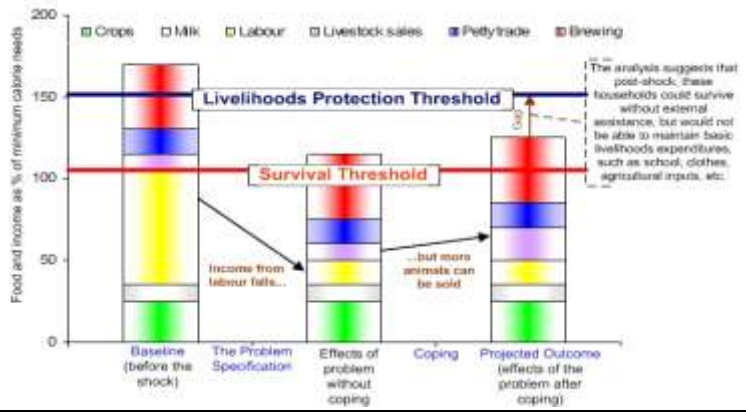
The second component of the HEA analytical framework is the **Outcome Analysis**. Outcome analysis investigates how baseline access to food and income might change as a result of a specific hazard, such as drought or flood, and the consideration of the extent to which households will be able to meet their basic survival needs and protect their livelihoods following the hazard.

Like the HEA baseline, the Outcome Analysis also includes three steps: an analysis of the economic impacts of the hazard on food and income sources, i.e. the **Problem Specification**; the **Analysis of Coping/Response Strategies** for households living in the zone; and the measuring of the resulting situation (**Projected Outcome**) with reference to two different thresholds.
The **Problem Specification**, is the fourth step in the HEA analytical framework. This step translates a hazard into economic consequences that can be mathematically linked to household-level baseline information on food and income options or expenditure items.

After defining the problem and calculating its magnitude for each of the relevant aspects of the baseline picture, step 5 is an **Analysis of the Response Strategies**[4] that different types of households will employ to try and deal with the problems they face. This is a quantified analysis of households' ability to diversify and expand access to various sources of food and income, and thus to cope with a specified hazard.

The final step, **Projected Outcome,** is a systematic attempt to determine where different households fall in relation to clearly defined intervention thresholds. It is an analysis designed to set forth, with the best available evidence, a clear picture of which groups of households will be unable to respond on their own to a shock without using strategies that would undermine either their health or their longer-term welfare.

Figure 2: HEA Outcome Analysis



In sum, the objective of Outcome Analysis is to investigate the effects of a hazard on *future* access to food and income, so that decisions can be taken early on about the most appropriate types of interventions to implement. The rationale behind the approach is that a good understanding of how people have survived in the past provides a sound basis for projecting into the future. Three types of information are combined: (i) information on baseline access; (ii) information on hazard (i.e. factors affecting access to food/income, such as own production or market prices); and (iii) information on response strategies (i.e. the sources of food and income that people turn to when exposed to a hazard). The approach can be summarized as follows:

Baseline + ***Hazard*** + ***Response*** = ***Outcome***

[4] The term response strategy is preferred to coping strategy for two reasons. Firstly, the term coping strategy is often used to refer to regular components of everyday livelihood (e.g. firewood sale), which strictly speaking are only coping strategies when intensified in response to a hazard. Secondly, coping can be taken to imply that the strategy in question is cost-free, which is not always the case.

The two thresholds that are used to determine whether the total income after coping is sufficient to meet household needs are the **Survival Threshold** and the **Livelihoods Protection Threshold**. The Survival Threshold represents the costs to cover minimum survival requirements, including minimum food (2,100 kcal per person per day), water (if purchased in the zone) and the means to prepare food. If people cannot meet the Survival Threshold, their lives are at risk. This threshold is fairly standard across livelihood zones with the exception of water, which is often not purchased but collected. The second threshold is the **Livelihoods Protection Threshold**, which includes the cost of survival as well as basic education, health, productive inputs and minimum household items purchased in an average year. This threshold will vary across livelihood zones and wealth groups because of differences in production costs (e.g. a wealthy pastoralist with 100 cattle will have very different input requirements than a poor household living in a cropping area.) The Livelihoods Protection Threshold is the standard threshold used to determine whether humanitarian assistance is required. If households cannot cover these costs, an intervention to protect livelihoods (which is crucial for next year's survival) should be launched.

DATA COLLECTION AND FIELD METHODS

In HEA there are three levels of inquiry. The first level starts with the district level interviews, typically with government officials. During district interviews, the assessment team is able to inform district officials of the proposed fieldwork and obtain clearances to work at the village level. District level interviews are also useful for verifying livelihood zone boundaries, choosing villages where interviews will be conducted, collecting important market information, and building up a hazard/event timeline for the zone. Many district offices also collect data on production, prices and other reference data that can be used throughout the assessment and in the outcome analysis. Market and trader interviews are also performed at the district level. Reference year and bad-year information related to market networks, access, common commodity prices, and trade routes are collected during this level of inquiry.

Community-level interviews are done in 8 to 12 villages, and this is when information collected at the district level is verified and expounded on. During the community-level interviews key informants provide a detailed account of local livelihoods, market access, resource availability, seasonality, and differences in wealth within the community. Differences in wealth are determined by the community leaders using locally defined characteristics.

Once the characteristics of wealth are identified and agreed on by community leaders, households are divided into four or more wealth groups. Household-level interviews are conducted in each wealth group identified and at every village assessed. Information on food, income and expenditure patterns is quantified for a 12-month reference period.

The analysis of the household-level information is facilitated by assessment team leaders and team members immediately after the fieldwork is complete. Summary values for food, income and expenditure for each wealth group are cross-checked and compiled. The qualitative and quantitative information included in each of the following livelihood zone profiles are the results of the fieldwork and subsequent analysis.

SUMMARY DESCRIPTIONS OF THE GRAND SOUTH LIVELIHOOD ZONES

ZONE MG22 – HIGH RICE AND ONIONS PRODUCTION

Main productive assets	
Poor households	Better-off households
Land <0.25 ha Small tools Poultry	Land >1 ha Cattle (>50 head) Towing tools Storage facilities
Main foods and sources	
Poor households	Better-off households
Cassava (OP, MP) Sweet potato (OP) Maize (MP, OP) Rice (MP, OP) Meat (MP)	Rice (OP) Maize (MP, OP) Cassava (MP, OP) Meat/fish (MP) Milk and dairy products (OP)
Main income sources	
Poor households	Better-off households
Food crops Agricultural labor Poultry Firewood sale Petty trade Fishing Guarding livestock	Crop sales (esp. rice and onions) Sale of livestock, incl. cattle Trade
Main markets	
<u>Local</u> Androy Anosy	<u>Regional/national</u> Fianarantsoa Antananarivo
Main hazards, periods, and frequency	
Drought (1/2, 1/3 years) Insecurity and cattle raiding Crop disease	October–December
Coping strategies for poor households	
Consume gathered red cactus fruit Intensify poultry sales Sale of household supplies and equipment	

Zone 22 includes the majority of the Anosy region and an eastern part of the Atsimo-Andrefana region. The zone is primarily composed of savannah woodland with some degradation and natural pastures on lateritic plains. Rainfall varies from approximately 600 mm/year toward the north (Bara) and approximately 1,000 mm/year toward Taolagnaro (Ft. Dauphin). Land along the rivers is more fertile and suitable to growing rice in rotation with groundnuts. In addition, there are numerous locations with market gardening that in particular produce a surplus of onions that are traded far and wide.

The population density of Zone 22 is low, ranging from 6–25 people/km^2 in rural areas. Agricultural production systems are primarily traditional (manual labor or draft oxen).

The zone is the rice bowl of the south, although production is not at the level of some other parts of the country. The Anosy region produces over twice as much rice in terms of calories per person per year compared to Androy, even though the rainfall regime allows only one harvest per year. The zone does not bring in large quantities of rice on the market. It may seem surprising that any rice at all should enter the zone, but the fact is that imported rice is usually cheaper than local rice even here, and there is some demand from poorer people who cannot produce enough rice for themselves. Imported rice and other commodities come through Fianarantsoa to the district center markets and beyond.

Paid labor is primarily agricultural in the zone. Members of some poorer households also migrate for work, particularly to Tsivory, Betroka, and Bekily. On the other hand, the substantial sisal plantations attract labor from neighboring zones.

ZONE MG23 – MAHAFALY PLAIN: CASSAVA, GOATS AND CATTLE

Main productive assets	
Poor households	Better-off households
Land 1 ha Goats Poultry Handicrafts	Land 3-4 ha Cattle, goats, sheep Poultry
Main foods and sources	
Poor households	Better-off households
Cassava (MP, OP) Maize (MP, OP) Sweet potato (MP) Rice (MP) Wild plants incl. cactus Legumes (OP, MP) Pumpkins and water-melons (OP)	Cassava (OP, MP) Maize (MP, OP) Sweet potato (OP, MP) Rice (MP) Legumes (OP, MP) Meat/fish (MP)
Main income sources	
Poor households	Better-off households
Agricultural, mining labor Poultry Gathering Handicrafts Small business	Agricultural trade Livestock Small business Sharecropping
Main markets	
Local	Regional
Antranoroa Ambatry Large livestock: Betioky, Ampanihy, Gogogogo and Ejeda	Tuléar and highlands Large cities for handicrafts
Main hazards, periods, and frequency	
Drought	1/3 years
Insecurity (theft of cattle and harvest)	Especially around holidays
Locusts and other pests	May–July, 1/5 years
Cyclones	February–April, ~1/3–5 Years
Animal epizootic	March–July, 1/3 years
Coping strategies for poor households Increase livestock sales Reduce average age of the herd Increase gathering Migrate in search of labor opportunities	

This part of the Grand South region is characterized by a large plains area in the center and east at 300+ meters above sea level and a western limestone plateau at 100-300 meters above sea level that is largely unpopulated. Except for the dry, dense forest in the west, the zone's vegetation consists of xerophile and euphorbiaceae thickets as well as bushy and grassy savannahs. Soils are primarily calcimorphic and not very fertile. With rainfall of only 300 to 400 mm per year, it vies with Zone 24 in the extreme south as the most arid zone in the country. There are three seasons: a hot and rainy season (January to April), a cool and dry season (May to August), and a hot and dry season (September to December). The temperature ranges from approximately 20°C to 35°C.

Due to these difficult natural conditions, the population density is low (approximately 7 to 10 inhabitants per km²). Despite this, farms are small due to the lack of good soil and problems with water access. Livestock raising is more widespread than agriculture and is dominated by small herds of goats, and, to a lesser extent, flocks of sheep. There are large herds of cattle (zebus), but these are highly concentrated in the hands of the Better Off households, which comprise less than 10% of total households. Apart from milking-cows, cattle-keeping is practiced more for ceremonial purposes than economic reasons, linked to the belief in the divinity of the dead. When a death occurs, especially of a respected family or community member, many cattle are slaughtered and the meat is distributed for free in his or her honor. However, people are beginning to sell zebus during difficult periods. They then purchase younger animals and use the remaining money to purchase food. In recent years the rise in cattle theft has not only depleted herds but has discouraged owners from investing in herds as before. The possession of goats and sheep is also highly skewed towards the Better Off, although Poor households keep a handful. The cultivation of prickly-pear cactus has become an important source of fodder in the dry season when good grazing is hard to come by. The cactus leaves are singed to get rid of the spines and then fed mainly to cattle. At the same time the fruit of the wild red cactus, together with wild yams, makes a significant contribution to the diet especially of poorer households.

Crop performance depends on the amount of rainfall within the period from December to February at the latest. Cassava is by far the main staple crop, and it is planted from October onwards with the first rain showers but well before the main rains. Also cultivated in this period are maize, sweet potatoes and groundnuts, as well as cowpeas, mung beans and lima beans. Gathering of wild tubers and wild fruits contributes significantly to the diet and to the

income of poor households: in recent drought years the wild mangoes and cactus fruit (cultivated and wild) became the principal source of food in January-February, when most wild foods are mainly available. Even in normal times the list of wild plant products that are used as substitutes to basic foods during the lean season is very long in this zone. It includes the following plants: sosa (*Dioscorea sosa*), babo (*Dioscorea bemandri*), ovy (*Dioscorea acuminata*), 'prickly pear' cactus fruit (*Opuntia*), sakoa (*Pourpatia caffra*), lamonty (*Flacourtia ramoutchy*) and kily (*Tamarindus indica*).

Groundnuts are grown in the western part of the zone, mainly as a cash crop. But the volumes of production of groundnuts and of the different varieties of bean are too low to allow substantial sales. Unlike neighboring zones to the north and south, there is little or no rice cultivation in the Mahafaly Plain zone (with the exception of pockets in the Bezaha Mahafaly area, Ejeda, and around Bekily). There is some very localized market-gardening. To gain extra income, people migrate temporarily to work in rice paddies in the north (Tuléar, Mahajanga) and the mining areas in the east (Sakaraha, Lazarivo, Ilakaka, Ambatondrazaka, etc.), particularly during the zone's long lean season (December to February). Selling poultry and goats is another coping strategy utilized during the most difficult months of the year.

ZONE MG24 – ANDROY SEMI-ARID CASSAVA, MAIZE, SWEET POTATO AND LIVESTOCK

Main productive assets	
Poor households	Better-off households
Land <0.5 ha Small farming tools Draft oxen (1–2) Small ruminants (4–5) Poultry	Land >5 ha Plows, carts Draft oxen Small ruminants
Main foods and sources	
Poor households	Better-off households
Cassava (OP, MP) Maize (OP, MP) Sweet potato (OP, MP) Cactus (gathered flower and fruit) Cowpea (OP, MP) Rice (MP)	Rice (MP) Maize (OP, MP) Cassava (OP) Meat (OP, MP) Dairy products (OP) Fish (MP)
Main income sources	
Poor households	Better-off households
Food products Local labor Poultry and small ruminants Firewood Migrant labor Handicrafts Gathering (cactus, gourd fruit)	Marketing Cattle Cash crops Tool rental
Main markets	
Local	Regional
Tsihombe Ambovombe Beloha	Ihosy Taolagnaro (Ft. Dauphin)
Main hazards, periods, and frequency	
Drought	November–February; there is often a break in the rain in February
Locusts invasion	April–June, November, 1/10-15 years
Poultry disease	May – August
Animal epizootic	March–July, 1/3 years
Coping strategies for poor households Intensify migration in search of labor opportunities Increase consumption of red cactus, other wild foods Stock water Feed livestock burned cactus leaves Increase poultry sales	

This zone is in the southernmost part of the country and includes most of the Androy region. It is known as the country's driest area, with an average rainfall of only 300 mm/year in the south, although rainfall can reach up to 800 mm/year in the north. The rainy season lasts from November to February, with the main precipitation in the last two months. The zone's average temperatures range from 22°C to 35°C. With 5–15 people/km^2, population density is relatively low, compared to the country's other zones.

The somewhat more humid northern part of the zone has more lateritic and crystalline soil (similar to that of zone 23), conditions that are more productive for the staple cassava and sweet potatoes than in the drier south. Once the local stocks of cassava are finished, from February to May cassava is brought into the zone's southern markets from Bekily District in Zones MG22 and MG25, and from Betroka District in Zone MG22.

Maize is also staple crop here, but it has struggled against water stress in the last five or six years. It is most successfully grown in sedimentary lowlands in the southern part of the zone. But these are limited: apart from the two rivers that define the zone's west and east borders (the Menarandra and the Bemamba respectively) the main part of the zone is not served by substantial rivers: even the Manambovo river dries for part of the year. In the past maize was marketed more than consumed by households. Crops generally are collected in markets in the southern commune's administrative centers to be sent to the district capitals and Fort Dauphin. Other significant crops are cowpeas, other legumes, groundnuts and watermelons. Cassava leaves are also eaten. There is more localized cultivation of millet, sorghum and pumpkins.

Cactus plants are valuable on two counts. The invasive red cactus is now more widespread than the indigenous yellow cactus; but together their fruits furnish an important human dietary resource in the 'lean period' of the year, while the leaves are an important fodder resource for livestock, especially cattle, once their spikes have been singed. In a poor year for crop production, cactus fruit can provide as much as one-fifth of the basic food of very poor households.

Livestock systems are extensive and involve an annual migration from the South (e.g., Ambanisarika commune/Androy region) to Northern and Western zones (e.g., Antanimora Sud commune/Androy region) between May/June and October. Only zebus migrate since small ruminants are better able to withstand the heat. The distance between the home base and the destination area may be from 25 to 125 km in a normal year. Livestock are raised

for household consumption and to support agriculture, but even more so for marketing; this is particularly true for small ruminants (especially in Marolinta, Tranoroa, and Marovato) and for poultry. Zebus are raised to support agriculture (animal traction), but also in anticipation of funerals. When an important person from the family or community dies, households may decimate their zebu herd. Some households may choose to buy zebus for the funeral at the expense of buying food. This practice is gradually beginning to decline, particularly with the rising frequency of *dahalo* (cattle thieves) in the zone and in the transhumance corridors, which encourage pastoralists to limit herd size. Sometimes hundreds of zebus are stolen at a time, which sometimes leads to armed battles causing many deaths.

As regards income-earning by poorer people away from their own farms, demand for local labor is very limited because there is only one crop season. Informal gemstone mining occurs in some areas of the zone but does not absorb much of the local population. People travel outside the zone to work in artisanal mining of gemstones – to Betroka District (Anosy Region), Ihosy District and Sakaraha District (Ihorombe Region). People also work seasonally in industrial sisal plantations. Other destinations include the large cities of Tuléar, Mahajanga, and Diego (e.g. rickshaw, selling water, port labor). Seasonal work migration tends to come in the rainy season, which coincides with the 'lean season'. It is significant, therefore, that at this time migrants from poor households send money to the families they left behind.

ZONE MG25 – STAPLE CROPS AND CASH CROPS (GROUNDNUTS)

Main productive assets	
Poor households	Better-off households
Land <1 ha Hand tools Goats (few) Poultry	Land 4-6 ha Ox-plow Ox-cart (sometimes car) Cattle, goats, sheep
Main foods and sources	
Poor households	Better-off households
Cassava (MP, OP) Maize (MP, OP) Rice (MP)	Rice (OP) Cassava (OP) Maize (OP, MP)
Main income sources	
Poor households	Better-off households
Agricultural labor Groundnut sales Poultry sales Petty trade	Crop sales Livestock sales Trade
Main markets	
Local	Regional/national
Bekily Belindo Bekitro	Tuléar, Ambovombe, Ampanihy Fort Dauphin Fianarantsoa Antananarivo
Main hazards, periods, and frequency	
Rain failure Nov. - March Crop pests	Repeated drought in recent 5+ years Every year
Coping strategies for poor households	
Gather wild foods Look for extra paid work Sell off poultry, goats	

This zone lies largely within Bekily district in the north of Androy region with a leg to the south-east in Ampamata and Antanimora Atsimo communes of Ambovombe-Androy district. It sits between two highly contrasted zones – the semi-arid zone MG24 to the south, and to the north the rice-bowl of zone MG22. The area is substantial, and rather than representing simply a transitional territory it is recognizable as a zone with an economic character of its own. In this sense it can be distinguished from the south by its higher rainfall and far greater productivity especially in cassava, and from the north by its lesser production of rice and therefore dependence on a broader set of staples, as well as its substantial production of groundnuts as a cash crop.

With mainly sandy but fertile soils, this savannah area, dotted with jujuba trees, has an annual precipitation of 600-1000mm from south to north. The zone achieves a surplus in cassava, some of which is exported south to the drier zones in Androy and Anosy. The volume of groundnut production rivals that of cassava. On the other hand, while the zone does produce significant quantities of rice it also brings in imported rice from the ports of Tuléar and Fort Dauphin, rather than rice from neighboring areas of zone MG22, comparative price being the dominant factor. Maize is the main other staple grown, together with modest pulses production and market gardening where soil-moisture conditions are favorable.

This is the most 'inland' zone of the Grand South, but in market terms its strategic position between north and south is helped by good road access. Marketed groundnuts reach as far as Tuléar, Fianarantsoa and Antananarivo; cassava reaches Ambovombe and Ampanihy. On the other hand, the zone is a relatively modest producer of livestock – goats, sheep, some cattle – and these are nearly all marketed within the zone, in commune-center markets or still more locally.

There is a big difference in the amount of land cultivated by poorer and wealthier households, and the poorer are not self-sufficient in cassava, let alone other staples (they hardly produce rice at all). To pay for the bulk of their food as well as other necessities they need to seek income beyond their own farms, and they find it primarily through labor for wealthier local farmers. They also sometimes engage in construction or service work in local towns; but further migration for work is atypical.

ZONE MG26 – ANOSY CASSAVA, MAIZE AND LIVESTOCK

Main productive assets	
Poor households	Better-off households
Land ~0.5 ha Small farming tools Poultry	Land 3 ha Plows, carts Draft oxen Cattle, goats & sheep Poultry
Main foods and sources	
Poor households	Better-off households
Cassava (MP,OP,) Maize (MP, OP) Cowpeas (MP, OP) Sweet potatoes (MP,OP) Rice (little – MP)	Cassava (OP) Maize (OP, MP) Sweet Potatoes (OP) Rice (MP) Cowpeas (OP, MP) Dairy products (OP)
Main income sources	
Poor households	Better-off households
Paid labor Crop sales Sale of poultry	Crop sales Livestock sales Petty trade
Main markets	
Local	Regional/national
Local markets -> commune center (Behara, Ifotaka, Ranobe, Tsivory, Mahaly, Ebelo, Marotsiraka, Tranomaro) Staples coming in	 to Amboasary Sud from Amboasary Sud
Main hazards, periods, and frequency	
Rain failure – November-March Crickets plague Cattle theft	Used to be every 5 years but 3 years of failure between 2013/14 and 2015/16 Every 3 years Yearly
Coping strategies for poor households	
Looking for extra employment, especially mining More firewood sales More petty trade Consumption of cactus fruit	

This is a more low-lying zone than the surrounding MG22, but with a varied topography of plains, river valleys, hills and a few places of higher elevation. The main river, the Mandrare, is joined towards the south by other rivers mostly coming in from the west. The zone has a comparatively sparse population mainly cultivating moderately fertile clay/silt-based soils in the vicinity of rivers – which therefore strongly influence the location of villages. Pressure on productive land is consequently high, and the areas cultivated especially by poorer farmers are relatively small.

Rainfall is 350-500mm per year and falls between October and May, but with the major rains between November and March. The natural vegetation consists of bushy savannah and dry forest where wood, game, wild foods and honey can be collected There are also significant mineral resources in some areas in the form of mica and precious stones, notably in the Ebelo and Tranomaro communes. Although the area has been free of the severe civil insecurity that had caused it to close to normal travel before 2013, there was still significant localized banditry/cattle raiding as of 2017.

The main characteristic that differentiates this zone from the surrounding MG22 is the absence of rice cultivation other than in limited, irrigated riverside areas of the Marotsiraka, Ebelo and Tsivory communes, whence the main marketed rice within the zone and as far as the district market of Amboasary Sud. For the zone in general, there is a very high dependence on cassava as the staple crop, with some reliance on maize and sweet potatoes, while groundnuts, cowpeas and voandzou (bambara nut – *Voandzeia subterranea*) are the main cash crops. Water melons and pumpkins are secondary crops. Cactus fruit is gathered over half the year and is an important part of the diet, especially at the height of the lean season from December to February. It can provide as much as one-fifth of the yearly food calories for very poor households.

Livestock raising, including of cattle, goats and sheep (only cows are milked), is a major income-earner for wealthier households. Indeed, there are many localities far from rivers where the only use for the dry, stony land is for livestock grazing. However, poorer households rarely possess much more than poultry. They mainly depend on working on the fields of their wealthier neighbors for cash income;

they sometimes receive payment-in-kind for field labor, i.e. payment directly in food. They also engage in some petty trade and sell cut firewood, and there is some river fishing with nets. Away from their villages they sometimes find casual work in the local town, while further work migration is minimal and usually associated with artisanal mining, notably in February and March, or work in neighboring high rice producing areas in Zone 22, notably in the Tsivory area to the north-west.

The road access to markets is reasonable good in the dry season, although some localities are isolated from the road network. The rains bring problems on the universally earth-surfaced roads. The main market flows are chiefly south, from the commune centers as collection markets down to the big market of Amboasary Sud.

ZONE MG27 - MARITIME FISHING AND STAPLES CULTIVATION

Main productive assets	
Poor households	Better-off households
Small canoe Land 0.5 ha Hand tools Poultry	Small-medium canoes Land 2 ha Plow with oxen Ox-cart Small ruminants Poultry
Main foods and sources	
Poor households	Better-off households
Cassava (MP, OP) Sweet potato (OP, MP) Maize (MP, OP) Cowpeas (MP, OP) Fish (OP)	Cassava (MP, OP) Sweet potato (OP, MP) Rice (MP) Maize (MP, OP) Pulses (MP, OP) Fish (OP) Meat/dairy products (OP/MP)
Main income sources	
Poor households	Better-off households
Fish Firewood sales Wild food sales Work migration	Fish Petty trade
Main markets	
Local	Regional/national
Fish – direct trader offtake from producer or village market -> district town markets Crops – village / commune markets Imported rice from Tulear, Fort Dauphin	Tuléar Fort Dauphin Tamatave Antananarivo Export
Main hazards, periods, and frequency	
Fishing: High winds Cyclone Fish theft (pirates) Drought for crops	June-October: annually February-March: every 4 years January, May-October October - March
Coping strategies for poor households	
Sell more firewood Intensify poultry sales Migrate for work	

This 500-600-kilometer-long zone rims the coast from Ambohimanahavelona commune in Tuléar II district (Atsimo-Andrefana region) to Analapatsy commune in Taolagnaro district (Atsimo-Atsinanana region). As such it borders two large livelihood zones with different ecologies and economies (MG23, MG24). But the economic logic of the household economy holds all along its length: the mixture of sea fishing and to a greater or lesser extent staple crop cultivation. The distinctive aspect of the fishing from the point of view of economic vulnerability is that it is not affected by the hazards to crop cultivation, especially drought. This means that even if crop cultivation in the zone *is* affected, fishing income presents a stronger and safer buffer for households than, say, livestock for inland farmers which may also suffer severely from drought.

The typical households here, whether poorer or wealthier, operate as discrete producing units (or sometimes in an association) for both fish and crops: employment by one person of another is uncommon. The essential asset is a canoe, usually small and carrying not more than a handful of people, propelled by oar not motor, and with a wooden float-bar extending from one side to steady the boat in ordinary sea conditions. By the same token net sizes are relatively modest, as opposed to long drag-nets. A small minority among the wealthier people may own larger boats with motors, Types of catches vary according to localized conditions, with a different balance of fish, from sardines to tuna, and crustaceans from prawns to lobsters. Lobster production alone across the zone may reach some hundreds of tons in a year.

As with livestock inland, the value of the fish lies very much more in its sale than in family consumption. And although fish and seafood are par excellence perishable commodities, almost all are sold fresh by the fishers, rather than being dried or smoked. The target customers are not local, but mostly inland and in towns. This bespeaks an efficient and rapid marketing system, where specialized traders with small trucks take fish directly from the fishers or from local market points to main markets such as Tuléar, Ampanihy, Beloha, Tsihombe, Amboasary Sud or Fort Dauphin. A trade in chilled or frozen produce even takes more high value fish and crustaceans as far as Antananarivo and the export market. In the past areas there was substantial sale of seaweed for commercial use especially from the Tsihombe and Beheloka coast, but this has fallen off in recent years. Hazards to

fishing vary from winds that from one day to the next prevent boats from going out, especially between June and October, to the cyclones that strike every four years or so. Overfishing can be a problem, notably where a substantial town market is nearby, notably the port towns of Fort Dauphin and Tuléar with the tourist industry in its vicinity.

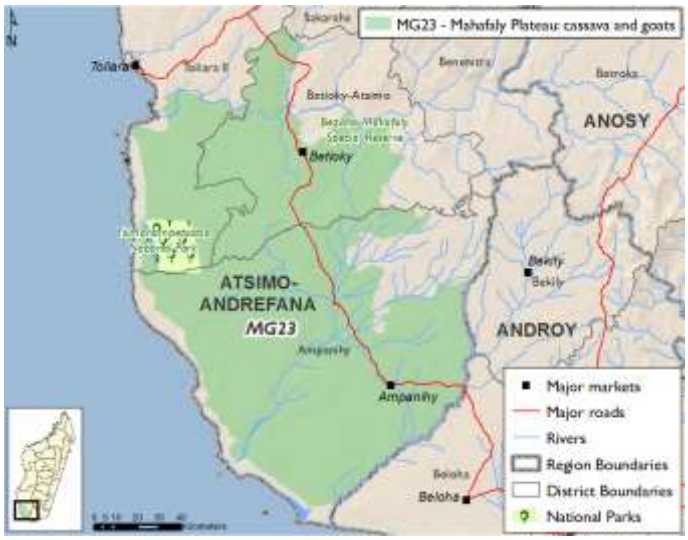
Villages and hamlets are usually situated within half a kilometer of the beech, in an environment of sandy soils and low bush vegetation and coastal mangrove forests, with some lagoons. The size of land cultivated and the rainfall conditions (under 400mm of annual precipitation) mean that few people, even wealthier households, achieve anything near self-sufficiency in staples, but they do cultivate a variety of crops: cassava, sweet potato, cowpeas, haricot beans, watermelons, sometimes cactus for the fruit and for fodder, and maize especially in some of the southern coastal stretches. Livestock are mainly small ruminants, including goats and poultry, and with pigs in some areas. Only the wealthier households tend to own more than poultry.

A certain number of poorer people are unable to earn enough from fishing (some do not fish at all) to be able to buy the required balance of food and to pay for the other essentials of life. The options open to them are to collect and sell what nature affords them on-land, whether cactus fruit or coconuts or firewood. Otherwise they have to migrate seasonally for work, usually in towns as cycle-rickshaw riders, hawkers, security guards etc., or sometimes in artisanal mining locations.

LIVELIHOOD BASELINE PROFILES FOR ZONES MG23, MG24, AND MG26

MAHAFALY PLAIN: CASSAVA, GOATS AND CATTLE LIVELIHOOD ZONE (MG23)[5]

Zone Description



The *Mahafaly Plain: Cassava, Goats and Cattle Livelihood Zone* is located in the south, or *Grand Sud,* of Madagascar and covers the districts of Betioky-Atsimo and Ampanihy, as well as the southern edge of the district of Tuléar-II. The zone lies inland from the coast and is characterized by vast plains and savannahs in its center and eastern sections. These plains are low lying at only 300+ meters above sea level. The eastern region of Betioky and the northeastern communes of Ampanihy are greener and have more agricultural production than the west due to the tributaries of the Onilahy River that run through the area. The western section of the zone is characterized by a limestone plateau at 100-300 meters above sea level. This part of the zone is largely unpopulated. The western portion is also drier and relies more heavily on livestock raising. Vegetation in the zone is diverse, with dense spiny forest mainly of the *Didiereaceae* family in the west, and in the center and east, *Xerophile* and *Euphorbiaceae* thickets as well as bushy and grassy savannah. A mix of secondary grassland, deciduous woody plants and evergreen succulents characterize the more interior areas. Several species of prickly pear cactus (*Opuntia)* have become important to the subsistence of Mahafaly pastoralists who use the fruit for food and as a cash crop. Moreover, the leaves are used as fodder for cattle. For these benefits, pastoralists sow, prune and shape prickly pear plants into enclosures around their corrals and villages. [6] Overall, due to the difficult natural conditions, the population density in the zone is low (approximately 7 to 10 inhabitants per km²).

Even in a moderate rainfall year, the zone has marginal production potential. Poor soil, an arid climate, limited natural in-ground water sources and most importantly, low annual rainfall, make food production challenging, even in a good year. Soils are primarily calcimorphic with limited agricultural potential due to low fertility and their sandy and rocky nature. Water in the zone comes from seasonal rivers, the largest of which is the Onilahy River. However, riverbeds and tributaries dry up during most of the year, forcing households to travel farther to fetch water or to resort to the use of overcrowded and polluted water holes. Lake Tsimanampetsotsa and its surrounding coastal dune complex are an important wetland in the southwestern region of the zone, protected within a national park. Fish from the lake provide a significant food source and livelihood activity for households in the area and lake water is used by those who can access

[5] Fieldwork for the current profile was undertaken in October of 2017. The information presented in this profile refers to the reference year, which was the consumption year that covered the period November 2016 to October 2017. Provided there are no fundamental and rapid shifts in the economy, the information in this profile is expected to remain valid for approximately five to ten years (i.e. until 2022-2027). All prices referred to in the document are for the reference year.

[6] Cactus cultivation has had the economic effect of both sedentary and transhumant intensification. It extends the stay of pastoralists at their villages and structures the timing of their seasonal migration to pastures beyond the *fokontany*.

it for both agriculture and livestock. Most households in the zone, however, do not have good access to a natural water source. Low annual rainfall further exacerbates the marginal productivity of the zone's dry climate and infertile soil.

With rainfall only 300 to 400 mm per year, the *Mahafaly Plain: Cassava, Goats and Cattle Livelihood Zone* vies with its neighboring zone (*Androy Semi-Arid Cassava, Maize and Livestock*) as the most arid zone in the country. The zone is characterized by acutely low and erratic rainfall which is spread over a small number of days. There is great inter-year variability depending on whether or not cyclones pass by, with prolonged periods of drought lasting several years. Indeed, between 2013-2017, the zone experienced a severe and prolonged drought. There are three seasons: a hot and rainy season (December/January to March), a cool and dry season (May to August) and a hot and dry season (September to December).[7] The temperature ranges between approximately 20°C to 35°C.

The zone supports small land holdings of mixed farming, principally cassava, maize, legumes (cowpeas, mung beans, dry beans and lima beans), groundnuts and sweet potato, as well as some localized market vegetable gardening. Crop performance depends on the amount of rainfall within a very constricted period, from December to February. The main crops grown for consumption are cassava, maize, cowpeas and sweet potato. Cassava is the main staple crop grown by all wealth groups. Better-off households are able to grow significantly larger quantities of these crops, so their dried stores last most of the year. While there are no real cash crops in the zone, the main crops that households grow for income are mung beans and groundnuts, as well as cowpeas for some households. Groundnuts are grown mainly in the western part of the zone. Unlike in the neighboring zones to the north, there is little or no rice cultivation in the Mahafaly Plain Zone (with the exception of pockets in the Bezaha Mahafaly area, Ejeda and around Bekily).

Land preparation is performed by hand hoe and spade using family labor, or in the case of the wealthier households, hired labor. Most better-off households cultivate with a plough and oxen. Land preparation, planting, weeding and harvesting are the primary agricultural activities performed by the whole family, including children. Weeding requires the most labor because it is done up to three times during the season for each crop. A family may be hired to prepare or weed one or two hectares through a contract that pays one lump sum when the land parcel is complete. Another arrangement is that related households will exchange planting labor. In a region where erratic rainfall, high seed prices and low germination affect decisions around the timing of planting as well as seed quantity, most households prefer to be in charge of their own planting by using family labor.

There are many factors that limit agricultural production in the zone. A principal constraint is that agriculture is rainfed and consequently, insufficient rainfall severely limits production. Moreover, late rains are increasingly changing the agricultural calendar. In addition, farms are small due to limited access to water and poor soil conditions. Lack of access to seed, due to scarcity and high cost, is also a factor that limits production. Thus, overall, the *Mahafaly Plain: Cassava, Goats and Cattle Livelihood Zone* suffers from insufficient food production 4 out of 5 years and is recognized as a chronically food deficit zone.[8]

Given these adverse conditions for crop production, livestock raising has become widespread, particularly in the arid west where there is insufficient rain for agriculture. Livestock raising is dominated by small herds of goats, and, to a lesser extent flocks of sheep. Most households also keep chickens. Large herds of cattle

[7] Historically, the rainy season began in October and lasted through February but in recent years the rains have been coming later and later, and the peak rains now begin in January except in the northeastern region of Betioky, where rainfall may begin as early as November.

[8] Poor households only meet about 15% of their annual food needs from their own crop production, while better-off households are able to fulfill up to 45% of their food needs from their own harvests. Very poor and poor households meet their remaining food needs by foraging wild foods (20%), by food purchase (30-45%) and by food aid and school feeding (8-20%).

(*zebu*) are common, but these are highly concentrated in the hands of the better-off households who comprise less than 10% of total households. Apart from milking cows, cattle raising is practiced more for ceremonial purposes than economic reasons, linked to the belief in the divinity of the dead. When a death occurs, especially of a respected family or community member, many cattle are slaughtered, and the meat is distributed for free in the dead person's honor. However, increasingly, people are beginning to sell *zebu* during difficult periods. They then purchase younger animals and use the remaining cash to buy food. In recent years, increased cattle theft has not only depleted herds but has also discouraged owners from investing in herding as a way to safeguard wealth. The possession of goats and sheep is also highly skewed towards the better-off, although poor households keep a handful.

Free grazing is the main method for feeding livestock in the zone. Herds are allowed to wander freely in search of pasture, under the oversight of a shepherd, usually a young boy from poor households in the case of herding goats and sheet, and/or a hired male relative from within the owner's family to herd the family's *zebu*. Herds feed on grass and crop residues (leaves and stalks of cassava, maize and straw), while poultry feed on grains (maize) and grubs, and any leftover food scraps. During the dry season when pasture is limited, the leaves of the prickly-pear cactus are singed to get rid of the thorns and then fed mainly to cattle. Maize cobs are also fed to cattle in this way. These feeding methods are referred to as "nutritional supplementation." Goats and sheep also follow free grazing. Sections of brush or forest are often burned to allow goats to more easily graze without being obstructed by thorns. In general, livestock are mobile and follow the rain. Peak seasonal migration occurs during the dry season from September until December, when herds are generally taken north or east in search of greener pasture. Migrating herds can go to other periphery communes or as far as other districts. If conditions continue to be better than in the village, herds will migrate for the whole year. Reciprocal grazing rights are practiced among herders and land owners throughout the zone. Lactating animals generally do not migrate beyond the periphery of the village. Cows are milked for household consumption and sale, however, due to the drought-stricken conditions, milk production was low in the reference year, averaging only 1 liter/cow/day during the 3 rainy months, January-March. Goats are not milked for general home consumption, only to provide supplementary food to infants and children from 7 months to 3 years. It is considered taboo to milk sheep. During the wet season, livestock are watered at local ponds and rivers whereas during the dry season they are watered from hand dug wells in riverbeds or from the same communal village well water points as households. Access to sufficient water and adequate pasture is a significant problem for livestock owners, especially between September and December.

Livestock production in the zone is greatly limited by periodic drought and by disease. When herds are malnourished and dehydrated, they are more susceptible to parasitic and insect-borne infections. Given the importance of livestock to household economies in the zone, this high burden of infectious disease among herds significantly limits production potential and livestock assets. Households may lose up to 25% of their monthly income under current disease conditions. A parasitic disease known as "*Soko*" commonly affects *zebu*, goats and sheep, and newborns are particularly susceptible. "*Besoroky*," a condition of inflamed muscles; "*Piroplasmose*" which causes bloody urine; "*Heart Water*" a form of mad cow disease; and tick-borne bovine anaplasmosis are all diseases that affect *zebu* and can decimate a herd. Avian cholera is a contagious, bacterial disease that affects poultry with sudden onset and high morbidity, often killing off the entire poultry population of a village. Poor households who only own chickens and one or two goats, are particularly vulnerable to the economic impact of livestock diseases. Vaccinations for *zebu* are officially mandatory, however, the **Malagasy Ariary (MGA)** 15,000 cost is prohibitive to many households so many animals are not vaccinated.

Gathering of wild tubers and wild fruits contributes significantly to the diet and to the income of poor households. In recent drought years, wild mangoes and cactus fruit (cultivated and wild) became the principal food source in January and February, when most wild foods are available and harvest stores are depleted. Even in normal years the list of wild plant products that are used as substitutes to basic foods

during the lean season is very long in this zone. It includes the following plants: *sosa* (*Dioscorea sosa*), *babo* (*Dioscorea bemandri*), *ovy* (*Dioscorea acuminata*), *raketa* (*Opuntia*), *sakoa* (*Pourpatia caffra*), *lamonty* (*Flacourtia ramoutchy*) and *kily* (*Tamarindus indica).*

Public services within the zone are limited. Drinking water, for both poor and better-off households comes from seasonal riverbeds, wells and boreholes. Not all villages have a water source and during the dry season women and children may spend several hours a day fetching water from wells in neighboring villages. Better-off households pay women from poor households to fetch water. Poor households reside in smaller straw homes while better-off households build more permanent structures of wood. Tombs are the only structures built of stone and their construction when a family member dies is the largest expense a household will have during the year. Only a handful of villages in the zone have health clinics, and many require long waits, particularly during peak disease periods like malaria season. There are no banks or formal credit lenders at village level in the zone. The practice of informal credit is common, mainly borrowing food for consumption, to be paid back with interest in-kind. When cash is borrowed, a 10% interest rate or the equivalent in livestock is expected. Mobile phone use is not common in the zone, except among better-off households. There are primary schools in most hamlets which children from all wealth groups attend. Secondary schools are located in commune and district centers; some better-off households send their children to secondary school. During the reference year, food aid was distributed between 1 to 6 months, stopping in June 2017. A WFP school feeding program has been in place in primary schools since 2015, contributing significantly to household food needs.

Markets

Trade and market access in this zone are made difficult by the lack of well-maintained, all-season roads at village level and the long distances between villages and trade centers. While the rainy season is brief, many roads become impassible from January to March and trucks with staple goods cannot get through. There is one main road, National Route 10, which connects the districts of Betioky in the north and Ampanihy in the south, and serves as a trade route further north to Tulear and south to Fort Dauphin. While this major trade route into the zone provides good accessibility year-round, the roads into villages are often no more than sandy and rocky paths that become impassible during the wet season. Moreover, local roads can be covered up by sandstorms and require long travel times. Rough roads also mean higher transport costs for farmers and traders, including expensive truck hire when roads are inaccessible by local oxen-drawn carts (*charrettes*).

Local crop production is not significant enough to export internationally or even to export beyond the southern region. The surplus harvest that exists, is sold in local markets to meet demand within the region. Crop supply and trading, therefore, follow the seasonal calendar with peaks during the harvest period for each crop and lows during the lean season as well as during the months between planting and first harvest. Maize is first harvested for green consumption at the household level in March and is then sold only at local markets in April and May. Sweet potato is sold fresh from June-August at local village and commune markets in Betioky and Ampanihy. From here it may be traded on to Masiaboay and Maroarivo. The main crop, cassava, is harvested from June through September, and can be found for sale as a fresh crop during these months at village, commune and district markets. Middle and better-off households produce surplus stores of cassava and are able to dry the crop and continue to sell dried cassava tubers into January and February. Farmers who can afford to wait and sell cassava during the late lean season receive a price point advantage as there is considerable variation in price throughout the year, with one kilo of cassava, measured by pile (*tas*), bringing MGA 400 at harvest but up to MGA 1,000 in January, when supplies are low. The trade route for cassava starts at the farm gate, where households take the harvest by oxen-drawn cart to the village or commune market. An oxcart can carry on average 200-300 kg of cassava. Middle and better-off households may own a cart whereas poor households pay an oxcart owner to transport the crop to market. Significant income from oxcart transport is made during harvest periods by households who own and hire out their

oxen and cart. From the local markets, cassava is purchased by households as well as by traders who then take the crop to district markets in Betioky, Ampanihy and occasionally as far as Maroarivo.

There is close to zero rice production in the zone and maize production is limited, so rice and maize are the two main crops that are imported into the zone. Rice is imported from northern zones, mainly from Anosy and the Tsirobihina Delta (MG20), and maize is imported from neighboring Tulear and Androy regions to the north and east. From administrative centers in these regions outside the zone, rice and maize are sent to the district capitals of Betioky and Ampanihy and then to regional and commune markets. Rice is purchased year-round whereas maize is primarily purchased from September to January, in the off-season.

The trade routes for livestock extend farther than for produce due to higher demand and better prices in urban centers and easier transport mobility. There is significant demand for beef in Betioky and Ampanihy district capitals as well as in the urban centers of Tulear, Fort Dauphin and Antananarivo. Village herds are brought to Betioky district market from where they are purchased by traders and taken to Maroarivo and Betroka, then north to Tulear and Antananarivo. The southern trade route goes from Ampanihy district market to Beloha and Ambovombe then on to Fort Dauphin. *Zebu* are traded year-round, with peak sales from December to February when beef is in demand for New Year celebrations and when money is needed at the end of the lean period. Goats and sheep sales also peak at this same time although trade routes for small ruminants do not extend as far. In the district of Betioky, goats and sheep are brought to the commune market and from there they are traded to Masiaboay, Beavoa and Beantaky. From the Ampanihy commune markets, they are either purchased by local households or are taken by traders to Maniry.

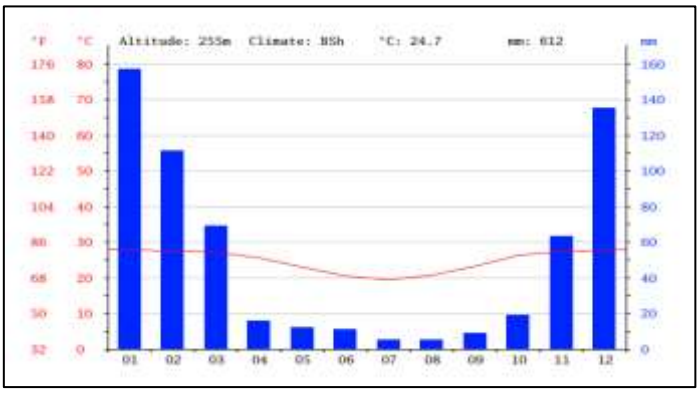
The labor market is mainly local; however, labor opportunities are relatively low within the zone so seasonal labor migration outside the zone is also common. About 70% of local casual labor performed is undertaken in rural areas. Rural casual labor includes agricultural activities on the farms of middle and better-off households, such as land preparation, weeding and harvest, as well as firewood and charcoal collection and sales. Roughly 5% of labor is performed in urban centers of local towns, including prepared food and handicraft sales, domestic work and trading. The remaining 25% of labor is sought outside the zone. To gain extra income, people migrate temporarily to work in rice paddies in the north (Tuléar, Mahajanga) and in the productive regions along the Onilahy River, as well as in the mining areas in the east (Sakaraha, Lazarivo, Ilakaka, Ambatondrazaka), particularly during the zone's long lean season (October to January). Typically, it is the male head of household or adult son who leaves the zone in search of seasonal labor.

Timeline and Reference Year

A HEA baseline assessment refers to a very specific time period called the reference year. In HEA, the reference year typically coincides with the "consumption" year, that is, a year starting with the main harvest and finishing at the end of the lean season. In the case of this baseline assessment, which was carried out in the aftermath of a prolonged drought, it was not possible to select a recent consumption year that was not marked by failed production and severe hunger. A different approach was therefore adopted. In short, the reference year covers the 12-month period from November 2016 to October 2017. November 2016 marks the start of the lean season and the reference year concludes at the end of the sweet potato harvest in October. The year was characterised by an inconsistent rainy season, with interrupted rains in November, causing the first planting to fail, but then favorable rains in January, following the cyclone *Enawo*. Sufficient late rains arrived for minimal production of cassava and a second planting of maize and cowpeas (at least for those households who could afford seed). It was overall a below average production year. A locust infestation destroyed much of the maize crop and production was very poor for cowpeas, mung beans and groundnuts due to seed shortages and very high seed prices. Nonetheless, the 2016-2017 cultivation year reflects to some extent the contribution of crops to the household economy although the lingering impact of drought and pests on both crops and livestock must be considered when reviewing the reference year results.

Year	Rank	Critical Events
2016-2017	2	Very low production due to lack of consistent rain, high seed prices and locusts. Rain arrived in October, but stopped during November, which caused a complete loss of the first planting. Slightly better year than the previous year due to a cyclone in January that brought more rain. Emergency food aid and school feeding benefited 40-50% of households in the zone.
2015-2016	1	Lowest production in the last five years. Drought due to failed rains in December-January. Locusts and livestock disease.
2014-2015	2	Very low production due to drought and locusts.
2013-2014	3	Average production due to increased rainfall following a cyclone.
2012-2013	2.5	Slightly better than average production due to increased rainfall, but rains came late. Insecurity due to livestock theft.
5 = an excellent season for household food security (e.g. due to good rains, good prices, good crop yields, etc) 4 = a good season or above average season for household food security 3 = an average season in terms of household food security 2 = a below average season for household food security 1 = a poor season (e.g. due to drought, flooding, livestock disease, pest attack) for household food security		

Seasonal Calendar for Reference Year



Source: Climate-data.org, Climograph **Betioky** town (average rainfall 1982-2012). Blue bars indicate rainfall/month.

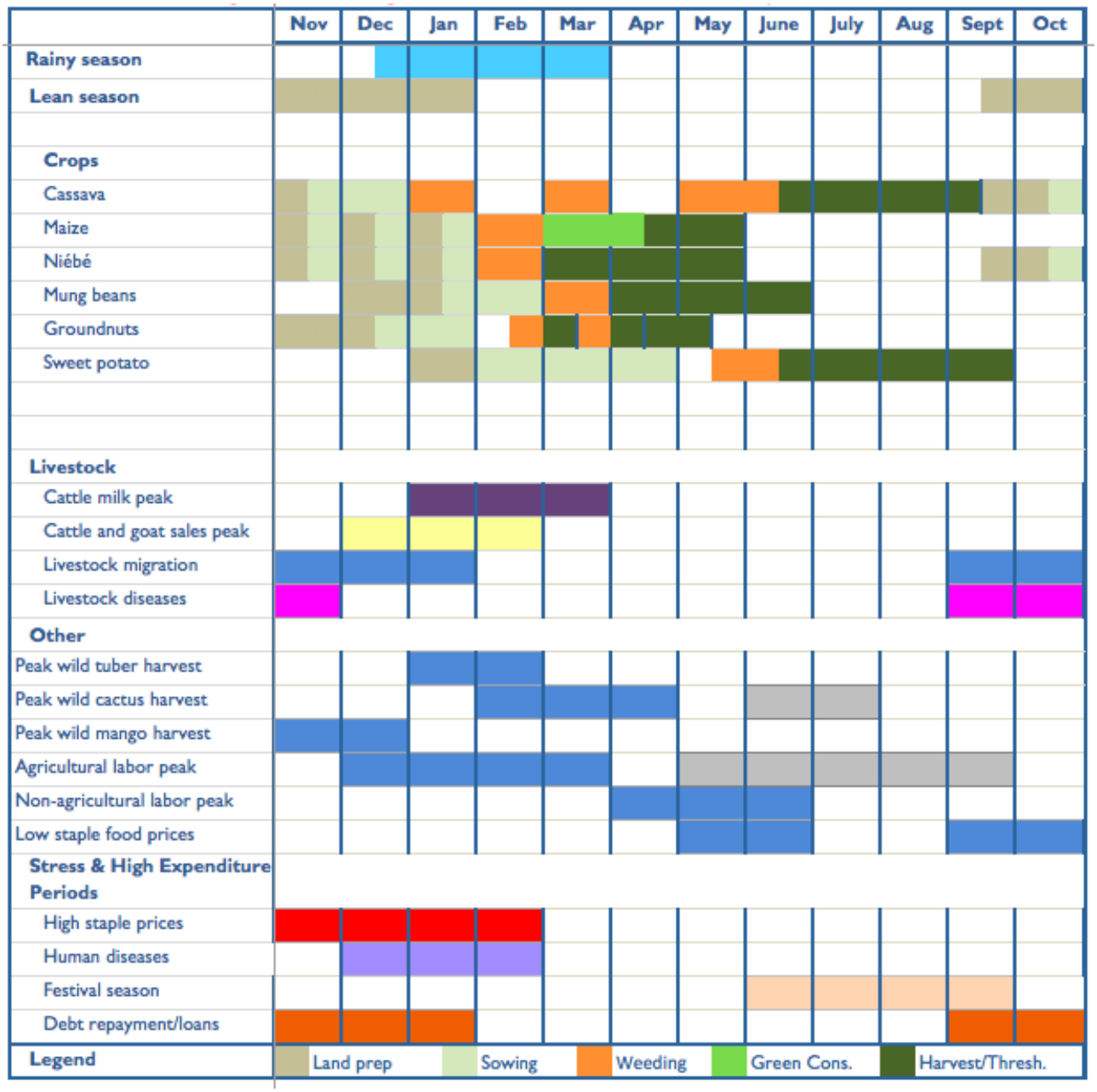
There is a single rainy season in the *Mahafaly Plain: Cassava, Goats and Cattle Livelihood Zone*. The period of highest and most predictable rainfall is from late December to March. However, the rains can start as early as October or November, and this was the norm until recent years. Villagers noted that in the last ten years the rains have arrived later and later and are now more erratic. In particular, very little rain is received overall in the year. 300 mm per year is the average total annual rainfall for much of the zone, increasing to 400 mm per year in the northeastern communes. The average number of rainy days per year is often less than 30. Thus, there is a long dry season lasting from April through to November/December (8-9 months), making this area one of the most arid zones in the country.

September through December is the main period when farmers prepare their land for cassava but the work continues into January for their other crops. Cassava is planted from October onwards with the first rain showers but well before the main rains. Also cultivated in this period are maize, sweet potatoes and groundnuts, as well as cowpeas, mung beans, dry beans and lima beans. Weeding takes place immediately after germination and continues until harvest, with most crops weeded up to three times, again, depending on rainfall. The first crops ready for harvest in March are maize (green consumption), cowpeas and groundnuts (i.e, short-cycle crops). Cassava is eaten fresh starting from mid-June to mid-September with the peak harvest in August. Surplus cassava is dried and stored to be consumed and sold throughout the year. Sweet potatoes have a similarly long harvest period from mid-June to the end of September, depending on the time of planting. Sweet potatoes are only eaten fresh and consumption ends in October. To make most efficient use of land, farmers intercrop cassava with legumes and maize with groundnuts and sweet potato.

Once the tuber harvest is over and when most households have consumed their own production, the lean season begins. September marks the general start to the lean season. The peak months are October-January. During this period, food prices rise, peaking from November to February for the staple crops. At this time, poor households supplement food purchases by gathering wild tubers and mangos and fruit from cactus plants. Wild

tubers are foraged in January-February and prickly pear cactus fruits are collected from February-April, providing an important calorie supplement to households during the final months of the lean season.

The lean season also coincides with the main period of migratory labor. Those who migrate (usually the household head) stay away until the next production season begins. This is also the time when livestock herds migrate in search of pasture. Other sources of income, such as sales of firewood and charcoal, occur throughout the year but decrease during the rainy season.

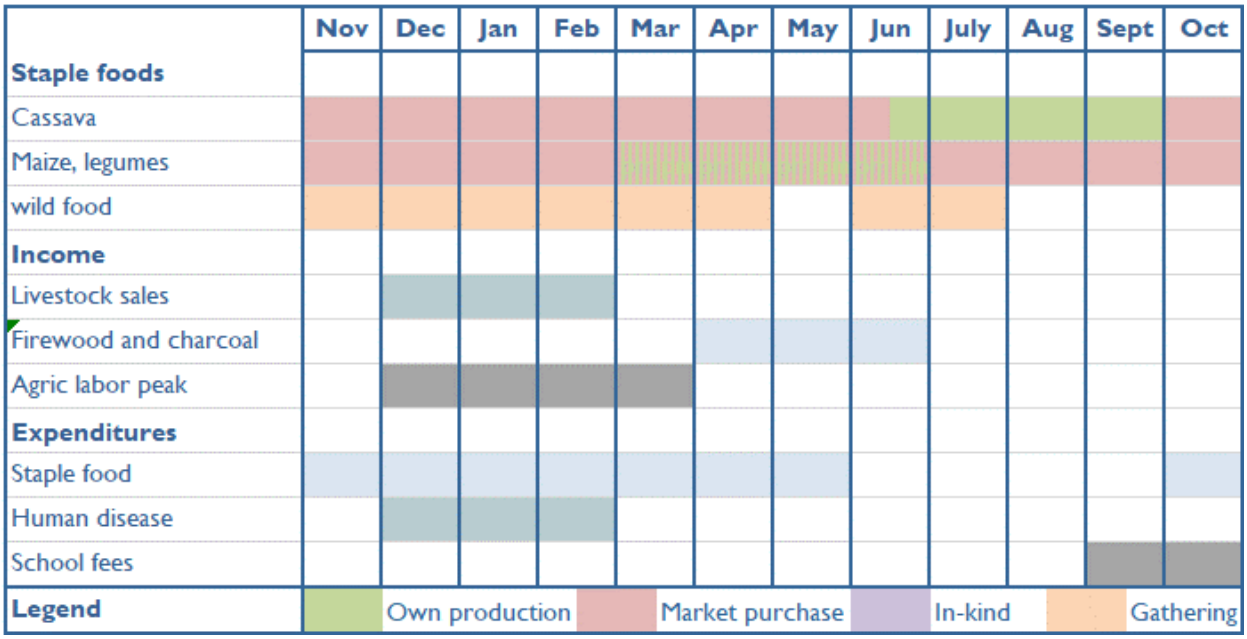


Agricultural labor peaks during the rainy season, from December to March, when land can be worked, crops planted and weed seed germinates. January-March are the months when the most on-farm employment can be found. Weeding is the most common activity, as each crop needs to be weeded up to three times. Cassava weeding can extend into June.

The rainy season is also the time of livestock births when pasture has been renewed and the new pasture enables milk production. Milk yields peak between January to March. Cattle and goat sales are highest from December

to February as this coincides with the lean season when food purchases typically peak and thus cash needs are highest. Livestock are also weakened by the end of the lean season, making them susceptible to the parasites and bacterial infections that come with the start of the rainy season in December. This is therefore a convenient time for herders to sell their livestock to both receive cash for food and to trade in their livestock before they are further weakened or die from disease.

Other important periods on the seasonal calendar to note are times of high expenditure and other stresses to households. Staple food prices are highest from November to February, when new crops have been planted and reserves from the previous harvest are depleted. Peak human illness occurs around this same time, from December to February, when the rains bring water-born infections and malaria. In many parts of the zone, the consumption of large quantities of mangoes in November-December causes illness which can be a significant economic stress. January 1 is an important holiday in Madagascar and large amounts of money is spent on festivals, food, clothes and gifts at this time.



The calendar above shows how poor households typically access major food items during the year, and the sources of income that are available to them in each season. Expenditures increase during certain points in the year, thereby placing additional pressure on the household budget.

Cassava, maize, and legumes are the main staples in this livelihood zone. Cassava is mostly harvested in mid-June; however, household stocks are typically depleted by the end of September. Therefore, from October until the next harvest in June, poor households must purchase cassava from the market. Maize and legumes are harvested from March until June. The amounts harvested vary but for the most part yields are low, so households also purchase maize and legumes from the market. Wild foods are an important part of the poor households' diet and are gathered from November until April and again in June and July.

Agricultural labor, firewood and charcoal sales, and to a lesser extent, chicken sales, are the main sources of income for poor households in this livelihood zone. Agricultural labor, which includes land preparation, sowing and weeding, is the dominant source of cash for poor households. From December until March, poor households will work on the farms of wealthier households in order to earn cash. They supplement their annual income by collecting and selling firewood and charcoal, and selling chickens as needed.

Wealth Breakdown

Wealth group differences have been significantly reduced by the drought in this zone. Three years of drought and hardship have meant loss of productive assets and general impoverishment for all of the population, but particularly for the very poor, poor and middle households. A number of better-off households with sufficient means to relocate have left the zone, further reducing wealth differences. Villagers categorize households into three varying groups of poor (the majority of the population) and then a small group of better-off. Despite this challenge, four levels of wealth among households were described.

		Wealth Groups Characteristics				
		HH size	Land cultivated (ha)	Crops cultivated	Livestock	Other productive assets
Very poor		7-9 (8)	0.25-0.75	cassava, maize, legumes, groundnuts	none	
Poor		7-9 (8)	0.25-0.75	cassava, maize, legumes, groundnuts	2-6 goats; 1-3 sheep, 1-2 chickens	
Middle		7-9 (8)	0.5-1.5	cassava, maize, legumes, groundnuts, sweet potato	8-10 goats, 2-4 sheep, 5-7 cattle, 5-10 chickens	oxcart
Better off		7-9 (8)	2-4	cassava, maize, legumes, groundnuts, sweet potato	40-45 goats, 32-38 sheep, 55-65 cattle, 20-25 chickens	oxcart, plough, wooden or stone house

The major difference between wealth groups is livestock ownership. The better-off have very large herds of livestock (55-65 cattle, 40-45 goats and 32-38 sheep). The large quantity of *zebu* is the most significant defining characteristic of better-off households because these assets are the most valuable. It is cattle ownership that makes the better-off much wealthier than the rest of the population. Middle households have smaller herd sizes (5-7 cattle, 8-10 goats, 2-4 sheep), but these livestock are important assets, especially in a time of drought when crop production is poor. Land size is also a distinguishing characteristic between wealth groups, with better-off owning between 2-4 ha of land, middle between 0.5-1.5 ha and the poor and very poor less than 0.5 ha. Livestock ownership and larger land holdings allow better-off and middle households to earn an important part of their income from livestock sales and rental, and crop production. Oxcarts are another important asset for middle and better-off households. In a zone with poor roads and long distances to water points and market, oxcarts are the primary means of hauling water and transporting crops to sell. Households who own oxcarts are able to rent out their transport services throughout the year but particularly during the harvest season. In addition, better-off households own a plough, further increasing their food production and crop income potential. In some regions of the zone, better-off households can afford to build homes out of wood or stone, making them less susceptible to insect and rodent-borne diseases than the rest of the population who live in straw huts.

Many similarities exist between the very poor and poor. While these two groups cultivate the same land size, roughly 0.5 ha, the very poor do not own any livestock. The poor own only small ruminants (2-3 goats, 1-3 sheep) and poultry (1-2 chickens). When land size is small or soil infertile, both very poor and poor households may cultivate additional land through sharecropping (*metayage)*. In a sharecropping arrangement, tenants will pay the landowner a portion of the harvest. If crops fail, tenants will be forced to pay for land use either in cash or by taking out a debt which they hope to repay the following year. Overall, land and livestock assets that are owned by the very poor and poor generate only enough produce or meat for household consumption and are too low to bring in significant income from either crop or livestock sales.

In addition to livestock sales and crop production, there are other differences in how the various wealth groups

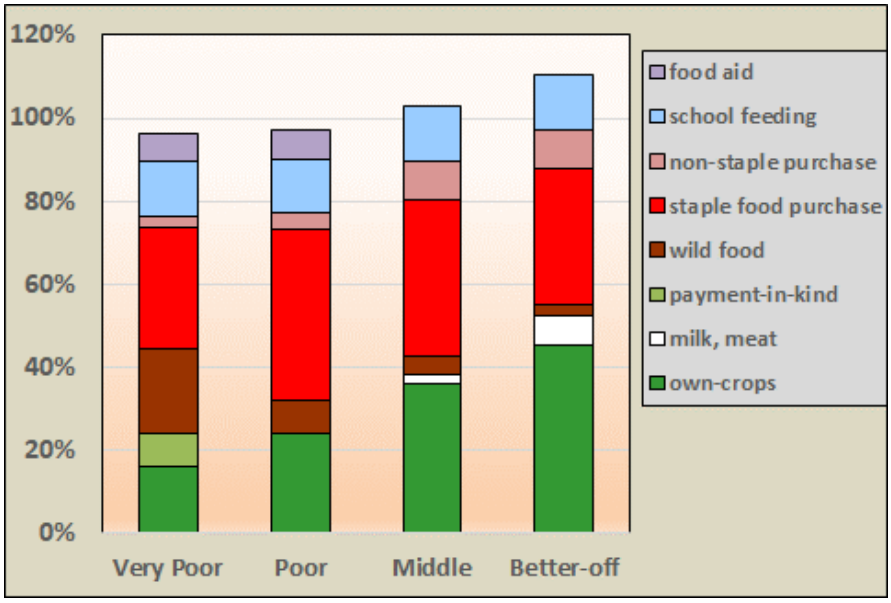
generate income. Better-off households often operate trading businesses by purchasing crops and livestock in the *fokontany* for resale at district markets. Moreover, they may have small businesses, for example selling prepared food or coffee in the town center. Middle households rent out their oxen and carts and operate transport businesses. Both very poor and poor households perform seasonal agricultural labor when it can be found but it is only the poor who are able to migrate in search of labor outside the zone, as the very poor do not have the funds to pay the transport costs. Some of the very poor may earn income by begging during market days. All wealth groups earn income from wild food sales, though the better-off only harvest and sell mangos. The women of all wealth groups except the better-off earn income year-round from the sale of handicrafts, such as straw hats, handbags and mats.

No link between household size and wealth was found, with households averaging 7-9 people across all four wealth groups. In a number of villages, poor households mentioned that the primary bread winner (usually the male head of household) had left due to the drought crisis to find work outside the zone. It was unclear how long these household members would be away and it was not common for single-headed households to receive remittances or money from the absent household member.

The majority (75%) of the population in the zone was identified as poor and very poor. Nearly half the population during the reference year was very poor (45%) and almost one third was identified as poor (30%). On the other hand, the proportion of the population considered better-off is extremely low (7%) and the middle wealth group was also quite low (18%). The high level of poverty is likely a reflection of the extended drought crisis which caused households to lose assets and wealth differences to decrease. If conditions improve, it is likely that wealth proportions will change in subsequent years. It is unlikely that an economy with such a high proportion of poor households and small number of better-off households will be sustainable for the long-term.

Sources of Food

The graph to the right presents the sources of food for households in different wealth groups in the livelihood zone for the period November 2016 to October 2017. November 2016 represents the onset of the lean season and the beginning of the rainy season whereas October 2017 marks the typical end of the period of consumption from own-crops. Food is presented as a percentage of 2100 kcal per person per day for the 12-month period.



In the graph, food access is expressed as a percentage of minimum food requirements, taken as an average food energy intake of 2100 kcals per person per day.

In the reference year, there were two main sources of food and two minor sources. The main sources were own crop production and the market. The minor sources were food aid (emergency distributions and school feeding) and wild foods. The differences in the relative balance of these sources, shown in the graph, reflect the differences in wealth. Better-off and middle households cultivate more land, and therefore have a higher reliance on own crops; they also have more livestock, which gives them access to milk and meat. Poorer households, on the other hand, with less land and less livestock, and lacking cash to increase food purchase, turned to the foraging of wild foods to make up for gaps in their capacity to produce.

Overall, for very poor and poor households, own crops met between about 16-24% of annual household food needs; food purchase accounted for between 31-45%; wild foods fulfilled 8-20%; and food aid met about 21% of food needs. For better-off and middle households, own crop production fulfilled about 36-45% of food needs, food purchase about 42-47%, food aid about 13% and only about 2-4% of food needs were met through foraging wild foods. The total number of calories consumed by households varied by wealth, with better-off households meeting roughly 110% of their minimum needs in the reference year, and very poor households just barely covering 97%.

Most of the food energy consumed from own-crops came from staple foods, such as cassava and maize, as well as legumes (cow peas and mung beans) and groundnuts. Cassava is the main staple food and is eaten both fresh and dried. For the poor and very poor, cassava alone accounted for 9-13% of the 16-24% of food needs filled by own crop production. For middle and better-off households, cassava was an even more significant contributor, fulfilling 15-26% of the 36-45% of food needs coming from own production.

During the 2016-2017 reference year, crop production was relatively low, especially for poorer households and food needs were met through other means, mainly market purchase, food aid and wild foods. The most significant source of food came from market purchase. Poorer households met between 31-45% of their calorie needs from purchased food, whereas middle and better-off households met between 42-47% of food needs at market. It is important to note that the usual trend for poor households who produce less food, is to fill calorie gaps by accessing a higher proportion of food from market purchase. This was not the case in the *Mahafaly Plain Livelihood Zone* during the reference year. Poorer households in this zone were not able to earn much income and therefore were not able to fill the calorie gap with food purchased at market. Instead, poorer households turned to food aid and foraging wild foods to fill this gap.

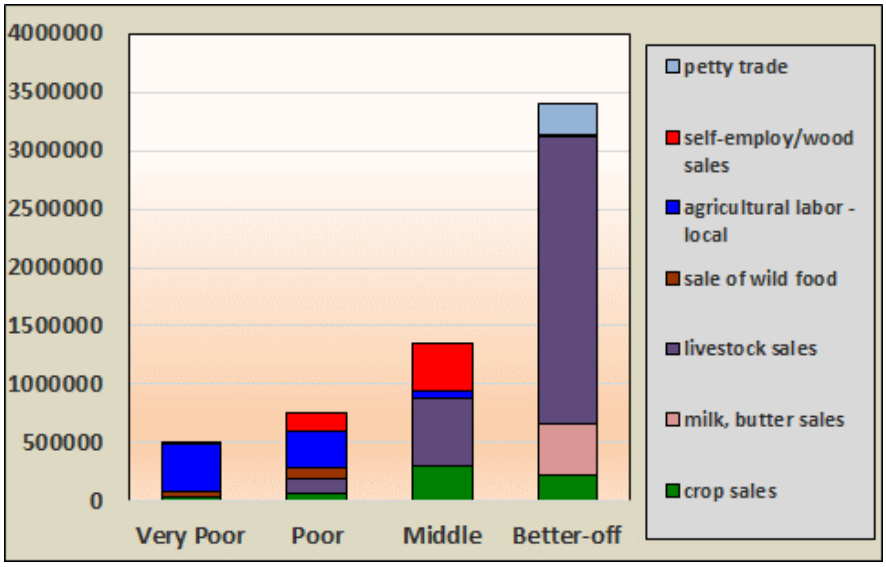
Food aid, in the form of school feeding and emergency food distributions, was a very important food source during the 2016-2017 reference year. School feeding was offered at roughly 50% of primary schools in the zone. This included providing a customized high-calorie lunch of legumes, rice and a protein powder which met the full daily calorie needs of students 5 days a week for 9 months out of the year. Given the average household size was 8 and on average 2 of these household members were children attending primary school, the high-calorie lunch contributed significantly to household food needs during the year. Emergency food aid distributions were less targeted, but nonetheless significant distributions of maize, rice, legumes and oil reached households in the zone. Out of 8 villages interviewed, poor households in 4 villages reported receiving food aid distributions. School feeding contributed about 13% of annual food needs and emergency food aid contributed roughly 7% to food needs of poor and very poor households during the reference year. Without this 20% contribution from food aid, many poor and very poor households would have struggled to meet their minimum food needs in 2016-2017.

The fourth food source for very poor, poor and middle households was wild food. Wild tubers, prickly pear cactus fruit and wild mangos are harvested from December through February, providing an importance calorie source at the end of the lean season when cassava reserves are depleted and before the first green maize is ready for consumption. During the reference year, wild foods – including wild tubers, cactus fruit, wild mango, watermelon and other types of foraged food – comprised 20% of the annual food needs of the very poor; 8% for the poor; and just 4% and 2% for middle households and the better-off, respectively.

The last source of food is milk and meat from households' own livestock. Milk and meat contributed a minor component to the diet of middle and better-off households, covering 2-7% of minimum calorie needs in the reference year. A typical middle household had 2 lactating cows, and better-off households had, on average, 12 milking cows. Due to the drought, cows in this livelihood zone produced only approximately 1 liter of milk a day during the rainy season (lasting around 3 months). Around 70% of the milk was sold, providing a substantial amount of cash income for better-off households, and leaving them with enough to cover 2-7% of their calorie needs. Meat from slaughtered *zebu* amounted to less than 1% and meat from goats slaughtered throughout the year provided better-off households with a maximum of 1% of minimum calories.

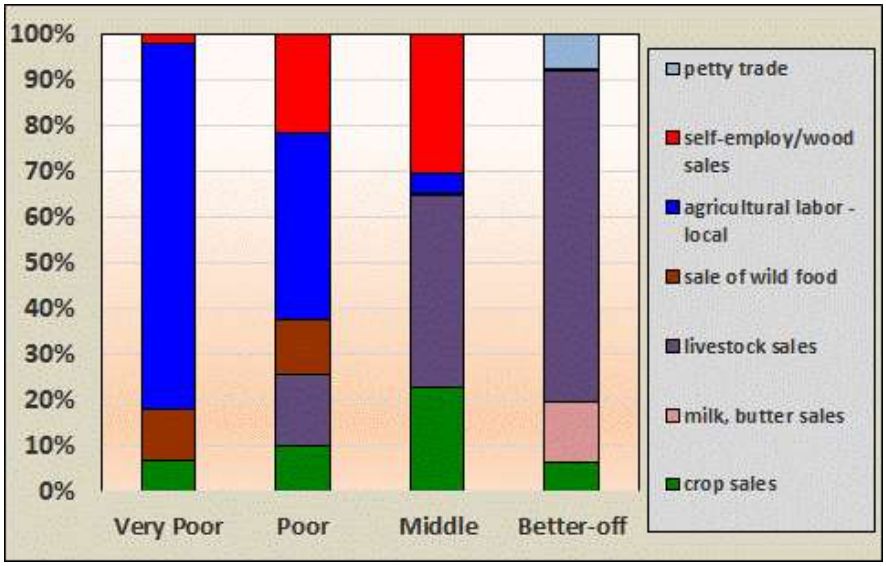
Sources of Cash Income

The graph to the right makes it clear that, although this is an agropastoral zone very little of households' cash income comes from crop sales, especially in a relatively poor year like the reference year, when production was very low.



The graph provides a breakdown of total annual cash income in Madagascar Ariary according to income source.

In 2016-2017, the principal income source for the very poor and poor households in the *Mahafaly Plain: Cassava, Goats and Cattle Livelihood Zone* was local agricultural labor. All active household members assisted with land preparation, weeding and harvesting. Land preparation and weeding are contracted by land parcel and a household is paid once the full piece of land has been worked, rather than by the day. The most income is earned from weeding as this is done three times for each crop. Earnings from local agricultural labor accounted for 80% of the annual cash income for the very poor and 40% for the poor.



The graph provides a breakdown of total annual cash income as a percent of annual cash income.

INCOME SUMMARY TABLE in Madagascar Ariary ('000s)				
Wealth group	**Very poor**	**Poor**	**Middle**	**Better-off**
Annual income per household [9]	175 –1,075	255 – 1,345	770– 1,915	785 – 8,873
Note: All results are expressed in a range				

Self-employment and odd jobs are the second most important income source for the poor. These households depend on firewood and charcoal sales to earn up to 22% of their annual cash income. Handicrafts and odd jobs such as water fetching and laundry also contribute slightly to this percentage. It was also common for women to go into the forest to collect wood and then sell it at weekly market or burn it and sell it as charcoal. Because the very poor households

[9] The average exchange rate during the reference year from November 2016 to October 2017 was USD 1 = MGA 3,000

lack carts for transport and cash to pay for transportation, they earned significantly less from firewood/charcoal sales (2%) than poor households who could afford to hire transportation and therefore take larger quantities to market.

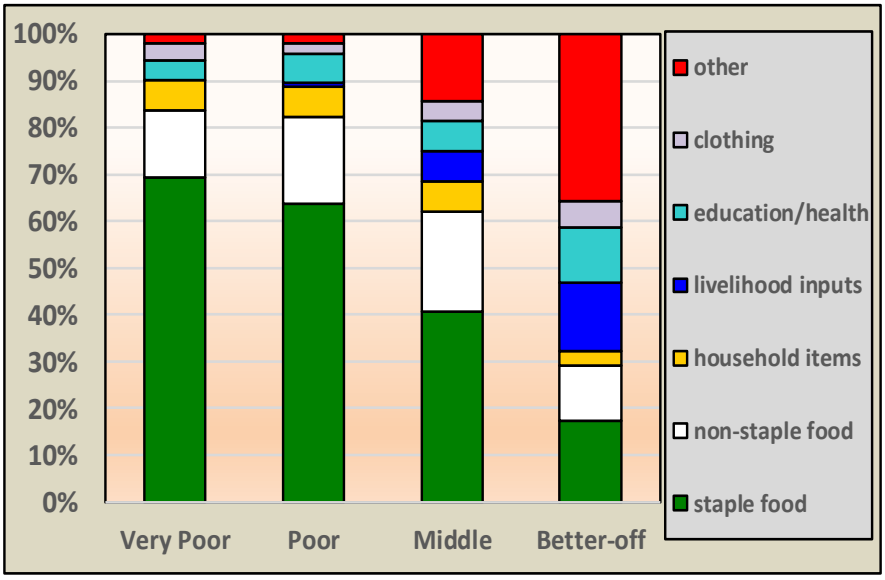
The sale of wild foods, primarily wild mangos, watermelon and cactus fruit, was an important economic activity for very poor and poor households during the reference year, earning these households between 15-17% of their annual cash income.

For better-off and middle-income households, the most important income source by far during the reference year was livestock sales. While cattle are customarily kept for ceremonial purposes as well as for milking and are generally not sold, drought conditions have forced better-off households to sell cattle for cash, often purchasing a younger animal and using the extra cash for food or other expenses, such as funerals. Better-off households sold on average 4 cows during the reference year, whereas middle households sold 1. A cow brings significant income; better-off households were able to wait for prices to peak and received MGA 325,000 for a cow whereas middle households often had to sell suddenly when prices were lower and received about MGA 300,000/cow. Goats are commonly sold by all wealth groups except the very poor, and sheep are traded mainly by the better-off. On average, a better-off household sold 15 goats and 8 sheep during the reference year, a middle household sold 6 goats and a poor household sold 3 goats. Livestock sales accounted for about 72% of cash income earned by better-off households and livestock product sales (milk and meat) accounted for about 13%. This large percentage of income from livestock reflects both the shift away from agriculture to animal husbandry in the zone as well as the hardship experienced during the reference year, which forced households to sell more cattle than in an average year. Middle income households earned about 42% of cash income from cattle and goat sales. For poor households, goat and poultry sales contributed 16% to annual cash income. In addition, middle households earned significant income from self-employment (cart rental, transport services, petty trading and commerce), about 35% of annual income. Better-off households earned a small amount of supplemental income from self-employment (crop merchant, vendor of prepared foods and livestock/cart rental), about 8%, roughly the same amount they earned from crop sales during the reference year.

Expenditure Patterns

The graph presents expenditure patterns for the reference year November 2016 to October 2017. While absolute expenditure increases with wealth in line with total cash income, the expenditure breakdown by percent in this graph shows the *relative* amount of income spent on different categories.

All households need to spend money throughout the year on a range of goods and services. These include staple and non-staple food, household items, productive inputs, social services as well as clothing and other miscellaneous items.



The graph provides a breakdown of total annual cash expenditure according to category of expenditure

The graph conveys a few important points about the priorities and spending requirements of households in this zone. First, the two poorer wealth groups spend a much larger share of their annual cash on just securing food,

especially staple food. Food purchases, in particular, staple food purchases, were the key expense for poor and very poor households in the reference year. In total, staple and non-staple foods accounted for 83% of the annual expenses of the very poor and 81% of the annual expenses of the poor. The staple food category here includes cassava, maize and rice. The non-staple food category includes food items that round out the diet, providing extra calories, essential nutrients and diversity, including cowpeas, vegetables, sweet potatoes, meat, oil and sugar. Middle and better-off households spent proportionately less on food during the year. Nonetheless, food spending amounted to 61% of the annual expenditures of middle households, though only 29% of better-off households' expenditures. This low spending on food by the better-off is explained by their significantly higher crop production which provided a food source for much of the reference year.

The remaining 17-19% of the very poor and poor's annual expenditures was spent on essential non-food items such as household products (salt, soap, firewood, torch batteries), education, health and clothes. Parents in this zone pay only a nominal fee for primary school (MGA 2,000/student/year) but they also pay for school supplies such as books and uniforms. Health care costs are relatively low and include the cost of modern medicine as well as traditional medicine.

The largest expense for better-off households is indicated by the red portion of the graph as "other." This noticeably large amount includes significant expense for funerals, ceremonies and community gifts. The largest expense for better-off households during the year is the cost of building a tomb for a deceased family member and sponsoring the funeral. Villagers explained it was typical for a better-off household to sponsor at least one funeral a year. A household who owns cattle is respected in the *fokontany* and when a family member dies, it is expected that the family will construct a large stone tomb and slaughter many *zebu* to be buried alongside the family member. Better-off households spent about MGA 600,000 on tomb construction and funeral expenses during the reference year. Because better-off households generate roughly five times more cash income than poor households, they are therefore responsible for the cost of ceremonies and community functions, which poor households would not be in a position to pay. While tomb and funeral expenses are generally for family members, better-off households spent roughly MGA 300,000 on ceremonies for the community, such as festivals, initiations and engagements. In total, payment for funerals and community functions amounted to almost 30% of total spending by better-off houses during the reference year. Other minor expenses included in the "other" category are transport and communication, mainly mobile phone credit.

The remaining 25-35% of annual expenditure for better-off and middle households is spent on livelihood inputs, education, health (mainly modern medicine), clothes and household goods. Among these, agricultural and livestock inputs are the largest expense, with better-off households spending about MGA 155,000 on seed and agricultural labor and MGA 280,000 on investments in livestock, primarily veterinary fees, vaccinations and feed. No other wealth groups spent money on livestock inputs. Middle and poor households spent a nominal amount on seed, while very poor households didn't purchase seed during the reference year. Cost of seed remains high due to drought conditions and limited supplies; these factors were mentioned as partial causes for low crop production. In a better or normal year, very poor and poor households said they would anticipate spending more income on seed than was possible during the reference year.

Hazards

While there are a number of hazards that affect the *Mahafaly Plain: Cassava, Goats and Cattle Livelihood Zone* on a regular basis, the most significant hazard is **lack of water**. Water shortage is both a chronic challenge as well as a periodic hazard. The zone has an arid climate with very little rainfall, even in a normal year. Rainfall averages 300 mm per year, making this zone the driest in the country. The erratic nature of rainfall in the zone further exacerbates the problem, as even during the wet season, rains are not reliable and crops may germinate with the first rains but then fail due to many subsequent days with no rain. Furthermore, there are few permanent rivers or lakes in the zone. When rain falls it quickly evaporates and water is not accessible after the brief rainy season.

Chronic hazards
- Water shortages
- Livestock disease
- Crop pests
- Lack of access to seed

Periodic hazards
- Drought
- Insect infestation of crops
- South wind/sand storms
- Livestock theft

Periodic drought used to occur every decade, but now is reported every 3-5 years. Climate change and the El Nino Effect have made drought years more frequent, with hotter temperatures and even less rain. The chronic and periodic lack of water leads to severe crop failures, degradation of pastures and an increase in seed and food prices.

The second chronic hazard is **livestock disease**. As more households shift to livestock rearing due to the challenging conditions for crop production, the impacts of livestock disease have become more devastating. Livestock diseases caused by parasites, bacteria and viruses affect cattle, goat, sheep and poultry every year. When herds are malnourished and dehydrated, they are more susceptible to parasitic diseases and insect-borne infections. Given the importance of livestock to household economies in the zone, this high burden of infectious disease among herds significantly limits production potential and livestock assets. While there have been education campaigns to promote the importance of cattle vaccination, the cost remains prohibitive to many households so the majority of cattle are not vaccinated, making herds further susceptible to the impact of disease.

Crop pests and insect infestations are both chronic and period hazards in the zone. The staple crop of cassava is affected every year by weevils, which decimate the plant stem and cause the tubers to rot and die. Larvae and worms are also an annual challenge, consuming the roots of tuber and legume crops. Cowpeas, mung beans and other legumes are attacked by microscopic insects known locally as "*la gale,*" causing the leaves to yellow and the seeds to rot. The Malagasy migratory locust (*Locusta migratoria capito*) is a devastating period hazard to all crops in the zone. Every 2-3 years, swarms of locust occur, often following a cyclone, which creates the optimal conditions for locust breeding. Pesticides and insecticides are not available to farmers in the zone, so when locust invasions occur they decimate most crops across the zone. Rodents are another annual challenge that damage maize, and to a lesser extent cassava and sweet potatoes.

Lack of access to seed is a problem for farmers every year. Given food shortages, seed reserved for the coming year is often consumed or sold for much-needed cash during the lean season. Lack of rain and challenging production conditions mean even large-scale farms have a limited supply of seed crops to sell. Therefore, come planting time, seed is very expensive and supplies limited. Often, multiple plantings are necessary due to erratic rain patterns and crop failures, making the impact of high seed prices more severe.

South wind and sandstorms are a period hazard that affects the zone once every four years, on average. The *Grand Sud* is a sweeping plain with few natural barriers to slow strong winds. When wind storms occur, they sweep sands and other debris over crops, often burying an entire harvest. Whole villages and their straw huts have also been destroyed by sandstorms.

Livestock theft has become more common ever since drought has impoverished communities and pushed households to extreme measures. Bandits from outside the district ambush a herd and steal mainly *zebu*, to resell or take back to their district. Petty theft of goats and sheep also occurs, usually by herders in adjacent communes. A household may be impacted by livestock theft every other year, or increasingly more frequently.

Response Strategies

In response to hazards and to years of bad production, households attempt to meet their minimum food needs and cash requirements through a number of strategies. These strategies are detailed for this livelihood zone below.

For the very poor and poor households, these include:

- **Increased consumption and sale of wild foods**: Wild tubers, prickly pear cactus fruit, mangos and watermelon grow in forests and thickets across the zone and provide an important food source when crops fail or cash for food purchase is limited. Consumption and sale of foraged foods contribute significantly to annual food calories and income for poor households. It is a particularly useful coping strategy because these wild foods are not as affected by drought as cultivated crops so both the quantity consumed and the number of months during which wild foods are foraged can be increased when there are crop shortages.

- **Increased seasonal labor migration** is a common response strategy when food and income are insufficient in the village. The household head generally migrates out of the zone in search of work. Laborers may migrate temporarily—for three to five months—to Tuléar or Mahajanga in the north where growing conditions are better and agricultural labor can be found. Alternatively, they may migrate to the mining areas in the east (Sakaraha, Lazario, Ilakaka and Ambatondrazaka), particularly during the zone's long lean season, from November to January. As drought continues and economic crisis increases, periods of time away are extended and household members may remain outside the zone for up to 1-2 years, or indefinitely.

- **Increased sale of firewood and charcoal:** Firewood collection for resale and charcoal making is common in the zone and poor households are able to increase these activities in times of economic hardship. While deforestation is a growing problem in the south of Madagascar, sufficient wood supplies remain in the zone for firewood and charcoal sales to increase. The typical response is to double the sale of firewood or charcoal by selling twice during the week instead of once. Firewood and charcoal are sold year-round, except during the rainy season.

- **Increased purchase of staple foods:** When crop yields are low, households respond by purchasing more staple foods, such as cassava and maize. To pay for these higher food purchases, households may have to decrease expenditures on non-staple foods and/or on non-food items.

Coping strategies of middle income and better-off households include:

- **Reduce crop production, shift to herding**. As production conditions are exacerbated by lack of rain, households with expendable income purchase goats, sheep and zebu, shifting to livestock raising as their principle economic activity. Goats in particular are well-suited to the arid climate of the *Grand Sud*; they can withstand high temperatures and long periods with minimal water and can forage on dry pasture that is unsuitable for other livestock or crop production.

- **Livestock sales**: As crop production is less dependable and less remunerative, better-off and middle households will increase sales of livestock to cover the deficit. Goats and sheep are the first livestock to be sold as cattle are kept for ceremonial events and as a last resort savings account of household wealth. As drought conditions increase economic hardship even for better-off and middle households, it is becoming more common for cattle to be sold when there is a need for cash, rather than slaughtered only for funerals. Increasingly, people are beginning to sell *zebu* during the lean period. They then purchase younger animals and use the remaining money to purchase food.

- **Multiple crop plantings** are a response strategy to frequent crop failure caused by erratic rains. Households that can afford to purchase a second and sometimes third batch of seed, replant later in the season when the January rains come.

- **Reducing crop sales and increasing seed saving** are other common strategies used in times of economic hardship by households that can get by with reduced cash income at harvest time. By consuming more of their own crops and keeping a portion for seed, households are able to avoid paying high prices for food and seed later in the year, when these items are scarce and more costly. This coping strategy for one

wealth group has a reverse knock-on effect for poor households, as it decreases food products and seed in circulation, contributing to price hikes and overall scarcity.

The coping strategies described above are summarized in the table below according to the timing when they are typically employed (i.e. during the early, stress stage of a crisis or in the later, emergency stage). Coping strategies that are employed late are considered "negative" strategies which is to say that they are last-ditch efforts to save lives even if they undermine livelihoods and health.

Livelihood Coping Strategies in *Mahafaly Plain: Cassava, Goats and Cattle* Livelihood Zone (MG23)

	Coping strategy	IPC phases of strategy	Rationale/justification
1	Reduce crop production, shift to herding	Stress	As production conditions are exacerbated by drought, households with expendable income purchase goats, sheep and zebu, shifting to livestock raising as their principle economic activity.
2	Increase seasonal labor migration	Stress	Increasing seasonal labor migration is a common response strategy when food and income are insufficient in the village. Generally, the household head migrates out of the zone in search of work.
3	Increase reliance on agricultural and casual labor	Stress	Households increase agricultural labor and casual labor activities in the zone to cope with food and cash shortages.
4	Increase sale of firewood and charcoal	Stress	Firewood collection for resale and charcoal making is common in the zone in a normal year and poor households increase these activities in times of economic hardship. The typical response is to double the sale of firewood or charcoal by selling twice during the week instead of once.
5	Decrease expenditure on non-food items	Stress	Households reduce expenditure on non-food items, such as livestock feed, veterinary services and drug purchase and focus more on food purchase.
6	Increase purchase of staple foods	Stress	When crop yields are low, households respond by purchasing more staple foods, such as cassava and maize, rather than relying on their own crop production
7	Reduce food purchase	Crisis	When conditions worsen, households reduce and limit expenditure on food items, such as cassava, maize and legumes.
7	Enrolled children in school feeding program	Crisis	WFP launched a school feeding program in 2014. Households enroll school aged children in school in a difficult year, so they will receive a free lunch meal.
9	Sell non-productive livestock	Crisis	In a bad year, households shift from crop production and sales to selling non-productive livestock. Young or old goats and sheep are the first livestock to be sold as cattle are kept for ceremonial events and as a last resort savings account of household wealth.
10	Reduce crop sales, increase seed saving	Crisis	Reducing crop sales and increasing seed saving are common strategies used in times of economic hardship by better-off households that can get by with reduced cash income at harvest time. This coping strategy for one wealth group has a reverse knock-on effect for poor households, as it decreases food products and seed in circulation, contributing to price hikes and overall scarcity.
11	Sell household and personal assets (kitchen utensils, jewelry)	Emergency	This is one of the last options when the level of food insecurity is leading to a state of emergency. Selling household and personal assets brings shame to the seller and to the household.
12	Entire household migrate out of zone in search of labor	Emergency	When food shortage is severe it is common for entire households to migrate out of the zone in search of labor or assistance.
13	Sell house and land	Emergency	When conditions are severe, households sell their land and homes, often to pay for transportation expenses to migrate out of the zone.

14	Begging	Emergency	In times of emergency, households turn to begging. Begging is practiced mainly by elderly single heads of households.
15	Sell productive livestock	Emergency	When conditions are difficult, households will sell their productive livestock, such as adult female goats, sheep and zebu.

Key Parameters for Monitoring

The key parameters listed in the table below are food and income sources that make a substantial contribution to the household economy in the *Mahafaly Plain: Cassava, Goats and Cattle Livelihood Zone*. These should be monitored to indicate potential losses or gains to local household economies, either through on-going monitoring systems or through periodic assessments.

It is also important to monitor the prices of key items on the **expenditure** side, including staple and non-staple food items.

Item	**Key Parameter – Quantity**	**Key Parameter – Price**
Crops	• Dry cassava • Maize • Cowpeas • Mung beans • Groundnuts • Sweet potatoes • Wild foods	• Cowpeas • Mung beans • Ground nuts • Wild foods
Livestock production	• Cow's milk (season 1) • Cattle sales • Goat sales • Sheep sales	• Cow's milk price (season 1) • Cattle prices • Goat prices • Sheep prices
Other food and cash income	• Wild mango (quantity sold/hh) • Agricultural labor (land preparation, weeding) • Agricultural labor (harvest) • Firewood/charcoal sales • Self-employment (handicraft sales)	• Wild mango sales • On-farm wage rates in cash (land preparation, weeding) • On-farm wage rates in cash (harvest) • Firewood/charcoal prices • Self-employment profits (handicrafts)
Expenditure (staple food)	• Dry cassava (consumer supply)	• Dry cassava (consumer) price
Other Expenditure		• Maize (consumer) price • Cowpea (consumer) price • Rice (consumer) price

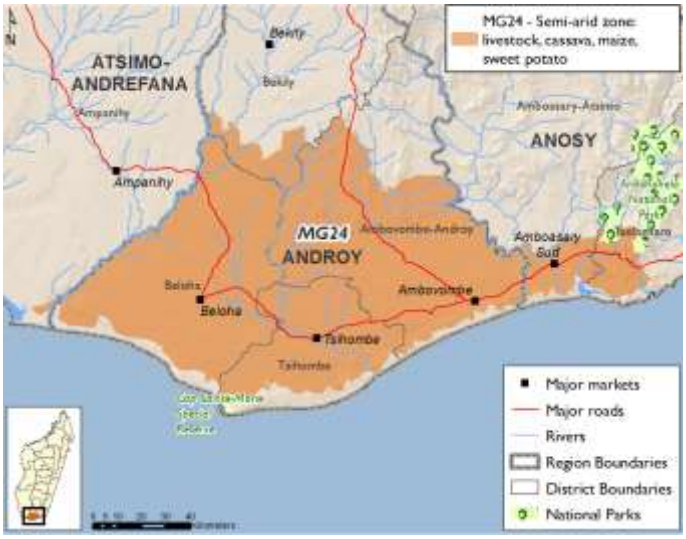
Program Implications

The longer-term program implications suggested below, prioritized by wealth group, include those that were highlighted by the wealth group interviewees themselves and those made by the assessment team following detailed discussions and observations in the field. All of these suggestions require further detailed feasibility studies.

Very poor	Poor	Middle	Better-off
Development of water points, such as wells, within close proximity to villages	Development of water points, such as wells, within close proximity to villages	Development of water points, such as wells, within close proximity to villages	Development of water points, such as wells, within close proximity to villages
Provision of safe drinking water, especially when wells dry up	Provision of safe drinking water, especially when wells dry up	Development of irrigation systems	Development of irrigation systems
Distribution of seed and cuttings to farmers (preference for drought resistant seed)	Distribution of seed and cuttings to farmers (preference for drought resistant seed)	Provision of livestock vaccinations for herders	Provision of livestock vaccinations for herders
Provision of agricultural tools (hand hoe, spade) and pesticides	Provision of agricultural tools (hand hoe, spade) and pesticides	Storage facility for crops, education in conservation techniques	Storage facility for crops, education in conservation techniques
Improvement of road infrastructure and cost of transport	Improvement of road infrastructure and cost of transport	Improvement of road infrastructure to markets	Improvement of road infrastructure to markets
Training in market gardening	Training in market gardening	Livestock breeding services	Livestock breeding services
Provision of fertilizer to improve soil	Provision of fertilizer to improve soil	Building of more schools and classrooms; improvement of education services	Building of more schools and classrooms; improvement of education services

ANDROY SEMI-ARID CASSAVA, MAIZE AND LIVESTOCK LIVELIHOOD ZONE (MG24)[10]

Zone Description



This semi-arid zone, located in the far south of Madagascar, supports a mixed farming economy of crops and livestock. The staple food crops are cassava, sweet potato, maize, cowpeas (*niebé*) and watermelons (*pasteque*). Some food crops are grown more for sale than consumption, including groundnuts, *dolique* (black-eyed peas), pumpkin and v*oadango* (muskmelon). The zone is not a surplus growing area due to water shortages, crop losses from insect attacks, and the lack of animal traction. In particular, rainfall is low, limited to a single season, and there are few permanent rivers for irrigated agriculture.

This zone was at the epicenter of the *Grand Sud* drought-related food crisis which lasted from late 2013 until June 2017. Although current herd sizes are low and have yet to recover from the drought, this dryland region is nonetheless known for its cattle, the *zebu.* Goats and some sheep are also kept by farmers. The majority of households, however, own few (or no) livestock except poultry. To supplement farm production, poor households seek out local agricultural work, sell firewood/charcoal, eat (and sell) wild fruits, migrate seasonally for casual work, and undertake petty trade at weekly markets. The drought response effort also supported the local economy during the years of crop failure with food aid, school feeding, safety net cash transfers, as well as inputs such as livelihood support (seeds, small ruminants).

The *Androy Semi-Arid Cassava, Maize and Livestock Livelihood Zone* is located in the three most southern districts of Androy Region, namely: Beloha, Tsihombe and Ambovombe-Androy. West of the zone lies the Mahafaly Plains, notable for its large goat herds. To the east is the Ambosary-Atsimo dryland cassava and livestock livelihood zone which has been plagued for some time by cattle rustling and banditry (*dahalo*), a situation that is not entirely contained within that zone but that has spilled over into the eastern edge of Androy Region. To the south lies a very narrow coastal belt which supports a mixed fishing and root crop economy. A wetter area lies to the immediate north in Bekily District (Androy Region) where farmers cultivate rice and where cassava yields are higher. Throughout the interior *Grand Sud* region, the people who inhabit the land are called the *Antandroy*. The zone has a moderate population density overall with north to south variations. The northern and central part of the zone is more sparsely populated (less than 10-20 people per km²) as this area was traditionally used more for seasonal grazing. The southern, sandy areas are more densely settled. Androy Region itself has a population of 753, 832 people (2014 census) and a land size of 21,930 km².

Much of the far south of Madagascar is characterised by broad, lowland plains at 0-300 masl. In the southern Androy Region (MG24), this lowland flat topography is traversed by just three main rivers. Of the three rivers, two form the eastern and western boundaries of the zone (the Menarandra River to the west and the Mandrare River to the east). The sole interior river passes through Tsihombe district town and is called the Manambovo River. These rivers are not permanent and dry up during the year. Nonetheless, the river beds are a vital source of water and local wells dug 10-30 meters deep provide water access throughout the year. The rivers flow from north to south and drain into the Indian Ocean on the southern coast.

[10] Fieldwork for the current profile was undertaken in October 2017. The information presented in this profile refers to the reference year, which started November 2016 and ended October 2017. Provided there are no fundamental and rapid shifts in the economy, the information in this profile is expected to remain valid for approximately five-ten years (i.e. until November 2021-2026). All prices referred to in the document are for the reference year.

Water is a critical resource that is in very short supply in the zone. Indeed, the zone's most pressing problem is water access and this affects both production and domestic consumption. It is not uncommon for women to walk 4-5 km to collect water in the dry season. In village hamlets (called *fokontany*) near Ambovombe town, water is brought to the villages by cart load and is sold on average for **Malagasy Ariary (MGA)** 1,000 – 1,500 per 20 liters as there is no local water source for 6 months of the year. In other areas, during the dry season, water is accessed from shallow wells dug in dry river beds or taken from natural depressions where water collects seasonally. Livestock are watered from different water points but the type of water source is often the same. The problem of water in the zone was heightened by the extended drought crisis of the last 5 years and at the time of the assessment it emerged as the central development priority in the zone.

With its dry climate, the zone supports mainly shrub vegetation comprised of thorny species.[11] There are also distinctive tree varieties (such as the baobab) as well as local woody species (both tree and shrub) that make up the region's distinctive spiny thickets and that are an important source for cut firewood. Indeed, widespread wood cutting for cooking fuel is reportedly reducing shrub coverage in the zone and thus woody species are being replaced by low-lying herbaceous vegetation cover. In places, soil erosion is an emerging problem. The region primarily falls within the sedimentary zone although red sandy soils give way to white sandy soils and dunes in the littoral zone (i.e., the narrow band along the coast). For the most part in the sedimentary zone, the dominant soil type is ferruginous which gives the terrain its' distinctive red color. The northern and central part of Ambovombe-Androy District falls within the crystalline zone as it is based on pre-Cambrian crystalline bedrock. It is also at a slightly higher elevation and receives more rain. There is one National Park in the livelihood zone which is located in the commune of Marovato (Tsihombe District).

Temperature in the interior areas of the far south is very hot, with an average temperature range of 22-35°C. Rainfall is sparse even in a relatively wet year and on average totals only about 300-550 mm/year, spread across a small number of rainy days.[12] Data collected over the last decades show an overall drying trend in Africa that could lead to a shorter and/or a more erratic rainy season. Farmers cultivate a diversity of crops including cereals, legumes, oil seeds and tubers but it is the tubers – cassava and sweet potatoes -- that are cultivated most widely. The staple food crops, thus, comprise cassava and sweet potatoes supplemented with cowpeas (*niebé*), maize and watermelons. Millet and sorghum are grown in pockets (principally in Beloha District). Elsewhere, in Tsihombe District, farmers cultivate *dolique* (black-eyed pea) pumpkins and *voadango* (muskmelon). Groundnuts are grown mostly for sale. Andalatanosy Commune in the northern part of Ambovombe-Androy District is notable for its higher level of groundnut production.

Although the harvest of staple crops is staggered over a period from February to September, all crop types are produced from a single rainy season that typically comes between November-February. Land is divided into small parcels (*tunda*) on which staple crops are intercropped, such as maize with *niebe,* and/or melons with cassava or sweet potatoes. Cultivation is rain-fed and is mostly carried out by hand using the local *bêche*. Better-off and middle farmers who own cattle, use their own plough or borrow a plough to prepare the land. Improved seed varieties are not used in this zone nor are other types of inputs (such as chemical fertiliser, organic manure or pesticides). Preparing the land for planting is usually done by men but the whole family (men, women and children) work together on other farming tasks, such as planting, weeding and harvesting. Most households use their own family labor for these tasks but some households pay for hired labor and this provides local labor opportunities for poor households. The most labor-intensive task for which casual labor is hired is weeding. The major hazards that affect farming in this zone are drought and pests. Locusts are a recurring hazard as are stalk borers (*chilo partellus*) and caterpillars which attack legume crops and sweet potatoes. Recently, agricultural experts from the CSA, the *Centre de Service Agricole,* received training in pest management through the program ASARA. As part of this training, for example, agricultural staff learnt about the application of neem and pepper (*piment*) to deter insects. In the baseline reference year, crop production was severely affected by locusts.

[11] The genus ***Didiereaceae*** is endemic to southern Madagascar and is the dominant plant species making up the spiny thickets that cover the southern region. The second most common shrub type is the genus ***Euphorbia***. Other woody species that make up the thickets include ***Acacia*** and ***Jatropha***.

[12] A Mission report from 2011 noted that both 2011 and 2012 were years of very good rainfall. 745 mm of rain was recorded in 2011 (Rakotondramanana, Juin 2012: *Rapport de Mission, Projet SOA GRET*, Ambovombe, Madagascar.)

In the *Grand Sud*, there is no precise system for measuring tuber production or yields. There are, however, local units of measure such as a cart-load (*charrette*) or pile (*tas*). Carts come in different sizes and a pile also has a different kilo weight from market to market.[13] Similarly, tubers themselves are of varying size and weight. The standard local weight for a cart-load of dry cassava is 120-200 kg (depending on cart size). In Beloha District, in the reference year, the average yield for dry cassava was an estimated 5 cart-loads, or about 1,000 kg/hectare. In a good year, the yield estimate is 7 cart-loads (1,400 kg/ha). In Tsihombe District, the crude yield estimate for the 2016-2017 season was 3,000 kg/hectare. These figures represent roughly half of total production as it normal that the other half of production is eaten green or fresh prior to the actual harvest. Thus, yield figures vary widely. The average yield for dry cassava for the whole *Grand Sud* region is an estimated 10,000 kg/hectare (or 1 kg per square meter). In times of drought, tuber yields fall substantially. In the 2015/16 drought year, for instance, local district officials estimated that there was a 30% yield loss due to lack of rain.[14]

Livestock graze freely in this zone as the rangelands are extensive. Cattle are watered from local ponds in the wet season, and from hand dug wells in dry river beds or from other communal water points during the dry season. Access to sufficient water is a major problem for stock owners between April to November, and this problem is the push factor behind seasonal migration. Seasonal migration to reserve grazing land is common throughout the zone although the pattern differs from place to place. The two main patterns are from south to north, and from central interior to the east or to the west toward the rivers. For instance, cattle from *fokontany* near Beloha district center are typically taken west toward Ampanihy District whereas in southern Ambovombe-Androy District, cattle are taken north to Antanimora and Andalatanosy, a distance of 60 km.[15] Migration to these seasonal grazing areas is the responsibility of men and boys, and usually occurs from May to October /November but can also take place from November-June. Although cattle are free range, they are also given supplementary feed, consisting of cassava leaves and/or cactus leaves (*cactus brulé*).[16] Milk yields from cattle reach a maximum of 2-5 L/cow/day during the 4 months following the rains (the cool, dry season) but the more common yield throughout the milking season is around 1-1.5 L/cow/day. Moreover, a cow that gives birth in May produces very little milk (@ 0.65 L/day.) Goats are not milked for home consumption although some goat milk may be given to a baby that needs supplementary food.

Livestock production is greatly affected by severe, periodic drought and by disease. Parasitic diseases (such as bovine *schistosomiasis* and other tick-borne parasitic diseases) are very common, affecting both cattle and small ruminants. Respiratory disease is another common ailment affecting cattle and goats in the southern rangelands. Tick-borne viral diseases such as lumpy skin disease and a disease leading to bovine paralysis are also common hazards.[17] Livestock

[13] For instance, a small cart load of dried cassava roughly equals 200 kg but a large cart holds 600 kg. A pile of dry cassava weighed between 0.22 kg/pile to 2 kg/pile. The weight of one piece ranged from 40 grams to 400 grams. Likewise, fresh cassava and sweet potato ranged from very small to very large tubers leading to a wide range of weights per piece, per pile, per sack and per cart.

[14] Yield estimates for other crop types are also based on local units of measure. Cereals, beans and legume yields are measured by cart-load, by 50 kg sack or by *gobelets. Gobelets* are small tins that are the standard measure for purchasing small quantities of staple foods in the market (3.5-4 tins = 1 kg). In the reference year, production for maize was estimated at 1 cart per hectare (200-300 kg). For *niebe*, the estimate was 125 kg (or 2.5 x 50 kg sacks).

[15] Migration routes include the following: (i) Commune Analamasy, from *fokontany* Ankazomangitsy: to Antanimora and Andalatanosy @ 60 km, Oct-Jan; (ii) Commune Maroalipoty, from *fokontany* Soatsita: to the northern district of Tranomaro @ 70 km, January-June; (iii) Commune Ambohimalaza, from *fokontany* Ampanosora to Betroka and Soamiry to the north in Anosy Region @ 55 km, June-Oct; (iv) Commune Sihanamaro, from *fokontany* Analamasy to Belampy @ 50 km (a trip of 3 days), April-Oct; (iv) from Beloha District to Tranovaho to the north @ 30-40 km, July-Oct where there is better forage (cactus); (v) Tsihombe District, from *fokontany* Betanty to Beloha and Betsaba in a very bad year @ 80 km (3 days trip), July-Nov. In a year of good rainfall, cattle stay around Betanty.

[16] The cactus leaves are prepared by burning off the thorns before they are fed to the cattle.

[17] Common animal diseases in the zone include: *anteotoximie, monissa, equima contasez*, *bsmany*, *tsonioke, manjabo*, *rekereke*, *menatsinay* and *soko* (diseases affecting goats); bovine parasites (*beravy*; *besoroke*); bovine paralysis (*desidralation*); and respiratory diseases (*pester loge*). Zebu are also affected by *bearibé* and

vaccination campaigns are carried out once a year to prevent disease outbreaks and/or limit their spread. Vaccinations are a fee-for-service, and are part of an effort by the government to minimize disease spread by requiring livestock sellers or traders to show a certificate of vaccination. These are relatively new regulations and vaccination rates for cattle, sheep, goats and chickens has not yet reached blanket coverage.

Some wild fruits are prepared as a fruit drink. For instance, the pulp of the baobab fruit and the wild tamarind is mixed overnight with fermented milk. Alternatively, tamarind pulp is soaked in water then one hour before drinking, the solution is mixed with wood ash to reduce its acidity. This drink is known locally as *bonta*. Some fruit is dried, pounded into a flour, sieved, and then cooked or mixed with fermented milk. Another way of preparing wild food is to grill the seeds (like groundnuts).

Current stock levels post-drought are very low although the southern rangelands are known for its large herds of *zebu*. *Zebu* play a central ceremonial role at funerals and other social occasions. In the past, a wealthy man's entire herd of *zebu* were slaughtered at his death, and the horns of the *zebu* decorated his tomb. This practice is not as widespread as in the past and today it is more common to slaughter only part of the herd. Funerals remain a major expense, however, and a traditional tomb can cost upwards of MGA 3-5 million (USD 1-1.5 million). In terms of stock ownership, in the reference year, the majority of households owned a few chickens only. [18]

For herders, a key fodder plant in the extreme south is the prickly pear cactus, known locally as *raketa*. The cactus plant plays a role in the whole mixed farming economy. For instance, around Ambovombe town where the spiny thickets of the broad plains open up into larger swathes of cultivated farmland, each parcel of land is bordered by cactus hedges. The wild cactus plant is a key natural resource in the far south that provides fodder for cattle, food for humans, and a wind break for growing crops. There are different varieties of cactus but at present the dominant type is the red cactus. The red cactus is perhaps the least preferred species with respect to the flavor and palatability of its fruit. However, the red cactus has colonized the region with the result that it has largely pushed out the local "yellow" cactus (also called the cactus Malagasy) which produces fruit of greater palatability. FAO reported in 2006 that the original cactus was for the most part destroyed by the introduction of mealy bugs. The red cactus plant, by contrast, is resistant to the bug but as an invasive species its uncontrolled spread is controversial.[19]

In this zone, it is usually women who gather the red cactus fruit and other wild foods to prepare for meals. By contrast, it is men and boys who cut and burn the cactus leaf to feed to cattle.

Despite being an invasive, colonizing species, the red cactus plays a vital economic role as a source of survival food during the lean season and during periods of drought. Notably, the red cactus plant bears fruit for much of the year whereas the local cactus bears fruit for only 2-3 months (February to March). Both the fruit and the leaves are eaten during crisis times. The fruit is typically eaten raw (with or without its outer skin removed). The thorny leaf, by contrast, requires preparation by first burning off the needles, then by removing the outer skin. Only the inside flesh is consumed. This edible part of the cactus leaf can be eaten raw or is heated and eaten with a little salt.

Fruit from a wide range of shrub and tree species that characterize the southern spiny forests are eaten as both a snack to complement own-crops or as a primary food during the annual lean season and during times of crop failure. A recent study in Androy and Anosy Regions amongst the Antandroy and Antanosy peoples, listed 18 different species of wild fruit consumed locally (of which 8 were common between the two groups).[20] Some of the most common wild foods

bearoba. There are vaccine campaigns against bacteria and other diseases (*charbon bacteridien*; *charbon sympotamatique*).

[18] Chickens are also very susceptible to disease. Unfortunately, residents of one village who were provided with 4 chickens per household by CRS reported that all their chickens died due to disease.

[19] Berte and Suttie's 1974 & 1975 research referenced in the following paper: J.H Rasambainarivo and N. Ranaivoarivelo, 2006: *Country Pasture / Forage Resource Profile for Madagascar*, FAO / AGP. See also K.F. Valentine, 2016: *An Investigation of Water Access and Quality in the Ambovombe Region of Southern Madagascar*, Honor's Thesis, Oregon State University, University Honors College, June 2016.

[20] L. Ramamonjisoa, F. Ralison, and V. Andriamiarantsoa. 2017: *Tree Species for Food Security in the Southern*

include wild mango; the Madagascar "plum" *flacourtia indica* (local name: lamonty); the sticky fruit *tamarindus indica* (local name: kily); the baobab fruit *adansonia za* (local name: Za); the large hard fruit *strychnos spinosa* (local name: dagoa); the narrow-leafed mustard tree *salvadora augustifolia* (local name: salsavy); and the *maerua filiformis* (local name: solety). The red date from the *ziziphus jujuba* tree is also eaten but the tree itself was introduced to Madagascar and is considered an invasive species in some areas. Some fruits are only sold, not consumed, such as the jatropha seed (local name: *ricin*). Typically, cactus fruits are gathered **daily** in 15 liter buckets. A full 15-litre bucket of fruit can be consumed by a household during a single day when it serves as the principal meal. As these wild foods are endemic to southern Madagascar, they withstand water stress relatively well. For instance, the hardy *raketa* (the red cactus plant) can survive two years without water before it withers and dies.

Markets

The *Androy Semi-Arid Cassava, Maize and Livestock Livelihood Zone* does not have paved roads although there is a main route that connects Tulear on the south-west coast with Fort Dauphin on the eastern seaboard. There is also road access to district, commune and *fokontany* centers. The mainly dry conditions in the region mean that roads are passable for much of the year albeit unsealed. Some road improvement was observed in southern Tsihombe District with road grading and improved drainage but for the most part road conditions are poor. District markets are nonetheless lively weekly events and occur on staggered days. In Beloha District, the main market day is Tuesday. In Tsihombe, it falls on a Friday and in Ambovombe town, the market day is Monday.

Local production is not abundant enough to export internationally, or even to export out of the southern region. Instead, local produce when in season is sold in local markets to meet demand within the region. Supply patterns, therefore, follow the seasonal crop calendar with peaks paralleling harvest time and troughs paralleling the planting period. Local maize, for instance, is found in district and commune markets from May-September, and local cassava sells from July to October. Regional supply and demand trends may result in some movement of produce across district borders (i.e. from Tsihombe to Beloha or from Ambovombe to Tsihombe), or to major urban markets in the south, such as to Fort Dauphin. However, when the volume of local stocks falls, staple food items are imported into the zone from neighbouring regions. Dry cassava, for instance, is brought into Tsihombe from neighbouring Ambovombe from October to February, and then from northern neighbouring areas such as Beraketa (Bekily District, Androy Region) and Isoanala and Betroka (Betroka District, Anosy Region) from February to May. In short, the more productive districts in the northern part of the *Grand Sud* region supply markets in the far south when local production is insufficient to meet local demand. In the case of maize, the grain is imported into the zone from Tulear during the off-season (a west to east pattern). The same pattern occurs during years of poor production.

Staple Crops	Min Price/Month	Max Price/Month
Dry Cassava	July-October	December-February
Sweet Potato	June-October	November-February
Maize	February-October	November-February
Cowpeas/Niebé	March-September	January
Dolique	September	January
Watermelon	February-April	June
Groundnuts	May	November-January

Price trends for dry cassava, shown in the box to the left, follow an expected pattern. Prices are lowest when quantities are highest (i.e., during the harvest season (June/July-October)). Prices then rise in the off-season (November-January). The peak price continues through the planting season into the months just prior to harvest. During these months, prices typically double. In the reference year, dry cassava was sold in the district market for MGA 400 for roughly 1 kg (5 pieces) during the post-harvest period. In the off-season, the same quantity costs MGA 1,000.

Rice is not a staple food grown in the livelihood zone but it is a grain that even poor households buy at least small amounts of during the year. Rice that is sold in the southern markets is imported mainly from Pakistan. It comes to local

Region of Madagascar. University of Antananarivo, Graduate Agronomy School, Antananarivo, Madagascar, 2017.

district and commune markets via Fort Dauphin (on the south-east coast) as well as through Tuléar on the south-western coast, and from Betroka, Bekily, Bekitro and Soanala (the northern parts of Madagascar's *Grand Sud*). Rice prices are relatively stable throughout the year (MGA 1,750/kg). However, during the extended drought of 2013-2016, merchants in the local markets of Beloha and Tsihombe towns reported that the price tripled to MGA 5,250/kg.

Prices for Cassava 2013-2017
Reported by district officials, Beloha District
2012 – MGA 500 /kg
2013 – MGA 600 / kg
2014 – MGA 800 / kg
2015 – MGA 1 000 / kg
2016 – MGA 1 500 / kg
2017 – MGA 1 000 / kg

Although the zone is not a major producer of cash crops, groundnuts and various legumes and melons are sold as cash crops by local farmers. For instance, *dolique* (black-eyed peas) is a crop that is particular to Tsihombe District only and hence, there is good demand for the legume in the urban markets of Fort Dauphin. *Pasteque* (watermelon) is also cultivated as a food and cash crop but the market in this case is mainly local. Groundnuts are another cash crop of importance although local production is relatively low. In general, groundnuts are brought to southern local markets from their principal source in Bekily and Bekitro (Androy Region). May-June are the months of peak volume but by September local supply drops. October-December is planting time and at this time local supplies in the market are lowest. Price trends for groundnuts showed a change in almost 200% from the low price at peak sales (MGA 2,000/kg) to the peak price when supply drops (MGA 3,500-4,000/kg). *Niebé* (cowpea) prices also peak during the December planting season with a high of MGA 2,000 / kg falling to MGA 1,000 / kg during the harvest (peak volume) season. Another marketable commodity in the zone is *ricin* (or jatropha) which is a wild seed. Farmers sell *ricin* directly to the buyer, in this case, a factory that produces bio-diesel.

The market for livestock is driven mainly by local demand for meat in district and commune towns. In addition, there is demand for beef in Tulear and Fort Dauphin (the region's major urban centres) as well as in Antananarivo (the nation's capital), and in neighbouring regions (Amboasary-Atsimo to the east, and Ampanihy District to the west). During the period of Ramadan, there is a high demand for mutton (sheep meat), and exports of sheep from the zone to Tulear rise at this time. Price trends follow the pattern of the rains. Prices drop in the dry season reaching the minimum price from September-November and then peak during the rains (November-January). Households are reluctant to sell at this time, hence supply drops on the market. For cattle, goats and sheep, prices tend to triple during the rainy season.

Local labor opportunities are relatively low within the zone. There is some local demand for agricultural labor but the opportunities are insufficient to meet the local labor supply. In Ambovombe District, it was estimated that only 5% of casual labor is found in the rural sector within the zone. Approximately 65% of casual labor is found in local urban centers and the remaining 30% is found outside of the zone. Thus, migration to major urban centers (such as Tuléar or Mahajanga plays an important economic role for at least 6 months of the year during the lean season and/or during years of poor production. The most common types of migratory work include docker, domestic worker (laundry etc.), bicycle rickshaw driver (*cyclo-pousse*) and security guard. District centers, including Beloha, Tsihombe and Ambovombe towns, are also important labor markets in the zone. Finally, there is some gem-stone mining in Betroka and Ilakaka (Ihosy District) and in Sakaraha (Sakaraha District), areas that lie to the north of the zone, as well as in Jofaro (Ambovombe-Androy District) which falls within the zone. Typically, it is the male household head who migrates away for work.

Timeline and Reference Year

Baseline research was carried out in the southern Madagascar region in the aftermath of a severe and extended drought. The crisis in the *Grand Sud* began with the failure of the 2013 rains and then continued into the 2013-2014, 2014-2015, and 2015-2016 production seasons.[21] In localized areas within the zone, 2016-2017 was also a very poor year.

[21] Production failure in 2016 was due to the failed rains of 2015/16. This was the third very poor season in a row, beginning with rain failure in 2013/14. Although there was some variation in how poor those three years were, the score assigned by villagers to those extended drought years was either a 1 or 2. A particularly warm El Nino event was the main

Fortunately, for much of the zone, the 2016-2017 rains, and the 2017 production year was moderate. The rainy season overall was good but insects destroyed certain crops which reduced overall production. On a scale of 1-5 with 1 being the worst and 5 the best, most villages gave the 2016-2017 production year a 2-3 ranking score.

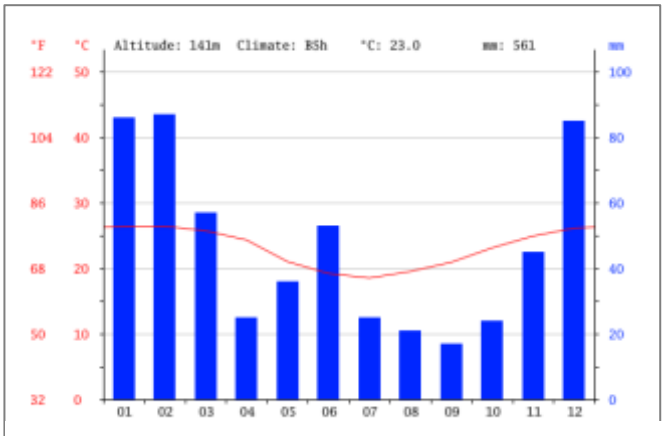
In HEA, the reference year typically begins with the start of the "consumption" year which refers to the start of the harvest. The consumption year can begin when "green" crops are eaten (i.e., fresh crops before they are dried) or with the actual harvest as this marks the end of the lean season. In this particular case, the last full consumption year began in March 2016 with the harvest of maize. Alternatively, it could be said that it started in July 2016 with the harvest of cassava. With either start date, the last full consumption year featured a production season that was ranked "1" on a scale where 1 is lowest and 5 is highest. The subsequent rains of 2016-2017 were ranked 2-3 on the scale but food deficits continued until the start of the cassava harvest in July 2017. The consumption year of 2016-2017, therefore, was characterized by production failure and by a very long, harsh lean season.

The recent prolonged drought presented a challenge when it came to the selection of a reasonable reference year. The reference year should be neither a very bad nor a very good year but a year in-between these two extremes. As the last full consumption year was a very bad year, it was not selected. Instead, using a different approach to the standard HEA assessment, the reference year for the *Grand Sud* zones covers the 12-month period from November 2016 to October 2017. This means that the reference year starts with the lean season and concludes with the end of the sweet potato harvest in October. The year was characterized by a relatively good rainy season and an average production year for tubers. It was a very poor year for maize due to an infestation of locusts which destroyed much of the crop. Similarly, production was very poor for cowpeas, groundnuts and other legumes due to seed shortages and very high seed prices. Likewise, income from livestock production was very low due to the continued impact of drought on herd sizes and subsequently the low number of animals in the herd. Nonetheless, the reference year reflects to some extent the contribution of crops and livestock to the household economy although the impact of the hazards mentioned above must be taken into account when reviewing the results.

Year	Rank	Critical Events
2017	**2-3**	Good tuber harvest but maize yields very low due to locusts. High prices of seeds reduced the planting of cowpeas and groundnuts.
2016-2017	**1-2**	Extremely poor production in 2016. The 2016-2017 rains were good. WFP provided aid to drought-affected areas through the general food distribution and through school feeding.
2015-2016	**1**	Extremely poor production in 2015. The subsequent 2015-2016 rains failed.
2014-2015	**1**	Very poor production in 2014. The rains of 2014-2015 also failed.
2013-2014	**2**	Poor production outcomes for most crops in 2013. Very poor rains in 2013-2014.
2012-2013	**2-3**	Poor to average harvest outcomes for most crops in 2012. Poor rains in 2012-2013.
2011-2012	**3**	Very good production year for maize.
5 = an excellent season for household food security (e.g. due to good rains, good prices, good crop yields, etc.) 4 = a good season or above average season for household food security 3 = an average season in terms of household food security 2 = a below average season for household food security 1 = a poor season (e.g. due to drought, flooding, livestock disease, pest attack) for household food security		

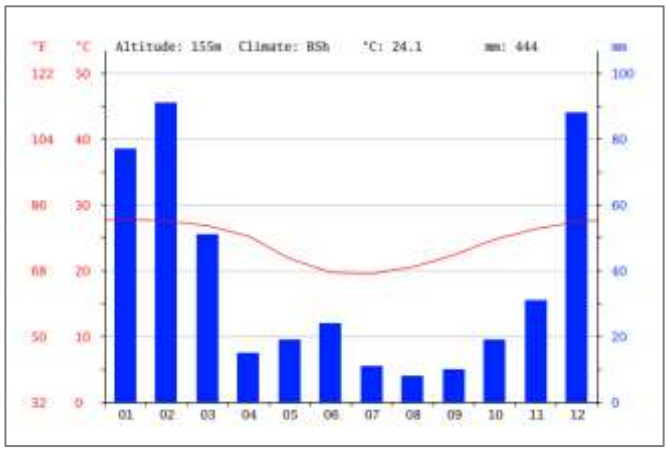
aggravating factor that produced the prolonged drought crisis.

Seasonal Calendar for Reference Year



Source: Climate-data.org, Climograph **Ambovombe** town (average rainfall 1982-2012). Blue bars indicate rainfall/month.

There is a single rainy season in the *Androy Semi-Arid Cassava, Maize and Livestock Livelihood Zone*. The period of highest and most predictable rainfall is from December to February (see graph at left, Ambovombe town). However, the rains can start in November and continue into March. What is notable is how little rain is received overall in the year. 300-500 mm/year is the average total annual rainfall for much of the zone rising to 800 mm/year in the northern communes. The average number of rainy days per year is often less than 30. This means that there is a long dry season lasting from March to November (9 months).



Source: Climate-data.org, Climograph **Beloha district town** (average rainfall 1982-2012). The blue bars show monthly rainfall amounts. The red line indicates temperature.

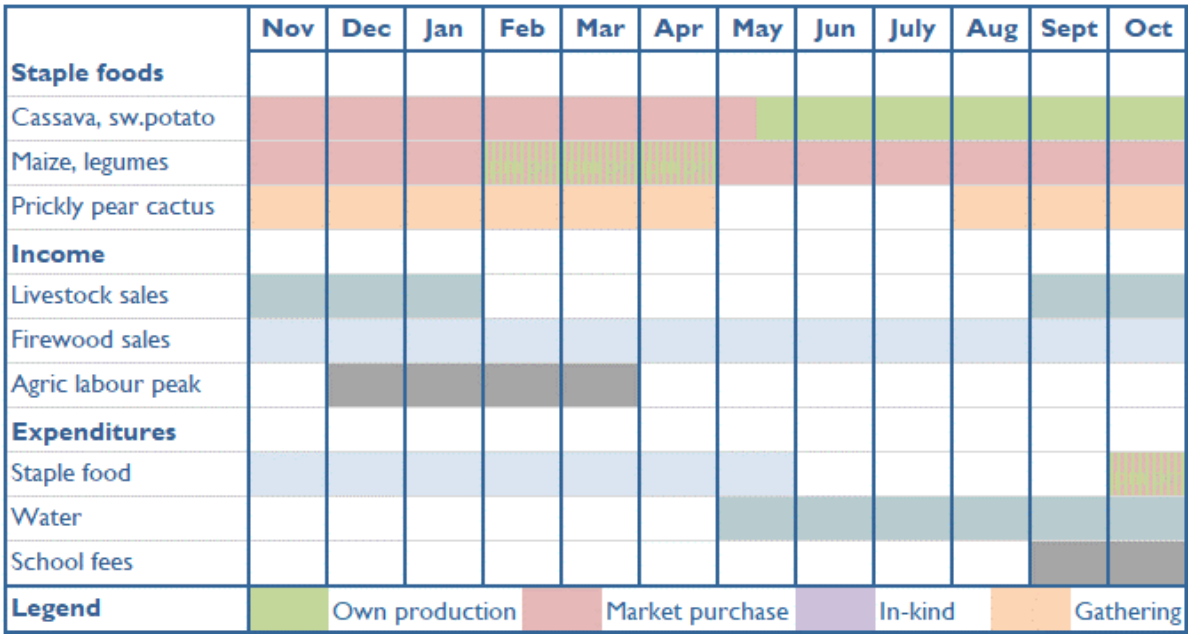
Land preparation begins just prior to the rains from September through to December. With the arrival of the rains, farmers plant their crops. Planting times are staggered by crop, beginning with maize, cowpeas and watermelons (*pasteque*) in November-December, followed by cassava in December-January and then sweet potato from February-May. Specific planting times depend on rain outcomes in any particular year but these are the most common months for planting. Weeding takes place during the dry season while crops are growing. The first crops ready for consumption are maize, cowpeas and watermelons (i.e., short-cycle crops). The lean season is broken by the consumption of first fresh maize and watermelon in February and then dry maize and cowpeas in March. Cassava is eaten fresh from June to August and is harvested between July to October with the peak months occurring in August-September. Sweet potatoes have a similarly long harvest period from July to October depending on the planting time. Tubers are long-cycle crops and mature after 12-18 months. For this reason, some cassava is planted after the maize harvest in April to reach maturity by the following July whereas other cuttings are planted in December. To make most efficient use of land, farmers intercrop maize with cowpeas, groundnuts and other legumes. Cassava is typically intercropped with watermelons.

The lean season typically begins once the tuber harvest is over and when most households have consumed their own production. September marks the general start to the lean season and the peak months are September-January. During this period, food prices rise, peaking in December-January for the staple crops. This is also the period when poor households supplement food purchases with gathering fruit from cactus plants and other wild shrubs and trees. The red cactus (*raketa*) produces fruit all year round but the local cactus by contrast has a very short fruit season lasting two-months (February-March). Nonetheless, the timing is important because its fruits supplement fresh maize and legumes in the critical February-March period and thus helps to break the period of hardship, or *soudure*.

The September to January peak lean season also coincides with the main period of migratory labor. Those who migrate (usually the household head) stay away until the next production season begins. Other sources of income, such as sales of firewood and charcoal, are year-round activities. The season for on-farm employment peaks during weeding, from January to March although it can also extend to April/May.

The rainy season is the time of livestock births when pasture has been renewed and the new pasture ensures good milk production. Milk yields peak between January to March. If a calf is born too late into the dry season, such as in May, the cow's milk is left for the calf and is not used for household consumption. Livestock sales are highest from September to January as this coincides with the lean season when food purchases typically peak and thus cash needs are highest. Livestock diseases are also highest during the rains as wetter weather brings with it parasites and other bacterial, viral and respiratory diseases.

The other period of note in the seasonal calendar are the months when expenditures are highest. Staple food purchases are highest during the rainy season when newly planted crops are growing (September-January). School fees are also due in September when students return to school to start the new year. 31 December and 1 January are important holiday dates in Madagascar, and require money for festive meals and new clothes. Finally, the incidence of human illness is typically highest in the month(s) following the rains (i.e., February) and this also puts demand on the household budget.



The calendar above shows how poor households typically access major food items during the year, and the sources of income that are available to them in each season. Expenditures increase during certain points in the year, thereby placing additional pressure on the household budget.

Cassava, sweet potato, maize, and legumes are the main staples in this livelihood zone. Cassava and sweet potato crops are harvested in May and June, but household reserves typically run out after four to five months. Once stocks have been depleted, poor households must purchase these staples from the market for approximately seven months out of the year. Maize and legumes are harvested from February through April. The amounts harvested vary but for the most part yields are low, so households also purchase maize and legumes from the market. Prickly pear is an important part of the poor households' diet and is gathered from August to April.

Livestock sales, firewood sales and agricultural labor are key sources of income for poor households. The peak period for livestock sales, which primarily consists of chickens but also includes sheep and goats, is from September through January. During this time, purchased foods become a priority for poor households and cash is in demand. Firewood collection and sales occur throughout the year, which supplements poor households' cash needs. Agricultural labor occurs during the cultivation period of the agricultural campaign from December to March.

Wealth Breakdown

		Wealth Groups Characteristics						
		HH size	Land owned (ha)	Land cultivated (ha)	Crops cultivated	Livestock	Poultry	Other productive assets
Very poor		6-10	0.5-1	0.5-1	cassava; sweet potato; maize; cowpeas	none	0-10 chickens	none
Poor		8-10	0.5-1.5	0.5-1.5	cassava; sweet potato; maize; cowpeas	0-1 goats; 0 sheep	0-10 chickens	none
Middle		8-10	1-4	1-4	cassava; sweet potato; maize; cowpeas	0-6 cattle; 0-6 goats; 0-6 sheep	5-10 chickens	1 cart; 2 oxen
Better off		7-11	1-10	1-10	cassava; sweet potato; maize; cowpeas	2-30 cattle; 0-30 goats; 0-15 sheep	5-20 chickens	1 cart; 1 plough; 2 oxen

Note: The results are expressed as a range.

An extended drought leads to much asset loss and in turn to the impoverishment of the local population. Subsequently, key informants found it easy to describe the two groups at either end of the wealth spectrum, i.e., the majority group who are poor (or whom became impoverished) and the few who remain better-off but they found it harder to describe upper and lower "middle" wealth groups. Although the wealth breakdown proved challenging, four different types of households (or wealth groups) were eventually defined.

The major difference between wealth groups is asset ownership. The better-off have relatively large land sizes (1-10 ha) and large herds (2-30 *zebu*; 0-45 goats and sheep; and a pair of oxen).[22] This allows them to generate much of their food and income from livestock and crop production. Middle households also generate an important part of their food and cash income from crops and livestock, albeit their land size and herd sizes are smaller (1-4 ha and 0-6 *zebu*). Overall, herd sizes were relatively low due to drought and slow recovery. After a few years, stock levels could climb again to pre-drought levels (an estimated 30-100 *zebu* for the better-off and 20-30 *zebu* for middle households). Both middle and better-off households own at least 2 draft oxen, and the better-off also own a plough. Middle households usually access ploughs on loan but like the better-off, they typically own a cart for hauling water, collecting the harvest or transporting goods to market.

Poor households are distinguished from the very poor because they typically farm their own land (not rented land). Poor households may own small ruminants (goats and sheep) as well as poultry but they do not usually have cattle. Land sizes are small (around 1 ha). The very poor, by contrast, cultivate about 0.5-1 ha of land but it may in part be rented. Their own land is typically very small (0.5 ha). Sharecropping (*metayage)* allows them to cultivate another plot. However, according to sharecropping arrangements, some of the tenant's harvest will be paid to the land owner. Overall, land and livestock assets owned by the poor and very poor are too low to lead to much income from crop and/or livestock sales.

Different wealth groups also generate income in different ways. Better-off households may own small businesses (i.e, a kiosk in the *fokontany* center) or engage in higher-profit petty trade. Middle households often use their cart for

[22] A better-off household would typically have at least 1-2 small ruminants but better-off households in several villages reported losing all their small stock to drought and/or to theft. Stock numbers are expected to rebuild in the coming years if conditions improve.

higher-volume sales during market days whereas the poor and very poor rely on lower-value manual labor (cutting firewood or being hired to weed growing crops). Poor households are more likely to engage in seasonal migratory labor than the very poor who often cannot generate the funds to pay the transport costs involved in migrating away.

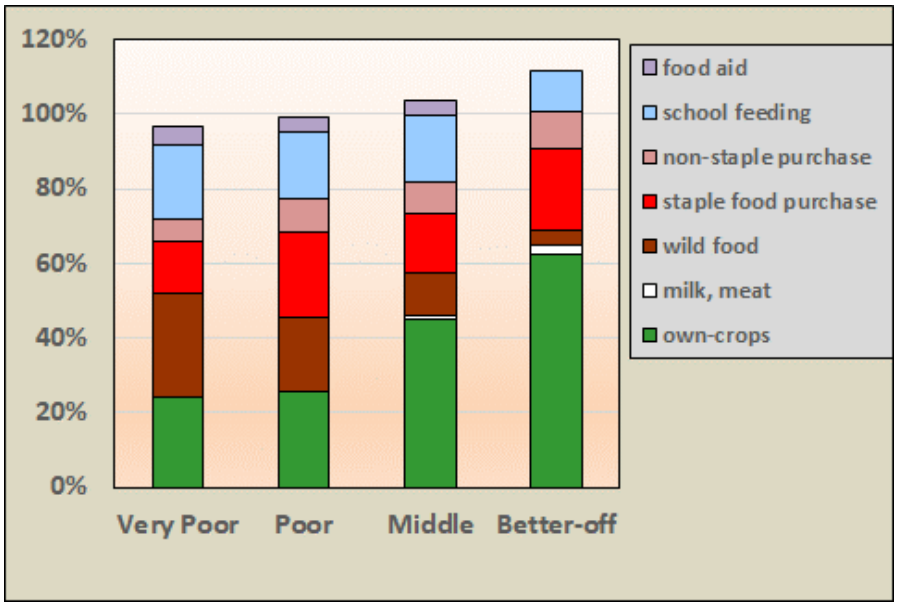
> In Ankilitelo village in Beloha District, the villagers estimated that 40% of very poor households, and 30% of the poor, were female headed whose husbands had yet to return from migrating away for work.

A household size of 8-10 people is common across the four wealth groups. In this assessment, the average household size of the very poor was 8. This is slightly smaller than the other wealth groups (9-10 household members). In part this reflects that many of the very poor are currently one-parent families, often female-headed. These single parent families emerged because the male (or in some cases female) left to find work outside of the region during the drought crisis and had yet to return (and were no longer sending funds). This "abandonment" due to drought stress may be temporary but may yet prove permanent. This situation was not typical in every village but was nonetheless characteristic of the very poor in several areas.

The proportion of the population who were identified as very poor and poor was extremely high. Almost half of the population are currently very poor (45%) and almost one-third (32%) are considered poor. Conversely, the proportion of the population currently considered middle and better-off is extremely low (15% and 8% respectively). The very high level of poverty likely reflects the impoverishing nature of an extended drought crisis. In this regard, it is also likely that these proportions will change 3-4 years after the drought.[23]

Sources of Food

The graph to the right presents the sources of food for households in different wealth groups in the livelihood zone for the period November 2016-October 2017. Own-crop data reflects the 2017 production season whereas food purchases, food aid and wild food peaked during the November 2016 to May 2017 lean season. Food is presented as a percentage of 2100 kcal per person per day for the 12-month period.



In the graph, food access is expressed as a percentage of minimum food requirements, taken as an average food energy intake of 2100 kcals per person per day.

[23] Equally, this assumption may **not** hold true. Notably, poverty has been widespread for several decades. For instance, data collected in 1999 showed that 71.3% of the population in Madagascar was classified as poor, with incomes that did not meet a daily ration equal to or in excess of 2 133 calories daily. Among the rural population of Madagascar, 76.7% were below the poverty level in 1999. The World Bank also concluded that after an extensive analysis of household data from 2001-2005, the head count poverty ratio at the national level was 68.7% but was 73.5% in rural areas. More current data from the World Bank shows that the extreme poverty rate in 2012 was 77.8%. N. Amendola and G. Vecchi. 2008: *Growth, Inequality and Poverty in Madagascar. 2001-2005*. Africa Region Working Paper Series, World Bank, April 2008.

In 2016-2017, yields for cassava and sweet potato were considered relatively average. However, crop outcomes were very poor for maize, cowpeas, *dolique* and groundnuts. This outcome reduced the overall contribution of own-crops to household annual food energy in the reference year. Overall, for poor and very poor households, own crops met an estimated 24-26% of annual household food needs (or an estimated 3 months of consumption from own-crops). Middle households met 45% of their annual food needs (5-6 months consumption) from own-crops; and better-off households met 62% of their annual household food needs (7-8 months of own-crop consumption).

Most of the food energy consumed from own-crops came from staple foods, such as cassava and sweet potato. Cassava is eaten both fresh and dried. Sweet potato is more typically eaten fresh but, in some villages, the tuber is sliced and dried for better preservation and longer storage. For the poor and very poor, these staple crops accounted for an estimated 20-22% of annual household food energy – which amounts to 85% of the total contribution of own-crops to household food needs. For middle and better-off households, the two staple food crops likewise contributed the most food energy.[24] However, in the case of better-off households, they did not typically eat much fresh cassava but instead waited until the tuber reached a mature size at which time it was harvested and dried. Although cassava and sweet potato are both considered staple foods in the zone, some village conditions were better suited to growing sweet potato (i.e., where white sandy soils predominate) whereas other villages with red sandy soil were more suited to cassava production. Thus, the quantity of each particular staple crop, and the balance between them, varied within the zone.

It generally takes one week or more to dry the cassava tubers, and then the dried tubers are stored for home consumption. In the 2016-2017 reference year, this period of post-harvest consumption was fairly short. For the very poor, poor and middle households, dried cassava from their own-harvest lasted only 1-4 months (June/July-August/September). However, better-off households consumed their own dry cassava for 2-5 months post-harvest (i.e. up until October 2017 although for some their cassava harvest is predicted to last until December 2017).

Cassava and sweet potato leaves do not add much food energy in terms of kilocalories. However, the green leaves are an important source of nutrients in the household diet. Leafy greens are generally cooked into a meat sauce or cooked on their own with salt and oil, and then eaten with other staple foods.

In the 2016-2017 reference year, maize, legumes and melons from own-crop production contributed very little to annual household food energy. In part, this reflects the preference to sell some of the crop to generate a cash income. It also reflects a poor production year for these particular crops. The combined contribution of cereals, legumes, melons and/or pumpkins to annual food needs was only about 5% for very poor, poor and middle households, rising to 10% for the better-off. In the case of maize, better-off households harvested small amounts of dry maize whereas the other three wealth groups ate their maize green, or fresh. One reason for the tendency for poorer households to eat fresh maize is that it is ready for consumption in February/March and thus provides some relief during the lean season before cassava and sweet potatoes have grown to maturity. Cowpeas, *dolique* (black-eyed peas) and watermelons are also short-cycle crops that help break the lean season as both a food and cash source.

The contribution of food purchase to annual household food energy was relatively low in the reference year. There were several reasons for this trend. First, food aid and school feeding helped cover food deficits during the lean season which in turn allowed households to use their cash income for non-food needs. Second, the poor production of maize, cowpeas and groundnuts meant that there was less income from own-crop sales, and thus less income with which to purchase food during the year. Third, low herd sizes in the post-drought year also meant low household income, and fewer cash resources with which to buy food.

Overall, food purchases were lowest for the very poor (21% of annual food needs) which reflects their poverty. Poor households bought more food than, for instance, middle households because their own-crop production was low, driving the need for purchased food. Although limited in income, the poor at least are a two-parent household which

[24] Indeed, for middle and better-off households, 85% of the total annual food energy from own-crops came from cassava and sweet potato (just as with the poor and very poor).

meant more labor to earn an income than the very poor. Better-off households also purchased more food than middle households. In their case, less aid received meant more food had to be purchased. Moreover, the better-off reportedly buy extra stocks of rice and maize to keep in case of the need to prepare a special meal. Funerals in particular, but also other ceremonies, are important events in southern Madagascar. For this reason, better-off households may invest in grain stocks.

Dry cassava was the staple food purchased by all wealth groups, providing 9-17% of annual household food energy. Dry cassava purchases were highest for the poor and very poor, accounting for 53-55% of the total food energy from food purchases. By contrast, dry cassava comprised 40% of the total food energy from food purchases for middle households and just 28% for the better-off. Another difference was that although all wealth groups bought small amounts of (imported) rice for dietary diversity, the better-off were able to afford more rice than the poorer wealth groups. Food purchases by the better-off typically comprised items that they do not produce themselves, such as sugar and oil, or items that did not do well in the reference year, such as maize. Poorer households bought supplementary staple foods such as cowpeas, *dolique*, sweet potatoes, cassava and maize due to low crop production overall. Moreover, the poor and very poor did not generally buy sugar. Cooking oil was purchased by all wealth groups but even for the better-off, cooking oil was bought in small quantities only.

Food aid, in the form of school feeding and general food distribution, was a very important source of food in 2016-2017. The general food distribution (GFD) began between December 2016 to February 2017 (it varied from village to village) and came to an end in June 2017. The end date was selected to coincide with the month when cassava and sweet potato were harvested. The Humanitarian Response Plan only secured 65% of its pledges and thus the GFD program had to be targeted within the drought-affected area.[25] In the *Androy Semi-Arid Cassava, Maize and Livestock Livelihood Zone*, very poor, poor and middle households from 5 of the 8 villages surveyed received maize, legumes and oil from the GFD program.

A critical source of food energy from food aid other than the GFD program was WFP's school feeding program. In response to the drought crisis, the school feeding program introduced a special high-calorie lunch. Due to the high-calorie lunch, primary school students were able to meet their daily food needs 5 days a week for the 9 months that they attended school. The school feeding program was also a targeted intervention and in the reference year it was found in 75% villages surveyed. In total, food aid (emergency distribution and the school feeding program) provided an estimated 22-25% of annual household food needs for the very poor, poor and middle households, and an estimated 13% of food needs for the better-off.

The fourth major food source for very poor, poor and middle households was wild food. Fruit from the red cactus plant (*raketa*) was a principal food source for the very poor and the poor when other food stocks from own-crops or purchase were low. The red cactus fruit is ubiquitous in the zone, and a bucket holding 15 kg of the fruit can be gathered within 30 minutes. Moreover, the fruit is readily available throughout the year. By contrast, the local cactus produces fruit for just 2 months (February-March). During the reference year, wild foods – including cactus fruit, tamarind, jujube [*ziziphus jujuba* or wild date] wild mango and other types of wild food – comprised 27% of the annual food needs of the very poor; 19% for the poor; and just 11% and 4% for middle households and the better-off respectively.

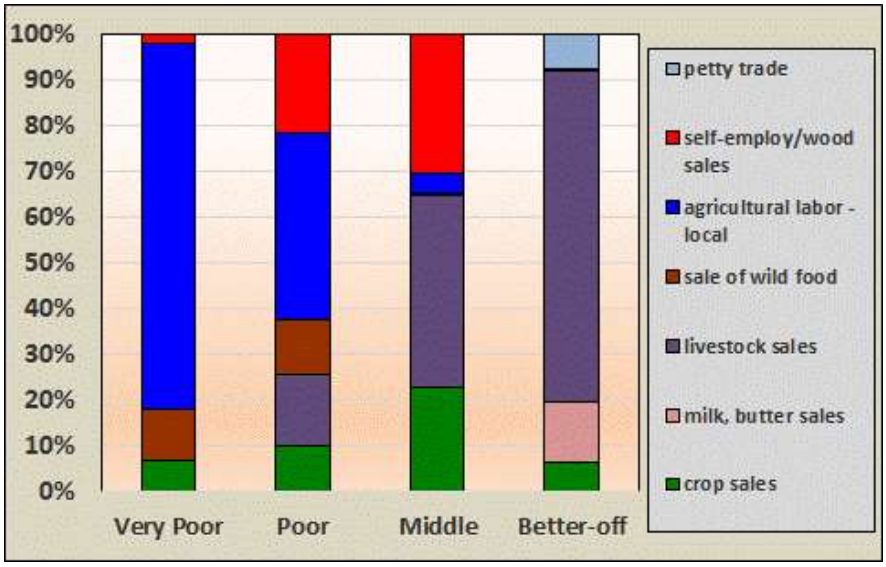
Livestock production in the form of milk and meat provided very little food energy during the reference year. This situation does not represent full recovery. For instance, prior to the drought, better-off households typically had herds of 30-100 *zebu*. By contrast, in the reference year, better-off households owned just 10 *zebu*/household and only 2 lactating cows (middle households had just 1 cow). Thus, milk and some meat contributed just 3% to the annual food energy for the better-off and only 1% for middle households.

[25] Rakotondramanana. 2017: *Rapport de Mission*, Projet SOA/GRET. CIRAD/AFC, Juin 2017.

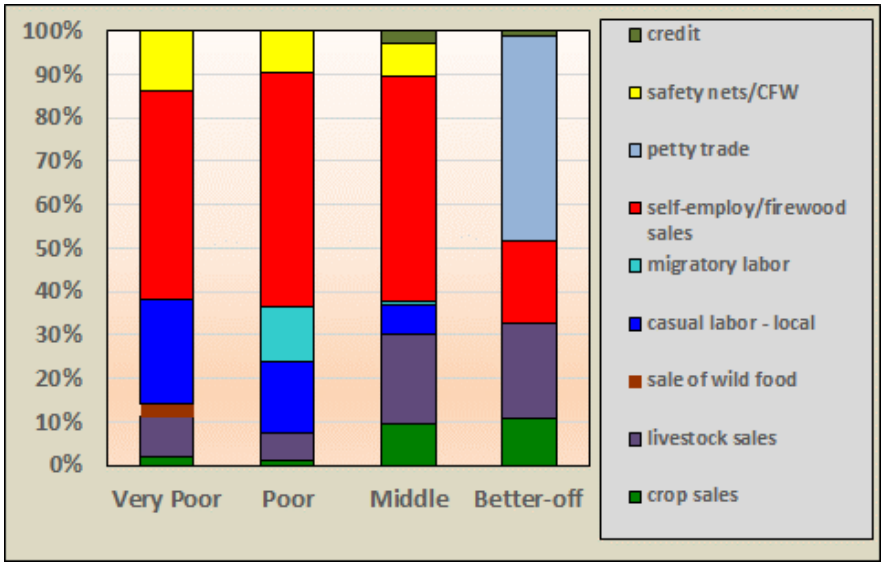
Sources of Cash Income

In 2016-2017, the main income source for the very poor, poor and middle households in the *Androy Semi-Arid Cassava, Livestock and Maize Livelihood Zone* was the sale of firewood and/or charcoal. Households in Ambovombe District relied the most on this income source. A common pattern was for family members to cut and sell firewood/charcoal at weekly markets throughout the entire year. Earnings from firewood/charcoal sales were lowest for the very poor because they lack the means to transport large quantities of firewood to market. Instead, after cutting the wood, the very poor typically sell it to middle households. Middle households then use their carts to bring the wood to market where they earn a small profit. Poor households often rent carts to transport cut wood but the cart rental costs reduce their weekly earnings. Income from firewood and charcoal sales (as well as from other self-employment activities such as petty trade or water hauling) accounted for 53-56% of the annual cash income of very poor, poor and middle households in the reference year.

Better-off households earned an estimated 20% of their annual cash income from self-employment activities. For this wealth group, their self-employment earnings were generated from cart rental and the petty trade of local produce and livestock.



Breakdown of total annual cash income in Madagascar Ariary according to income source



Breakdown of total annual cash income as a percent of annual cash income.

INCOME SUMMARY TABLE in Madagascar Ariary ('000s)				
Wealth group	**Very poor**	**Poor**	**Middle**	**Better off**
Annual income per household [26]	420 – 985	775 – 1,520	800 – 1,800	1,310 - 6,075
Note: All results are expressed in a range				

Although the *Androy Semi-Arid Cassava, Maize and Livestock Livelihood Zone* is a mixed farming economy, crop sales contributed very little to annual household income in the 2016-2017 reference year. The main crops sold for cash performed poorly and thus only better-off households sold a fairly diverse range of crops including sweet potatoes, groundnuts, cowpeas, *dolique*, melons, pumpkin and leafy greens. Middle households mainly sold dry cassava and

[26] The average exchange rate during the reference year from November 2016 to October 2017 was US$1 = MGA 3,000

sweet potatoes. Overall, crop sales accounted for just 11% of the annual cash income of better-off households, and only 9% of the annual income of middle households.

Income from the sale of livestock and livestock products (milk, butter, eggs or meat) was also low for most wealth groups in the reference year. Poor and very poor households sold poultry whereas middle and better-off households sold poultry, goats, sheep and/or cattle. Cattle are kept for ceremonial purposes as well as for milk, and thus are not usually sold. However, if circumstances require a household to generate cash then they will sell a *zebu*. Better-off households typically sold around 3 goats and/or sheep per year and together with the occasional cattle sale the cash earned amounted to about 22% of their annual cash income. On average, middle households sold 1 or fewer goats and sheep as well as poultry which, together with the occasional cattle sale, came to 20% of their cash income. For poor and very poor households, income from poultry sales was 6-9% of their cash income. Livestock income was likely particularly low in the reference year due to the accumulated effects of the extended drought in the region.

Only the very poor earned an income from the sale of wild food in the reference year. During the year, they sold fruit from the Malagasy cactus (*cactus jaune*) as well as jatropha seeds (*ricin*). *Jatropha Curcas* is a perennial shrub that produces seeds from which vegetal oil is extracted for biofuel. A refinery in Madagascar buys jatropha seeds directly from farmers. Domestic demand for this wild seed may increase in the future.

The other income source of note in the reference year for poor and very poor households was casual labor. The very poor earned 24% of their annual cash income, and the poor 16%, from local agricultural labor. Weeding is the most common type of work for which better-off farmers hire labor. In some parts of the zone, when labor supply outstrips labor demand, the household head migrates to district centers or to major urban areas outside of the zone in search of work. From Beloha District, the pattern is to migrate to Tulear for work whereas in Ambovombe District, men will travel to Fort Dauphin or Ambovombe town. The most common types of casual jobs are port-based (i.e., a docker) or bicycle rickshaw driver, or security guard. The very poor are reportedly less likely than the poor to engage in seasonal out-migration due to their difficulty raising the resources to pay for transport. Overall, poor households earned about 13% of their annual cash income from migratory labor in the 2016-2017 reference year.

Another important source of cash for certain households in the reference year was aid transfers, including cash transfers, cash-for-work and livelihood support (seeds and assets). These interventions were targeted (not blanket coverage) and therefore not all villages received such inputs. In the targeted villages, families with children under 5 years from very poor, poor and middle households, received MGA 30,000 / month for 3-8 months in the reference year. This social protection transfer was provided by FIOVOTA/FID (*Le Fonds d'Intervention pour le Développement*) and represented 8-14% of annual cash income overall.

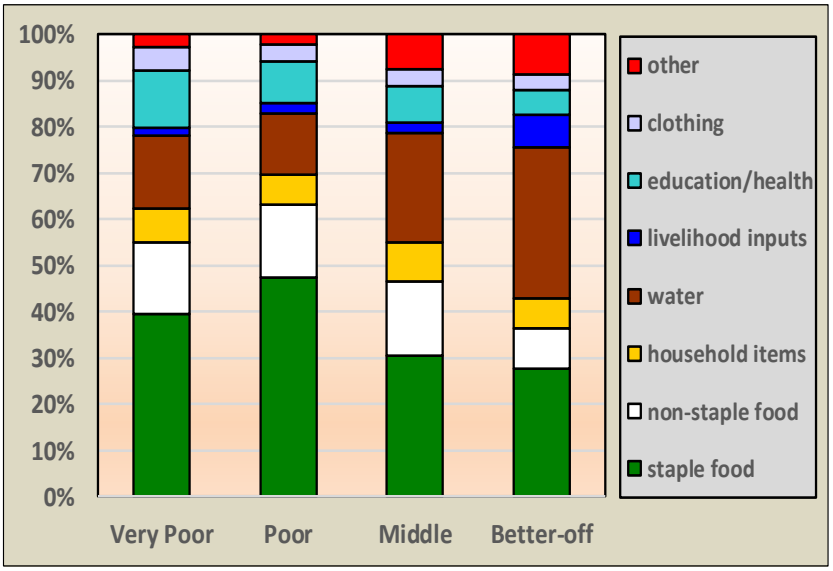
Income from petty trade and small business was more common amongst the better-off who have the resources to invest in a business. It is often women often run small kiosks or are petty traders at the weekly market which they attend 1-2 times per week throughout the year. Typical earnings per market day were MGA 5,000-10,000. Overall, small business earnings accounted for almost 50% of annual household cash income of better-off households in the reference year.

In some instances, middle and better-off households borrowed cash which was repaid by the end of the year. This type of credit is informal, i.e., the credit is taken from a member of the extended family, rather than a formal loan from a bank.

Expenditure Patterns

The graph presents expenditure patterns for the reference year November 2016-October 2017. While total expenditure increases with wealth, the expenditure breakdown by percent in this graph demonstrates the *relative* amount of income spent on different expenditure categories.

Food purchases, in particular, staple food purchases, were the key expense for poor and very poor households in the reference year. In total, staple and non-staple food accounted for 55% of the annual expenses of the very poor and 63% of the annual expenses of the poor.



Breakdown of total annual cash expenditure according to expenditure category.

The importance of food purchases reflects the poor production year for many crops as well as small land sizes and lack of animal traction leading to low yields. Middle and better-off households spent proportionately less on food during the year. Nonetheless, food spending amounted to 47% of the annual expenditures of middle households, and 37% of better-off households' expenditures. In absence of food aid, food purchases might well have been higher but the Emergency distribution and school feeding programs helped reduce food spending in 2016-2017.

The second major expense in the *Androy Semi-Arid Cassava, Maize and Livestock Livelihood Zone* was water. The zone is marked by water shortages particularly in Ambovombe District. Consequently, for at least six months of the year, households from all four wealth groups typically had to pay for water. Water expenses were highest for the better-off (33% of annual expenditures) because their higher income allowed them to buy sufficient water for much of the year. By contrast, water comprised 13-16% of the annual expenditures of the very poor and poor. Lower expenditures did not reflect less need but rather less income to pay for sufficient water. For instance, the very poor and poor households do not pay for water during the rainy season. Instead, when the rains come, these households collect water from shallow depressions even though the water may be muddy or of poor quality.

The remaining 25-30% of the very poor and poor's annual expenditures were spent on essential non-food items such as education, health, household articles (salt, soap, torch batteries), clothes and ceremonies. Parents in this zone pay only a nominal sum for primary school (MGA 2,500/student/year) but they also pay to educate their children at secondary school level. Health care costs are relatively low and include the cost of modern medicine as well as traditional medicine.

Better-off households spent income on livelihood inputs such as seeds, veterinary medicine for livestock and hired labor. Households in the other wealth groups also paid for seeds but the expense was low.

The "other" category of annual expenditures includes important expenses such as money for ceremonies (including funerals), transport, phone credit and credit repayment. Of these various "other" expenses, funeral and other festival expenses were the highest for all wealth groups.

Hazards

The most significant hazard in the *Androy Semi-Arid Cassava, Maize and Livestock Livelihood Zone* is a **lack of water**. Lack of water is both a chronic problem as well as a periodic hazard. Chronic water shortages are due to the semi-arid climate of the far south where rainfall averages 300 mm/year and is often poorly distributed. There are also very few permanent rivers, and the Mandrare River on the eastern boundary of the zone is often inaccessible due to banditry and cattle rustling.

Chronic hazards
- Water shortages
- Insect attacks on crops

Periodic hazards
- Rain failure
- Widespread insect invasions
- Livestock diseases (parasites, respiratory and bacterial)

This semi-arid zone also experiences **periodic drought**. In 2009, in the midst of prolonged and terrible drought, an early warning expert based in Ambovombe town said: "Before, people spoke of the cycle of drought every 10 years. Now it is every 5 years, or every 3 years."[27] Another expert commented that since 1981, recurrent drought conditions have become chronic, and droughts in southern Madagascar have been reported in 1981, 1988, 1992, 2000 and 2003. The most severe droughts were 1981, 1992 and 2003 (i.e., every decade). [28]

Drought in East Africa and the Southern African region (including Madagascar) is often associated with the warming phase of an ENSO event (El Nino Southern Oscillation). 2014 and 2015 were the hottest years on record, and the most recent El Nino was reported as being one of the three strongest El Nino events since 1950.[29] In general, an El Nino event typically occurs every 3-7 years.

The other chronic hazard that affects crop production is **insect infestations**. Insects reduce crop output every year but some years the invasion is more widespread and severe. In the case of **locust invasions**, the plague can build over years. For example, a plague that started in 1939, lasted 18 years until 1957 due to a lack of well-coordinated action. Another invasion that was traced to an initial locust outbreak in 1992 in southern Madagascar built to a country-wide locust plague in 1997. Fifteen years later, in November 2012, the government declared a state of emergency across the country due to a locust plague. This hazard has seen a coordinated response in recent years. For instance, the *Centre National Antiacridien Malagache* (CNA) is spearheading the fight against locust invasions. From 2013-2016, a 3-year project funded by the state with partners such as FAO, saw a "quasi-remission" of locust invasions in 2016. The three-year project involved research, training, and the stocking and distribution of inputs (such as pesticides and bio-pesticides) as well as environmental impact studies to ensure that negative impacts were minimized. (Bio)chemical inputs are best applied at key moments in the reproductive cycle (i.e., before the locusts develop wings) which is why coordinated action is so crucial. Notwithstanding the vital work carried out by those involved with the *lutte acridienne (*fight against locusts), these outbreaks remain a serious concern in the far south where poor farmers cannot afford to buy insecticides. Certainly, it was a problem affecting production in 2016-2017.

Livestock diseases caused by parasites, viruses and/or bacteria reduce livestock productivity in the zone every year. Epidemics also occur periodically. Some epidemics feature diseases that are less common in Madagascar. For instance, in 1979, 1990-1991 as well as in 2008-2009 there was an outbreak in cattle of Rift Valley Fever. At the district level, *the Centre de Service Agricole et Elevage* promotes vaccination campaigns to reduce parasitic (and other) diseases. Their vaccination campaigns involve public education as well as delivery of vaccine services.

[27] Tovohery Zo Raobijaona, director of a food insecurity early warning system in nearby Ambovombe quoted in *Ravaged by Drought: Madagascar feels the full effect of Climate Change*, 23 Oct 2009, The Guardian

[28] T. Elmqvist et al. 2007: *Patterns of Loss and Regeneration in Tropical Dry Forest of Southern Madagascar*. Plos One Journal. May 2007.

[29] www.unocha.org/country/el-nino/what-el-nino

Response Strategies

When crop production fails, households engage in a number of strategies in an attempt to cope with reduced production.

For the very poor and poor households, these strategies include:

Increased consumption of wild fruit: The red prickly pear cactus is widely available throughout the zone and as the red cactus fruit grows throughout the year, the cactus provides an available food source that can be increased when own-crops fail or when there is less income to purchase food. Both the quantity consumed per day (i.e., from one bucket to two) as well as the number of months during which the fruit is eaten are both increased during production shortfalls.

Increased sale of firewood and charcoal: This is a common response where there is still access to sufficient supplies of wood to allow for increased sales of firewood and charcoal. Typically, the response is to double sales of firewood or charcoal by selling twice during the week instead of once.

Reduced expenditure on clothes and other non-essential goods: Reducing spending on items considered non-essential (such as clothes) frees up income to buy more staple food.

Sell wild fruit (cactus Malagasy, tamarind, jatropha and others): There is little demand for the red cactus fruit as it is ubiquitous but there is some demand for the less common *yellow cactus* (the Malagasy cactus). Very poor households sell this fruit even in an average year but higher quantities are sold in a bad year. The strategy is limited to a small two-month window of production. However, other types of wild fruit are also sold including tamarind and jatropha (*ricin*).

Labor migration: Labor migration is a common strategy to cope with food and income deficits. Usually, the household head migrates away for six months in search of work, to major urban centers within the southern region and/or to places in the north-west such as Majunga. If an economic crisis is prolonged, the period of time spent away can also be extended to 1-2 years of more and the

Consumption of cactus leaves: During the most recent drought crisis, many households reported replacing staple foods such as cassava, sweet potato, maize and rice with the consumption of cactus leaves. The leaves are first burned to remove the thorns, then the outer part of the leaf is removed, and the interior flesh is eaten either raw or heated with a little salt and water.

Reduced expenditure on food and seeds: A coping strategy that is applied once an economic crisis has deepened is to reduce expenditure on essential items such as food and seeds. This strategy has clear negative impacts on health and wellbeing.

Sell more (or all) of household poultry: The very poor and poor households have few livestock assets. Nonetheless, they do own poultry, and when there are income shortfalls, households will sell off all their poultry to generate some cash. In the reference year, poultry holdings were relatively low (< 5) but numbers can vary quite widely during and between years, and thus the actual number sold in a crisis year varies too.

Sell productive and domestic assets: When an economic crisis is prolonged, households sell off their assets, including assets such as cooking pots and land. This is a last-ditch coping measure to generate income for food purchases but is very harmful for future livelihood survival.

For the better-off and middle-income, there are some coping strategies that they share in common with the poor and the very poor as well as some coping strategies that are specific to these two wealth groups:

Livestock sales: When crop production is low and there is less income from crop sales, better-off and middle households will increase sales of livestock to cover the deficit. Goats and sheep are the first livestock to be sold as cattle are kept for animal traction and for ceremonial events. In current years, cultural expectations around the slaughter of the herd during important funerals is changing and some cattle may be sold when there is a need for cash for essential needs.

Increased sale of firewood and charcoal: Middle households often adopt similar strategies to the poor and the very poor, such as increasing their sale of firewood and charcoal. To do this, they will sell firewood at more than one commune market during the week. A higher supply of firewood and charcoal does not necessarily mean that there will be demand for it although it is reportedly a common coping strategy.

Consumption of wild food: Due to the availability of the red cactus fruit, households will increase their consumption of wild fruits. If crop and livestock production is extremely low, then consumption of the red cactus fruit will be the principal strategy to meet food needs throughout the year.

Reduced expenditure on non-essential expenses: When faced with production and income deficits, middle and better-off households reduce expenditures on non-essential items such as cell phone credit and clothes. They also reduce expenditures on more expensive food items (such as rice, oil, sugar or meat) so that they can increase their staple food purchases.

Labor migration: Middle households use this strategy when production fails. In a normal year, labor migration is not a typical source of income but in a bad year, the household head will migrate away for around 4 months to earn an income.

Small business: Better-off households may respond to a shock by increasing their small business activities to cover deficits in crop sale of livestock sale income.

Reduced expenditure on essential items: This coping strategy is one of the last strategies because it undermines health and livelihoods. In times of severe stress, expenses on seeds, health and education are minimized to allow for higher spending on food.

The coping strategies described above are summarized in the table below according to the timing when they are typically employed (i.e., during the early, stress stage of a crisis or in the later, emergency stage). Coping strategies that are employed late are considered "negative" strategies which is to say that they are last-ditch efforts to save lives even if they undermine livelihoods and health.

Livelihood Coping Strategies in *Androy Semi-Arid Cassava, Maize and Livestock* Livelihood Zone

	Coping strategy	IPC phases of strategy	Rationale/justification
1	Consume more cactus fruit	Stress	The prickly pear cactus fruit is widely available throughout the zone and fruit consumption can be expanded to cover shortfalls in both own-crop production and/or food purchase. The red cactus fruit is available throughout the year. Note that replacing tubers and grains with cactus fruit may have health impacts.
2	Consume crops when green or fresh	Stress	This strategy is typically used during the first production season after previous year(s)' failed harvest(s). Due to high food prices in the market and due to few food stocks at home, households are compelled to eat more of their crops fresh or "green" at the very beginning of the season rather than waiting to harvest the crops once they have matured or dried (i.e., when the crops are more energy dense).

3	Sell more firewood and charcoal	Stress	Where there are sufficient local woody resources, increasing firewood/charcoal sales is one of the first coping strategies to be used.
4	Increase local agricultural work.	Stress	After facing production shortfalls the previous season, one of the poor's first coping strategies is to look for more local agricultural work during the next growing season. However, local demand for labor is often too low for the local labor supply. Moreover, in a sustained crisis, middle and better-off households may also be suffering the effects of poor production.
5	Increase migratory labor	Stress	This strategy is used when the local labor supply is higher than local labor demand. Typically, during a period of food stress, many poor laborers are looking for work and thus labor supply outstrips labor demand. Poor laborers thus migrate out of the zone in search of work. During periods of stress, the period of migration is often extended from 6 months to 9-12 months or more.
6	Reduce non-food expenses (education, health care, veterinary care etc.)	Stress	As with the other strategies listed above, reducing non-food expenditures is both an early coping strategy and a late coping strategy because it can be equally applied to all the different stages of a hazard from stress to crisis to emergency. Some expense reductions do not have such severe consequences (such as reduced spending on social events or clothes). Other types of expense reductions, such as lower spending on health, education and vet care, have a more profound impact.
7	Increase consumption of a wide variety of wild food.	Crisis	As the food crisis deepens, households increase their consumption not just of the fruit of the prickly pear cactus but also other types of wild fruits, seeds and leaves (such as tamarind or jujube).
8	Consume all food stocks	Crisis	Any food stocks that have been kept in reserve for special events or for unexpected needs will be consumed as a period of food stress turns into a food crisis. The consumption of food stocks often involves consuming stocks that were put aside for seed.
9	Reduce food expenses	Crisis	A deepening food crisis typically leads to households cutting back on overall spending including spending on non-food items as well as spending on food items. Proportionately, more income will be spent on food. However, the amount of food purchased may be lower due to rising prices, declining income, and the effort by households to switch from food purchase to wild food gathering.
10	Sell non-reproductive livestock	Crisis	Households with livestock will first sell off their non-reproductive animals in order to generate cash income to buy food.
11	Borrow money	Crisis	This strategy cannot be employed by all households as the poor and very poor do not have the asset base to be credit-worthy. However, middle and better-off households look to their extended family and network of relatives in order to borrow money to purchase essential items.
12	Borrow food	Crisis	This strategy is usually employed during a deepening food crisis but it can be of limited use if the food crisis is widespread and thus if few households have food to share.
13	Send family members to eat meals with others (i.e., better-off households)	Crisis	Borrowing food from one family to support another family has limited potential in a spreading crisis. Another alternative is to send family members to eat meals with households who still have food that day. Households may be more obligated to share a prepared meal with relatives or neighbors who are hungry than to share or lend out their food stocks.
14	Increase consumption of the cactus leaf, cactus fruit, tamarind and other wild foods	Emergency	One of the key strategies used by households in this zone throughout a period of food stress, crisis and emergency is the increased consumption of wild food. In a deepening food emergency, households are forced to expand the limits of their wild food consumption, including not only various fruits but also less palatable wild food items

			such as the cactus leaf.
15	Sell household assets (cooking pots, utensils)	Emergency	During a severe food emergency, households are forced to generate cash for food purchases by selling their household assets, such as their cooking pots and utensils.
16	Sell reproductive livestock	Emergency	In a continuing food emergency, once key household assets are sold, then households are forced to sell off their productive assets. Reproductive livestock are one such asset that many households are forced to sell during a food emergency even though this strategy undermines their livelihood survival in the future.
17	Sell productive assets (land, cart, plough, house)	Emergency	The strategy of selling off productive assets to generate cash for survival food extends from selling household assets to selling livestock assets to selling farming assets (ploughs, carts, land and so on). All of the different variations of this strategy have negative repercussions for the long-term survival of local livelihoods.
18	Slaughter and consume remaining livestock	Emergency	Livestock that are not sold may be slaughtered and consumed if the household lacks other means to access food.
19	Undertake illegal work (i.e. stealing)	Emergency	One of the last strategies employed by desperate households is to undertake illegal activities such as stealing. This strategy cannot be employed by everyone but it is one option for survival used by the desperate.
20	Beg	Emergency	The last strategy employed by households without any other option is to beg for food.

Key Parameters for Monitoring

The key parameters listed in the table below are food and income sources that make a substantial contribution to the household economy in the *Androy Semi-Arid Cassava, Maize and Livestock Livelihood Zone*. These should be monitored to indicate potential losses or gains to local household economies, either through on-going monitoring systems or through periodic assessments. It is also important to monitor the prices of key items on the **expenditure** side, including staple and non-staple food items.

Item	**Key Parameter – Quantity**	**Key Parameter – Price**
Crops	• Fresh cassava • Dry cassava • Sweet potatoes • Cowpeas • Maize • Groundnuts	• Dry cassava – producer price • Sweet potatoes – producer price • Groundnuts – producer price • Cowpeas – producer price
Livestock production	• Cow's milk (season 1) • Cattle sales • Goat sales	• Cow's milk prices (season 1) • Cattle prices • Goat prices
Other food and cash income	• On-farm labor (weeding) • Firewood/charcoal • Urban casual labor • *Ricin* (jatropha) (quantity sold/hh)	• On-farm wage rates in cash (weeding) • Firewood/charcoal prices • Urban casual labor rates • *Ricin* (jatropha) prices
Expenditure (staple food)	• Dry cassava (consumer supply)	• Dry cassava -consumer price
Other Expenditure		• Sweet potato - consumer price • Rice - consumer price • Water price • Soap price

Program Implications

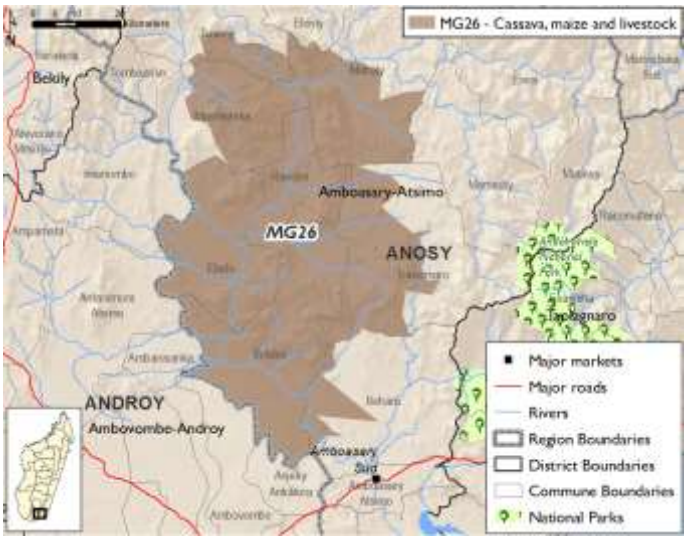
The drought crisis in southern Madagascar led to a significant, coordinated drought response by the state, national and international partners (including UN agencies and bilateral donors). Humanitarian assistance increased substantially in 2016 as the drought entered its third year and the impact of production shortfalls intensified. USAID, for instance, increased its emergency funding response from $785,000 in 2014, to $3,800,000 in 2015 to over $32,000,000 in 2016. Additional funding in 2017 meant that its total relief assistance by mid 2017 was an estimated $39 million. This funding reflects the massive relief effort in 2016-2017 to prevent famine and destitution. Overall, the multi-donor drought response effort involved targeted food distribution, supplementary feeding, school feeding, food-for-work, cash-for-work, seed and cuttings distribution, provision of chickens and goats, water point rehabilitation, and cash transfers. The different implementing partners involved in the response included the Madagascar state, the UN WFP, UNICEF. FAO, CRS (Catholic Relief Services), CARE, and ADRA (Adventist Development and Relief Agency). Other agencies who provide support in the region include FRDA and AINA (who focus on child nutrition interventions). FIOVOTA / FID (*Le Fonds d'Intervention pour le Développement*) provide cash transfers for families with children under 5 years. In 2018, a new project will start up, financed by USAID, called AFAFI.

The various agencies currently active in the *Grand Sud* of Madagascar carry out essential services through their livelihood support. During wealth group interviews, this type of livelihood support was highlighted as priority work. The abbreviated list of suggested activities below does not undermine their essential work but simply highlights feedback on priority interventions. All of the suggestions below would require further detailed feasibility studies prior to implementation.

Very poor	Poor	Middle	Better-off
Development of water points, such as wells, within close proximity to villages	Development of water points, such as wells, within close proximity to villages	Development of water points, such as wells, within close proximity to villages	Development of water points, such as wells, within close proximity to villages
Distribution of seed and cuttings to farmers (preference for drought resistant seed)	Distribution of seed and cuttings to farmers (preference for drought resistant seed)	Distribution of seed and cuttings to farmers (preference for drought resistant seed)	Distribution of seed and cuttings to farmers (preference for drought resistant seed)
Provision of agricultural tools (hand hoe, spade) and pesticides	Provision of agricultural tools (hand hoe, spade) and pesticides	Support to irrigation development where feasible	Support to irrigation development where feasible
		Provision of livestock vaccinations for herders	Provision of livestock vaccinations for herders

ANOSY CASSAVA, MAIZE AND LIVESTOCK LIVELIHOOD ZONE (MG26) [30]

Zone Description



The *Anosy Cassava, Maize and Livestock Livelihood Zone* is a low-lying agropastoral area in Amboasary District of southern Madagascar. The zone cuts across the communes of Behara, Ifotaka, Ebelo, Marotsiraka, Ranobe, Tranomaro, Tsivory and Mahaly. This semi-arid to arid zone is sparsely populated compared to neighboring livelihood zone MG22. The main geographical feature of the zone is the Mandrare River which becomes a series of isolated pools during the dry season. The zone has a mixed topography of hills, valleys and plains. The land is covered with dry tropical forest, scrub bush, savannah grass, thorny thickets, baobab trees and stony plains. Agricultural land is organised in small parcels located mostly in low areas near rivers. The zone is served by '*routes secondaires'* (secondary roads) which are fairly accessible in the dry season but are less accessible in the rainy season leading to the isolation of some communes in the rainy season.

Due to the dryness of the zone's climate, water problems are common. Access to sufficient water for both humans and livestock is a major challenge especially in the dry season. The zone's water problem is a key reason why villages are located close to the rivers. The other reason is that land near the rivers is the most productive. Notably, there are communal handpumps in almost all *fokontany* (hamlets) that allow water access to the surrounding villages. Occasional these pumps break, or the wells dry up, exacerbating the water problem.

The zone has three seasons; the rainy season; the cool, dry season and the hot, dry season. The rainy season is crucial for farming because crop production is entirely rain-fed. The rainy season typically occurs between October to March, and average annual precipitation is 350-500mm**.** In the reference year, the rains arrived between November and March. The land is generally dry and, in some places, covered with stones. Soil types are graphite and silty-clay. The most productive land is found in low-lying areas near rivers although some *fokontany* (and hence their farmland) are located far from rivers. Main crops cultivated include cassava, maize, sweet potatoes, cowpeas and various types of beans.[31] Other crops include groundnuts, pumpkin and watermelon. All crops can be intercropped except sweet potatoes which are normally grown in single stands. Overall, the *Anosy, Cassava, Maize and Livestock livelihood zone* is a marginal agricultural area with food deficits estimated at about 4 in every 5 years.

[30] Fieldwork for the current profile was undertaken in October of 2017. The information presented in this profile refers to the reference year, which covered the period November 2016 to October 2017. Provided there are no fundamental and rapid shifts in the economy, the information in this profile is expected to remain valid for approximately five to ten years (i.e. until 2022-2027). All prices referred to in the document are for the reference year.

[31] Rice is not a common feature of this zone as in the neighbouring zone MG22, however, there are limited pockets of rice cultivation in the zone in the communes of Ebelo, Tranomaro Marotsiraka and Tsivory where irrigation is also practiced.

Land for cultivation is divided into parcels called *tonda* or *tetiky* or *talaha. Talaha* specifically refers to the parcel(s) of land under rice cultivation. *Tonda* or *tetiky* are parcels of land used for the other crops. In general, *talaha* or *tonda* or *tetiky* refers to a parcel of land for cultivation and not any specific land size or unit. 1 hectare for instance can be referred to as a *tetiky* or *tonda* or *talaha*. If that hectare is divided into 4 parcels, there will be 4 *tonda*/*tetiky*/*talaha* and if it is further subdivided into 16 parcels, there will be 16 *tonda*/*tetiky*/*talaha* and so forth. 3 hectares will also be referred to as a *tonda*/*tetiky* or *talaha* as long as it is one parcel.

Although any size of land is called a *tonda*, and this makes it difficult to precisely estimate land sizes, it was established that farm sizes are typically small. In the reference year, very poor households cultivated on average 0.05 ha with majority of them cultivating no land at all. Poor households cultivated on average 0.3 ha, middle households on average cultivated 1 ha and the better-off in general cultivated 3 ha.

All crops cultivated in the zone are long-cycle crops that are cultivated during the single rainy season between October and March. Cultivation is done using a local tool known as *fangalay.* Middle and better off households use ploughs since they own *zebus* for animal traction. In the *Anosy, Cattle, Maize and Livestock Livelihood Zone,* improved seeds are not used. Instead traditional seeds from own crop production, market purchase, NGOs and friends are planted. Land preparation for crop cultivation is usual done by men but other tasks -- including planting, weeding, and harvesting -- are done by everyone including men, women and children. All wealth groups use their own-labor for cultivation activities. However, better-off households also hire labor seasonally to help with land preparation, planting, weeding and harvesting. In the reference year, better-off households mostly paid for weeding labor.

In the reference year, yields for staple crops such as cassava were average. This outcome, when compared to the last three years of insufficient rainfall and poor yields, came as a relief. Drought is a chief hazard in the zone compounding the normal dry conditions that are faced most years. The other major hazard that significantly affects crop production is locust infestations. Locust infestations occur almost every year with the most severe and widespread ones occurring in one of every three to four years. In 2012-2013, nearly half of Madagascar was infested with a severe plague of locusts[32]. It was reported as "*the worst plague to hit the island since the plague of 1950s which was said to have lasted for a duration of 17 years*". The southern region, including the *Anosy Cassava, Maize and Livestock Livelihood Zone*, was also hit by this severe infestation which affected crop yields in the 2016-2017 reference year. Another factor affecting crop production especially for the poorer wealth groups, is the lack of seeds for planting. After the three-year drought, the majority of poorer households did not have seeds to plant and could not afford to purchase them from the market due to cash shortages.

Livestock keeping is an important activity in this zone especially for the wealthier households to whom livestock, particularly *zebu*, are a symbol of wealth and status. Cattle (*zebu*), goats, sheep and poultry are all reared. Poorer households generally keep only chickens. In this zone, cattle feed mostly on grass and cactus leaves. The cactus leaves are first burnt to remove the sharp spikes then fed to cattle. Whenever there is rain, grass is plentiful and cattle have enough feed. However, during dry periods there is little dry grass and thus cattle depend on cactus leaves to supplement grass. *Shoats* (sheep and goats) feed mostly on grass. In addition, goats also feed on browse. Chicken feed from crop residues. Cattle and *shoats* free-graze on the vast land in the zone. Middle and better-off households do not spend any money on livestock feed. However, the better-off pay men and boys from the very poor and poor households to look after their livestock as well as to prepare cactus leaves to feed the cattle. There is no livestock migration in the zone.

[32] http://www.bbc.com/news/world-africa-21955740

In the *Anosy Cassava, Maize and Livestock Livelihood Zone* cows were the only animals milked in the reference year. Goats are not usually milked; instead, the milk is left for the kid. Moreover, in some of the *fokontany*, it was said that milking goats was a 'taboo'. Milk production occurs throughout the year depending on three factors: (i) when a cow gives birth; (ii) livestock health; and, (iii) water and pasture availability. However, according to information from the communities, the majority of the cows give birth during the rainy season. Thus, the peak period for milk production falls between December and February. On average in the reference year during this 3-month peak period, milk production was 1 liter per day per cow. Most of the milk produced was consumed at household level.

At times during the year, livestock are sold to generate income. The types of livestock typically sold in the zone include *zebu*, goats, sheep and poultry. *Zebu* are often sold both at commune and district markets for their meat. Generally, Madagascar *zebu* fetch a good price both locally and internationally. It is because of their high monetary value that *zebu* are often a target of cattle thieves, known locally as *dahalo*.

Banditry and cattle raiding is a regular occurrence in the south of Madagascar including in the *Anosy Cassava, Maize and Livestock Livelihood Zone.* Cattle thefts used to reflect ethnic customs related to rites of passage to manhood and eligibility for marriage, a tradition that was even accepted in some places by the owners of stolen *zebu* as they would also steal *zebu* from elsewhere. However, with time the practice become more violent as focus shifted from a cultural practice to the monetary value of the *zebu* (a *zebu* can fetch up to **Malagasy Ariary (MGA)** 1,000,000 depending on its health and body condition). The rise in *zebu* raiding was also due in part to increased poverty rates in the rural areas of Madagascar's southern region where youth have struggled to find employment and some have turned to raiding to find an income. Stolen *zebu* often find their way to local and international markets where they are sold for money. In 2017, there were still significant localized incidences of banditry and cattle rustling in the *Anosy Cassava, Maize and Livestock Livelihood Zone.* These raids aggravated livestock losses from the extended 2013-2016 drought with the result that in the reference year, livestock herd sizes (especially *zebu*) were low.

Livestock diseases are rampant in the zone and can occur at any time of the year. Livestock diseases greatly affect production and livestock health. Livestock affected most from disease include cattle, goats and chicken. The most common livestock diseases are *besoroka* and *drodro* affecting cattle, *soko, mangery lio* and *mena tsinay* affecting shoats (goats mostly) and *koropoke* affecting chicken. Cattle diseases peak between November and March whereas goat diseases peak between June and October. Middle and better-off households purchase vaccines and other livestock drugs from private veterinarians. The drugs are mixed with herbs before given to livestock. There have also been vaccination campaigns by the government and non-governmental organizations (NGOs) as an effort to prevent disease outbreaks and to control their spread.

Markets

Markets in the livelihood zone are mainly held in commune centers with the main market located in Amboasary Sud. The commune markets are weekly where various items including foodstuffs and livestock are traded. On a daily basis there are petty traders (mostly women and children) who sell small items such as foodstuffs. The flow of both agricultural produce and livestock for sale is from the *fokontany* to the commune to the district. The flow can also be from commune to commune. In general, market flows are north-south, with the commune centers acting as collection markets from where goods are sold south in the main market of Amboasary Sud. Market accessibility is fairly good in the dry season though some localities are isolated from the road network. In the rainy season

accessibility becomes a challenge.

Agricultural produce such as dry cassava, maize, beans and sweet potatoes are for the most part sold during and immediately after the harvest period. Cassava is mostly sold from August to February; maize from March to August; and sweet potatoes from August to December. Local production is not enough to be sold outside the southern region. Instead, sales are local, within the region, and follow a seasonal pattern (i.e., produce is sold during and immediately after the harvest). The poorer households generally start to purchase local agricultural produce for consumption during the harvest period since their own produce runs out after a month or two. During the long harvest period, prices are relatively low which helps the poor afford food purchases. However, after the harvest, during the lean season, prices for agricultural products are usually high. During the time when staple food prices are high, poorer households reduce food purchases and instead rely on wild foods and fruits for food consumption.

Rice is not a common feature of this zone as it is in the neighboring zone MG22. Nonetheless, there are small pockets of rice cultivation in the zone notably in the communes of Ebelo, Tranomaro, Marotsiraka and Tsivory. The rice that is produced from these communes is the main rice marketed within the zone. It is also sold in the main district market of Amboasary Sud. Moreover, some of the dry cassava sold in the commune markets between December to March (i.e., the lean period) comes from within the zone from these higher potential communes of Marotsiraka and Tsivory as well as from Ambovombe district. Beans and maize come from Amboasary sud in the lean period.

Market prices for agricultural products in the reference year were generally low at the start of the harvest period in March when 'green maize' became available all the way to October. Prices began to peak in November (although prices can begin to peak in October depending on production and locality within the zone.) Prices remained at peak levels until February reflecting that marketed goods were no longer local but were brought in from Marotsiraka and Tsivory communes and from Ambovombe district.

Livestock including cattle (*zebu*), shoats and chicken are traded at the commune markets and at the main market of Amboasary Sud. Livestock can be sold at any time during the year depending on a household's need. However, there are times when households can sell a huge number of their *zebu* such as during funerals. The peak sales for cattle is between October to March which coincides with the lean period. Shoats are mostly sold between June to September and December. Chicken sales peak between May and June.

Sugar and cooking oil are not produced locally and are brought in to the zone from Fort Dauphin all the year. Sugar and oil prices were uniform throughout the reference year. For instance, a kilo of sugar as well as a liter of oil were both retailing at an average of MGA 4800 throughout the zone.

In terms of labor opportunities, 90% of the opportunities were found in the local rural area with agricultural labor providing the most paid work although the opportunities were often scarce. Other local labor activities included fetching water and washing laundry for the better off households although in the reference year these activities were not typical. Only an estimated 5% of casual labor opportunities were found in local urban areas including Amboasary Sud. During the lean period between September and January and also in 'bad years', able-bodied persons from very poor and poor households migrate to Tsivory commune (i.e., where it falls in the MG22 livelihood zone) for agricultural labor.

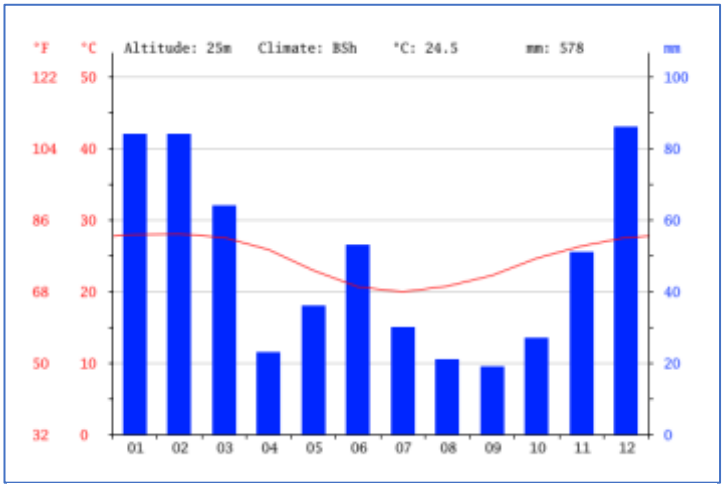
Timeline and Reference Year

The baseline assessment refers to a very specific time period called the reference year. Normally, the reference year begins at the start of the main rains for pastoralists and for agriculturalists at the start of the main staple harvest. *Anosy Cassava, Maize and Livestock Livelihood Zone* is an agro pastoralist zone and therefore the reference year should start either in March when 'green' maize consumption begins or in June when fresh cassava (the main staple) is ready for consumption. However, for this baseline assessment, the reference year started in November 2016 – i.e., the start of the rainy season and during the lean period – and carried on to October 2017 (the end of the cassava harvest). This time period was selected because it captured the 'average' 2017 crop production due to sufficient 2016-2017 rains. If the usual consumption year was selected, such as March or June 2016 to February or May 2017, it would have covered an extremely poor production year and a very tough lean season. This time period would not have reflected the production potential in the zone.

During community leader interviews, informants were asked to rank the last five years in terms of seasonal performance with '1' indicating a very poor season and '5' an excellent season. The table below summarizes the response of the community leaders. It shows year quality by *production* (based on rainfall performance). As shown in the table, crop production in 2017 was average due to sufficient rains in 2016-2017. By contrast, the past 3 years were ranked as being poor to below average due to a lack of rainfall for production.

Year	Rank	Critical Events
2017	2.5	Average crop production in 2017
2016-2017	1	Extremely poor production; Locusts; insecurity; Sufficient rainfall in 2016-2017
2015-2016	1.5	Poor production in 2015. Lack of rain in 2015-2016.
2014-2015	1.5	Poor production in 2014. insufficient rains in 2014-2015.
2013-2014	2.5	Average crop production 2013. Very low rainfall in 2013-2014.
2012-2013	1.5	Locust infestation. Poor production. Sufficient rainfall
5 = an excellent season for household food security (e.g. due to good rains, good prices, good crop yields, etc.) 4 = a good season or above average season for household food security 3 = an average season in terms of household food security 2 = a below average season for household food security 1 = a poor season (e.g. due to drought, flooding, livestock disease, pest attack) for household food security		

Seasonal Calendar for Reference Year



Source: Climate-data.org, Climograph **Amboasary Sud** town (average rainfall 1982-2012). Blue bars indicate rainfall/month.

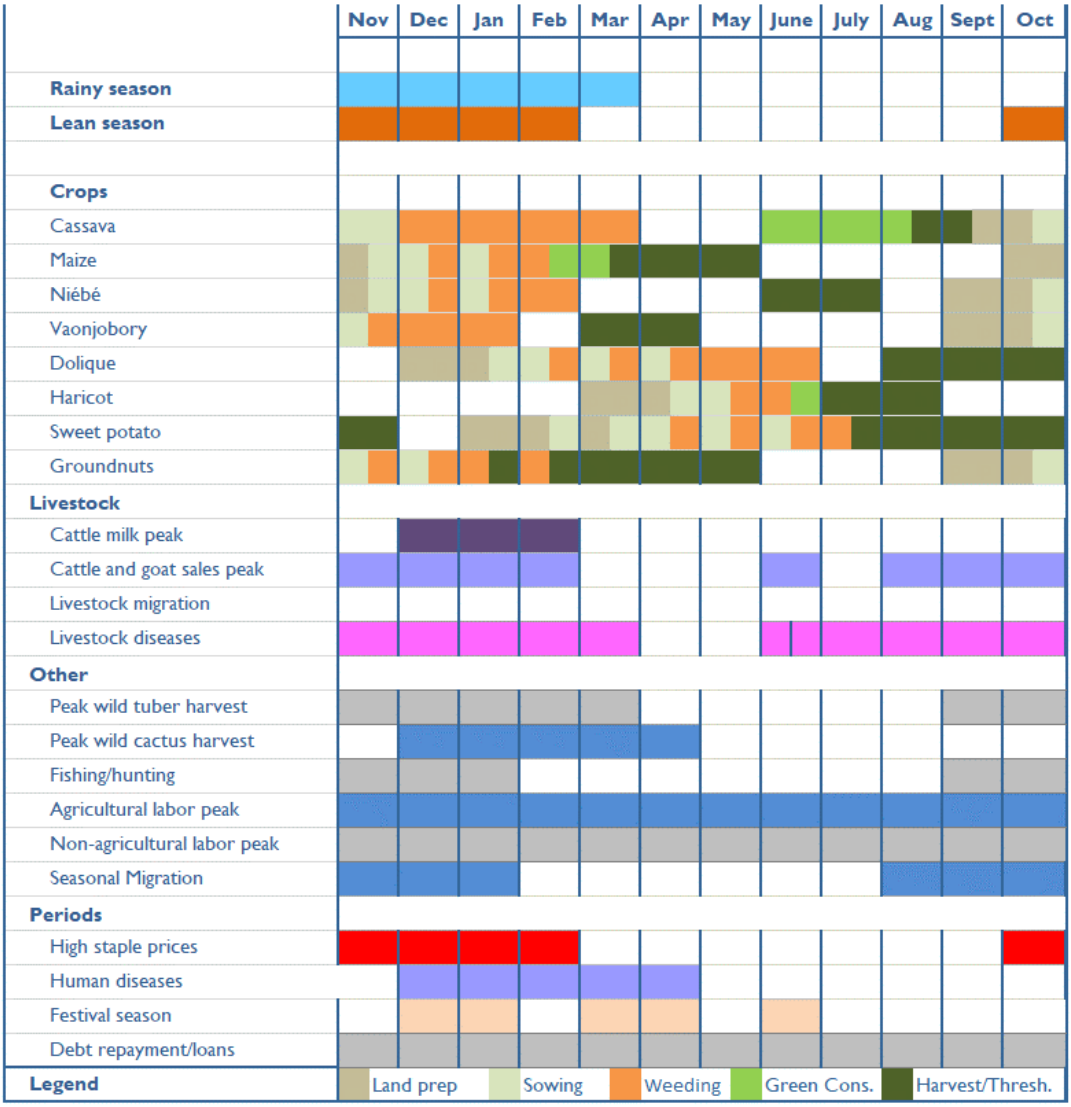
The *Anosy Cassava, Maize and Livestock Livelihood Zone* has one long rainy season which normally arrives between October and May but with the major rains falling between November and March. Many crops are grown during this period including cassava, maize, various types of beans, sweet potatoes, groundnuts, watermelons and pumpkins.

Land preparation for the main crop, cassava, begins in September immediately after harvest. Planting starts in October with the start of the rains. Fresh cassava is available from June to August with the main dry harvest in September to October. Land preparation for maize starts in October and the main planting occurs in November. Maize green consumption starts in March and main harvest follows in April. Land preparation and planting of sweet potatoes begins in January and can go all the way to June. Harvesting starts in July and goes all the way to November. Beans, groundnuts, watermelon and pumpkins are also planted and harvested during the principal months of the cultivation period. Sale of crops from own production occurs mostly during the harvest period and immediately afterwards.

Since there are several crops cultivated, there are agricultural labor opportunities throughout the year. However due to the limited land sizes under cultivation and also due to the small number of better-off households who hire labor, actual paid agricultural work (in cash) is scarce and mostly limited to land preparation and weeding. This work is organized on a contract basis per unit of land (*tonda*). There is also some work in planting and harvesting (mostly paid in-kind) although this was not typical in the reference year.

The lean season in the zone peaks between October and February, and this coincides with the months when staple food prices are also high. Moreover, during this period, mostly between September and January, the able-bodied from poor and some middle households migrate to Tsivory commune to look for paid agricultural work.

Wild food consumption, especially prickly pear cactus, tamarind and wild tubers such as *bangy*, peaks between September to March for wild tubers and December to April for cactus. Wild foods are consumed by all wealth groups but more so by the poorer households who not only produce fewer crops but have also limited purchasing power due to their economic status.



Non-agricultural labor, such as house construction, though limited in terms of opportunities for poor households, is at least a possible work option that is available throughout the year.

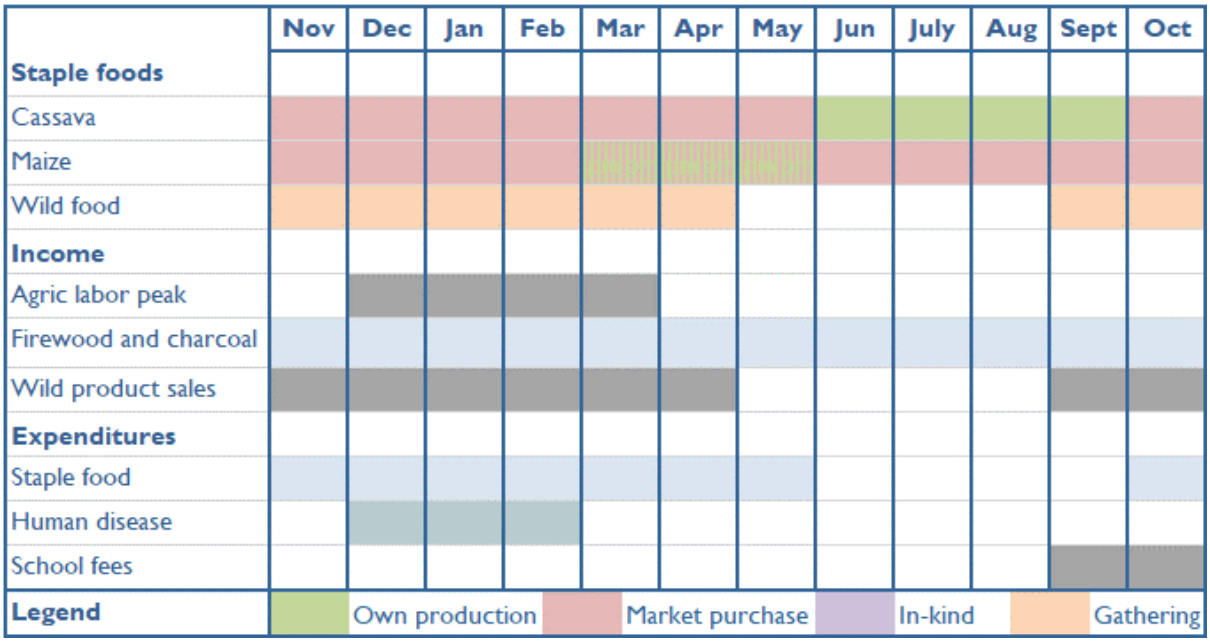
Since there are limited agricultural and non-agricultural labor opportunities, poor households also engage in self-employment work throughout the year. The most notable income generating activity is firewood and construction wood sales. Firewood and construction wood are obtained from the forest/bush and are either sold directly in the village or are taken to the market for sale. Grass for thatch is also sold in addition to firewood and wood.

Cattle milk production peaks between December and February as this is also the time when the majority of cows give birth. Most of the milk is consumed at the household level and very little (if any) is sold.

Livestock diseases can occur at any time of the year; however, the peak is between June and March. June to October is the peak disease period for *shoats* and November to March is the peak season for cattle diseases. During this period, there is increased expenditure on livestock drugs by the middle and better-off who own livestock.

Just like livestock diseases, human diseases can occur at any time of the year. However, there is also a

seasonal peak between December and April which coincides with the rainy season. Moreover, this period also coincides with the lean season during which time there is a lot of cactus consumption especially among the poorer households. High consumption of wild fruits often leads to human diseases such as diarrhea and other stomach problems.

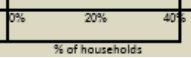


The calendar above shows how poor households typically access major food items during the year, and the sources of income that are available to them in each season. Expenditures increase during certain points in the year, thereby placing additional pressure on the household budget.

Cassava and maize are the main staples in this livelihood zone. Cassava is mostly harvested in June; however household stocks are typically depleted by the end of September. Therefore, from October until the next harvest in June, poor households must source cassava from the market. Maize is harvested from March to May, however the harvested amounts are low due to poor seasonal performance of rainfall. After the households' stocks are depleted, they must rely on market purchases for maize. Like the other zones in the Grand Sud, poor households in this livelihood zone collect and consume wild foods, usually from September to April.

Agricultural labor serves as the primary source of income for poor households. Most of the agricultural labor opportunities are found during the peak cultivation period from December until March. Firewood and charcoal sales occurs throughout the year, whereas wild food collection and sales take place from September through April.

Wealth Breakdown

		Wealth Groups Characteristics						
		HH size	Land owned (ha)	Land cultivated (ha)	Large Livestock	Small Livestock	Poultry	Other productive assets
Very poor		6-10(8)	0-0.1	0-0.1	none	none	0-2 chicken	0-1 fangaly
Poor		6-10(8)	0.1-1	0.1-1	none	none	1-4 chicken	0-2 fangaly
Middle		6-12(8)	0.3-2	0.3-2	2-8 cattle; 0-4 plough oxen	3-15 goats; 2-4 sheep;	4-10 chicken	0-2 plough; 0-2 carts; 0-1 bicycle; 1-3 fangaly
Better off		10-20(12)	1.5-5	1.5-5	15-40 cattle; 2-4 plough oxen	12-50 goats; 5-10 sheep;	6-15 chicken	0-2 plough; 0-2 carts; 0-1 bicycle; 1-5 fangaly
								

Note: The percentage of household figures represent the mid-point of a range.

Pressure on productive land is high in this zone. Therefore, the number of livestock owned by a household (especially cattle) and the land under cultivation are the main determinants of wealth.

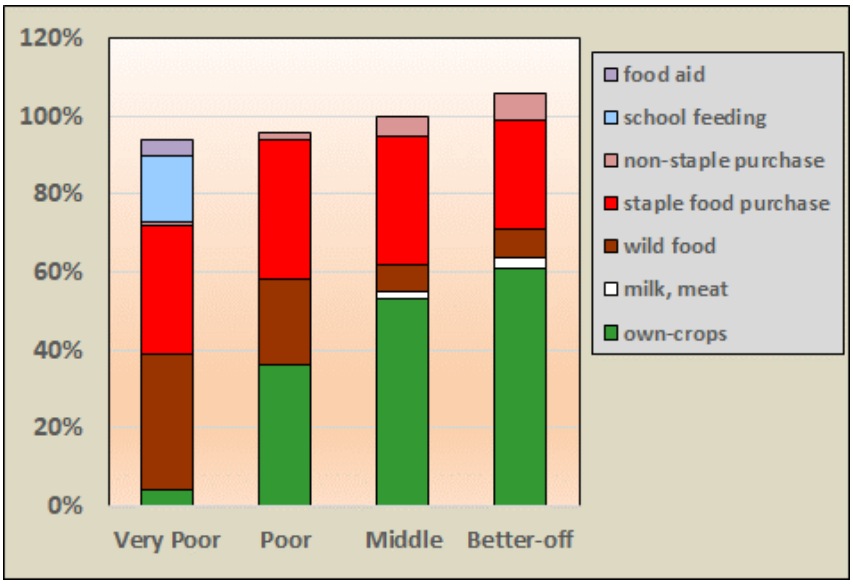
Livestock raising is an important income earner for wealthier households. In this zone, households keep mixed herds of cattle, goats and sheep. Poorer households rarely possess much more than a few chickens. Owning a large herd of cattle (*zebu* to a larger extend) signifies wealth and is furthermore a sign of superior economic status. Cattle also provide households with milk in addition to the cash income earned from cattle sales. In addition to being a symbol of wealth, *zebu* are at the heart of local culture in southern Madagascar and are eaten only at special occasions such as weddings and funerals. *Zebu* are also sacrificed for ancestral worship or in burial rituals. Better-off households own 15-40 cattle; middle households own 2-8; and poorer households own none. In addition, better-off households own 12-50 goats and 5-10 sheep; middle households own 3-15 goats and 2-4 sheep; and poorer households have none. As this is a semi-arid to arid zone with savannah grassland, grazing land is available for free grazing. Also, there are areas far from the rivers where the only use for the dry, stony land is livestock grazing.

Most of the productive land in this zone is near the rivers. Farmland owned and cultivated especially by poorer households is relatively small due to pressures on productive land. Moreover, how much land a household is able to cultivate also depends on whether they own plough oxen and whether they have the resources to buy sufficient seeds and to hire extra labor to assist in agricultural work. In the reference year, the better-off typically cultivated 1.5-5 hectares; the middle cultivated 0.3-2 hectares; poor households 0.1-1 hectares; and the very poor only 0-0.1 hectares**.**

The proportion of the very poor, poor and middle households in the community is very similar. For example, the very poor comprised 29% of households; the poor 31%; and the middle 32%. Better-off households are a unique and tiny group comprising only of 8% of households. In a “normal” year, the better-off own the largest herds, cultivate more land and produce more crops and milk as compared to the other wealth groups. They also use some hired labor. The better-off also have a larger household size of between 10-20 family members comprising of at least 2 wives plus some members of extended family. The rest of the wealth groups have a smaller household size, averaging 8 family members in the reference year.

Sources of Food

The graph to the right presents the sources of food for households in different wealth groups for the period November 2016 to October 2017. A typical HEA baseline covers a "consumption year" which begins either with the consumption of green maize (in this case, March) or with the start of the staple food harvest (in this case, June for cassava). However, for this baseline, the reference year started in November 2016 at the peak of the lean season and also at the start of the rainy season. The reference year ended at the close of the harvest period in October 2016. This choice of the reference year period enables the capturing of an 'average' 2017 crop production season due to sufficient 2016-2017 rains.



In the graph, food access is expressed as a percentage of minimum food requirements, taken as an average food energy intake of 2100 kcals per person per day. Note that food is presented as a percentage of 2100 kcal per person per day for the 12-month period.

In the reference year, own crop production and market purchase were the main food sources for the better-off and middle wealth groups. These two wealth groups also ate wild foods (a common feature of the zone) although for these households it was a relatively minor food source. Milk from their own cattle furthermore provided a few kilocalories. By contrast, the poor wealth group secured the majority of their kilocalories from market purchase as well as, to a less extent, from own crop production. Moreover, for the poor wild foods provided quite a lot of their annual food energy. For the very poor wealth group, wild foods provided the majority of their kilocalories in the reference year, followed by market purchase and food aid. Own crop production provided very little food energy in 2016-2017.

These patterns in the reference year highlight that better-off and middle households owned and cultivated more land thus secured more food energy from their own crop production. By contrast, the poorer wealth groups relied more on market purchase, wild food consumption and, for the very poor, food aid. Overall in the year, the better-off and middle households were able to cover their annual minimum food needs with the better-off covering up to 105% and the middle at just 100% of required food energy. The poor and very poor wealth groups, by contrast, barely reached their annual minimum food needs with the poor at 97% and the very poor at only 94% of required annual food energy.

Various types of crops are cultivated in this zone including cassava, maize, beans (various types), sweet potatoes, groundnuts, pumpkins and watermelons. There is a high reliance on cassava as the staple crop with some addition of maize and sweet potatoes. For instance, dry cassava from own crops contributed 0%, 9%, 18% and 32% to the annual food needs of the very poor, poor, middle and better-off households' respectively. Fresh cassava contributed 4%, 16%, 20% and 11% to the very poor, poor, middle and better off households respectively. Note that in the reference year, the very poor only consumed fresh cassava as they did not produce sufficient amounts to have a harvest of dry cassava as well. The contribution of maize and sweet potatoes was notably lower: maize provided 5%, 6% and 7% of annual food energy for the poor,

middle and better off households; and, sweet potatoes contributed just 3%, 5% and 6% of the annual food needs of the poor, middle and better-off.[33] Overall, own crop production contributed 4%-36% of the minimum food needs for very poor and poor households and 52%-61% of minimum food need for middle and better-off households in the reference year.

Market purchase is an important food source for all wealth groups but especially for the two poorest wealth groups. Market purchase contributed 34%-40% of the minimum food needs for the very poor and poor households and 35% to 38% for better off and middle households. Cassava was the main staple food purchased by all wealth groups in addition to some maize, beans and rice. Purchased cassava, however, contributed the most in terms of household food energy. For example, cassava comprised 25% of the annual food energy for the very poor; 28% of annual food energy for the poor, 23% for middle households; and 15% for the better-off. Sweet potatoes were mainly purchased by poorer households. All wealth groups purchased cooking oil in varying quantities with the overall amount increasing with wealth status. The middle and better-off households also purchased sugar.

Wild foods are a common feature of the zone. In particular, they are an important food source for the poorer wealth groups who produce less of their own crops and are also limited in terms of what they can purchase from the market as a result of their economic status. For the better-off and middle households, wild foods act as a snack that provide a few kilocalories during the year. By contrast, for the poorer wealth groups, wild foods typically constitute a meal throughout the lean season. Overall, wild foods contributed 22%-35% of the minimum food needs of the poor and very poor and just 7% for middle and better off households in the reference year. Wild foods are consumed more during the lean season which coincidentally is the peak period of wild food availability in the zone. The most common types of wild foods consumed include the prickly pear cactus fruit; tamarind; *bangy*, *fangisty* and *sosa* (which are more tuber-like).

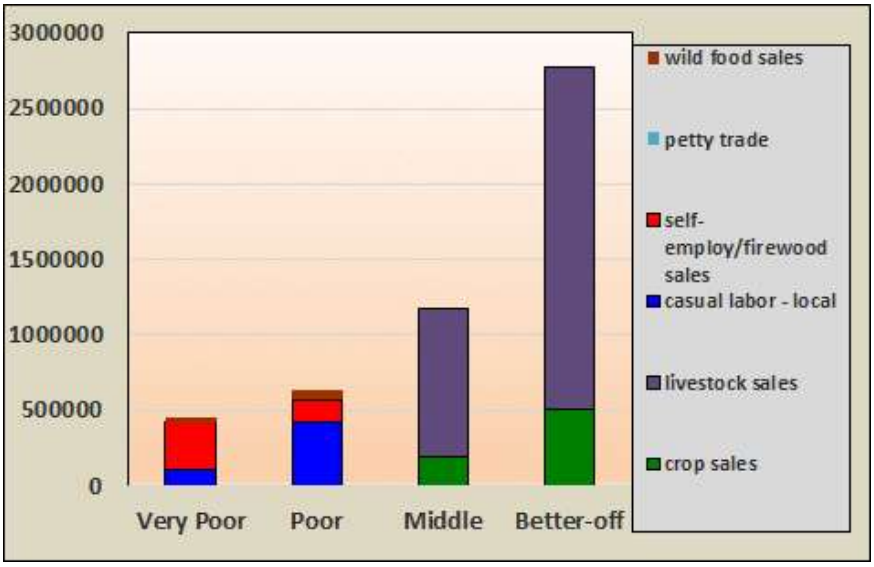
Another source of food especially for the very poor households was food aid. In the reference year, food aid was targeted mostly at the very poor households. This food source contributed significantly to the minimum annual food needs of the very poor giving them at least 21% of their annual food energy.

Lastly, milk was a very minor component of the diet of middle and better off households, covering only 2-3% of minimum food energy needs in the reference year. A typical middle household had on average 2 milking cows, and better-off households had, on average, 5 milking cows. Cows in this livelihood zone produce approximately 1 liter of milk per day during three months of the rainy season. Most of this milk is consumed at household level and only very small amounts are sold. Slaughter of cattle in this zone for consumption is not typical except during funerals at which time a household can decimate a huge number of its herd. For the most part, the middle and better-off households who own both cattle and shoats will slaughter just one goat in the whole year for consumption at home.

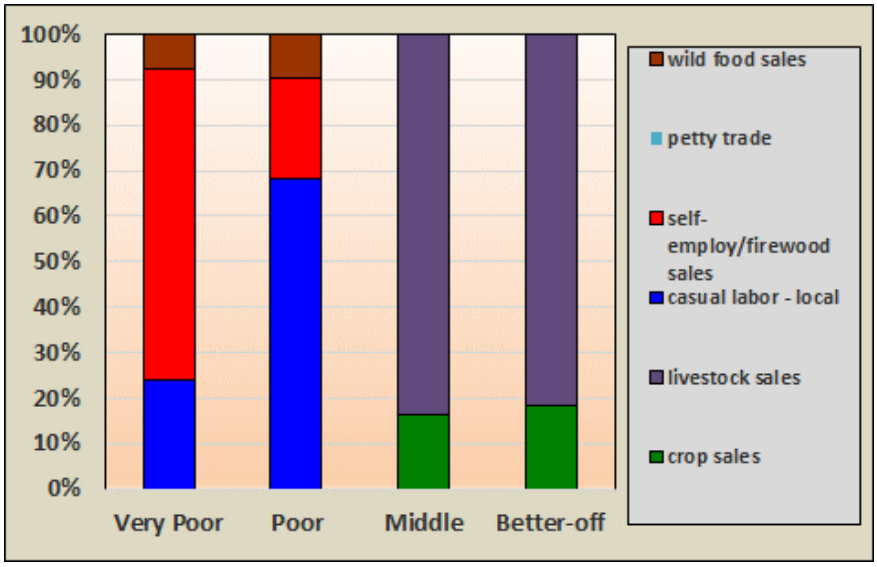
[33] Note that groundnuts and beans are mainly grown for sale although very small amounts of beans are also consumed at the household level. Watermelons and pumpkins are secondary crops grown for both consumption and sale.

Sources of Cash Income

The amount of income earned in the reference year greatly varied by wealth group. So too did the sources of income. Middle and better-off households earned cash income principally by selling livestock and by selling part of their crop produce. Livestock sales peaked during specific times of the year such as during the lean period but also during festival times as well as during funerals which are normally huge community events. Livestock sales accounted for MGA 2,270,000 /year or 82% of the better-off households' annual cash income, and MGA 980,000 /year or 84% of the middle household's annual cash income. Cattle sales accounted for the highest income for both wealth groups followed by goat sales. Sheep sales provided the least income. Crops sales accounted for 18% of the better-off's annual cash income and 16% of middle households' annual cash income. Groundnut sales secured the most cash income for both the middle and better-off households.



Breakdown of total annual cash income in Malagasy Ariary (MGA) by income source.



Breakdown of total annual cash income as a percent of annual cash income.

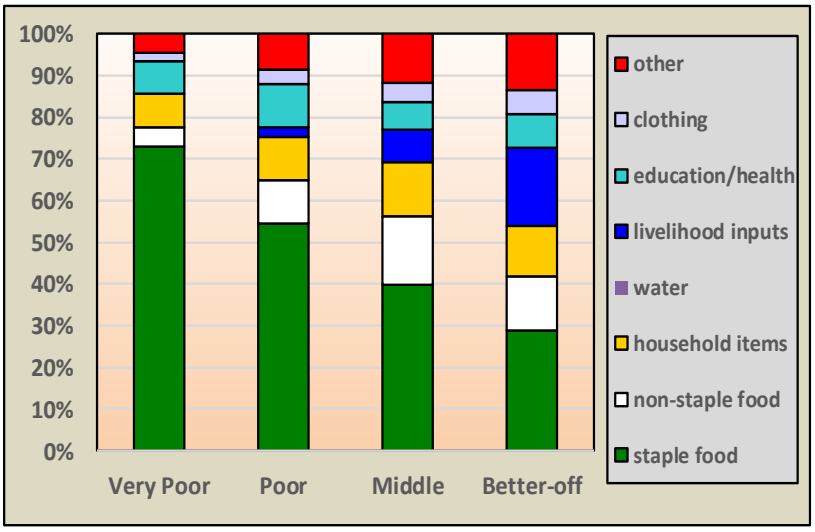
INCOME SUMMARY TABLE (in Malagasy Ariary ('000s)				
Wealth group	**Very poor**	**Poor**	**Middle**	**Better off**
Annual income per household [34]	252 - 840	530 - 949	840 – 1,341	1,846 – 3,591

[34] The average exchange rate in the reference year from Nov 2016 - Oct 2017 was 1 USD = 3,000 MGA

By comparison, the main income source for poor households was agricultural labor. Poor laborers are typically hired by better-off households who pay cash mostly for weeding labor. Poor households also sold cut wood just as the very poor also earned some cash from agricultural labor. For these two poorer wealth groups, another small but important income source was the sale of wild fruits. Overall, the sale of construction wood and firewood earned the very poor households MGA 308,000 representing 69% of the total cash income in the reference year, and earned poor households MGA 140,800/year (i.e., 22% of annual cash income). Agricultural labor earned the very poor MGA 108,000/household/year or 24% of the total cash income, and MGA 427,500/ household/year for the poor (68% of annual cash income). Wild food sales earned the two poorer wealth groups MGA 33,750 and MGA 60,000/household/year for the very poor and poor respectively, representing 7.5-9.5% of total annual cash income.[35]

Expenditure Patterns

The graph presents expenditure patterns for the reference year November 2016 to October 2017. While absolute expenditure increases with wealth in line with total cash income, the expenditure breakdown by percent in this graph shows the *relative* amount of income spent on different categories.



The graph provides a breakdown of total annual cash expenditure according to category of expenditure

Staple food and non-staple purchase represented a significant proportion of cash income spent by the very poor, poor and middle households in the 2016-2017 reference year. For example, staple and non-staple food purchases accounted for 78% of the very poor expenditure, 65% of the poor's expenditure and 55% of the expenditures of middle households. For better-off households, spending on staple and non-staple food items accounted for only 40% of expenses.

Of this food spending, staple food purchases accounted for the majority of expenses. Very poor and poor households, for example, spent more than half of their income on staple food purchases alone. Specifically, the very poor spent about 75% of their income on staple food purchase alone and the poor spent about 55% of their income on staple food. By contrast, for better-off households, staple food purchases accounted for only 28% of their annual spending. In general, the high proportion of annual expenditure on staple food by the poor and the very poor was the result of low production from their own crop production (itself a result of limited land under cultivation). Indeed, the majority of the very poor did not cultivate any land in the reference year, a situation that forced most of them to purchase much of their food from the market. Notably, for the very poor, poor and middle households, most of their staple food expenditure went toward cassava purchases. In addition, the very poor also spent a significant amount on sweet potato purchases. Other food purchases by these three wealth groups included maize and rice. By contrast, for the better-off, a larger proportion of their staple food expenditure went toward rice purchases. The better-off also purchased some cassava and maize.

[35] In general, wild fruit sales were lower for the very poor households in the reference year because the majority of them would gather wild fruits more for own home consumption rather than for sale.

The non-staple food items purchased included cowpeas and other beans**,** sugar and cooking oil. All wealth groups purchased cowpeas/beans and oil but expenditures increased by wealth. Only the middle and better-off households spent money on sugar purchases.

Since the poorer households do not produce much food from their own crop production, they consequently start to purchase food during and immediately after the harvest. At this time, food prices are still low. Their food needs remain high in the lean season following the harvest but poorer households turn more to wild foods at this time instead of purchase due to rising food prices in the market. By contrast, the middle and better-off purchase food from the market once they have consumed and depleted their own production even though staple food prices are high at this point. Unlike staple food prices, sugar and cooking oil prices tend to remain uniform all year and all wealth groups spent the same amount of money per kilo on sugar and oil. During the reference year, a kilo of sugar retailed at MGA 4,800 as was a liter of cooking oil.

As shown in the expenditure graph (see page 11), all types of expenditures – with the notable exception of food purchases – increased with wealth. In other words, better-off households spent the most on household items, livelihood inputs, education, health, clothing and 'other' expenses whereas the very poor spent the least on these goods. Specifically, after subtracting food expenses (78% of annual expenditures), the remaining 12% of very poor household's cash income was spent on household items such as salt, soap and torch batteries. A small amount was also spent on education, health and festivals. With respect to poor households, the remaining 35% of their household income was spent in a similar way to the very poor but in addition the poor paid small amounts of cash on livelihood inputs (such as seeds) and transport. By contrast, middle households spent their remaining 45% of income on household items including salt, soap, torch batteries and utensils; and on education, health, transport, festivals, and inputs (seeds). The better-off spent the remaining 60% of their income on purchasing similar items but in addition they bought firewood and paid for hired agricultural labor.

Hazards

The main hazard in this zone is 'too much sunshine', in other words, a **lack of water** and **lack of rainfall**. The zone is semi-arid to arid with periodic droughts often associated with the El Nino phenomenon. El Nino is the name given to a weather pattern associated with a sustained period of warming in the Central and Eastern tropical Pacific which can spark deadly and costly climate extremes in various parts of the world. From 2013-2017, southern Madagascar itself experienced a prolonged and widespread drought. Even in the reference year, hot, dry weather was still a significant factor in the below average crop production in the zone though production was better compared to the last three years.

Insecurity is the second most pressing hazard in the zone. Banditry and cattle-rustling are a common feature of the whole zone but it mostly affects the communes of Ebelo, Ranobe, Tsivory and Marotsiraka where attacks occur at least twice a year during the hardest-hit times. During the reference year, there was still significant banditry in those communes. Whenever attacks occur, livestock, especially *zebu,* are stolen; villages are destroyed and/or burnt; and people are also killed. Due to the violence, households sometimes migrate (or shift) to where they consider it is safe, even if that means just hiding in the bush at night. Sometimes the insecurity issue affects even crop production as households do not go to their farms out of fear of an attack, and this leads to crop losses.

Livestock disease is another common hazard occurring in this zone almost on a yearly basis. The most common livestock diseases are *besoroka* and *drodro* which affect cattle; *soko, mangery lio* and *mena tsinay* which affect *shoats* (goats mostly); and *koropoke* which affects chickens. Cattle diseases peak between November and March whereas goat diseases peak between June and October. In order to control cattle and goat diseases, middle and better-off households purchase vaccines paid in cash from veterinarian services.

They also purchase livestock drugs which they mix with herbs to treat their sick animals.

A fourth common hazard in the zone is **crop diseases and pests**. The most common pest is the locust. Locust infestation occurs every year, most years on a small scale that nonetheless still affects crop production. However, the most widespread and severe locust infestations occur one out of three to four years leading to massive crop losses.

Response Strategies

Households implement a number of coping strategies as a response to food and income shortfalls due to production failures. The types of responses implemented by households vary to some degree across wealth groups although there are common patterns too. Listed below are some common strategies that are employed by households to compensate for food and income losses:

Very poor and poor households

Increased wild food consumption: Poor and very poor households consume wild foods even in 'normal' years. However, in bad years, the two poor wealth groups depend on this food source even more both by consuming higher quantities of wild fruits and by increasing the number of months of consumption. Moreover, once wild foods are depleted in their locality, the poor and very poor will go even further to gather wild foods.

Consumption and sale of fish/birds: There is some river fishing as well as some hunting of small birds. In a bad year, this food and income source becomes more common especially among the poorer wealth groups.

Increased firewood and construction wood sales: Firewood and wood sales contributed significantly to the very poor and poor households' income in the reference year. In a bad year the sale of firewood is increased to almost double quantities.

Labor migration: During the annual lean season,1-2 able-bodied persons from the poor and very poor households migrate in search of agricultural labor (especially to Tsivory commune) in order to be able to support the family back home. Labor migration increases in a bad year.

Sale of household assets: Very poor and poor households tend to sell anything they can sell from the household including bedding, utensils and cooking pots. These items are normally sold at village level or taken to the commune market for interested buyers to purchase them.

Sale of productive assets: For the poor who own some cultivable land, they may sell it during hard times.

Sale of poultry: The very poor and poor households do not own much livestock other than poultry. They usually double their poultry sales in a bad year.

Reduced expenditure on non-essentials: Expenditure on non-essentials such as clothes and transport are reduced to nothing in a bad year. Expenditure on items such as salt, soap, torch batteries is also reduced.

Reduced expenditure on food items: Expenditure on staples is reduced whenever there are severe production shortfalls. During a prolonged crisis, very poor households may depend solely on wild fruits.

Middle and better-off households

Livestock sales: Livestock especially *zebu* are like a 'bank' or 'savings' that households utilize during difficult times. During times of hardship or in bad years, the better-off and middle households rely more on their

livestock to generate an income by increasing sales. However, if the supply of livestock prices are sometimes low thus the price obtained per animal would be less than what can be obtained in 'normal' times. The better off benefit more from this strategy than the middle since they have larger herd sizes.

Sale of productive assets: During periods of prolonged hardship, middle households are also forced to sell some of their productive assets, such as land, to survive.

Consumption of wild foods: Middle and better-off households did not consume much wild food in the reference year. However, when there is a prolonged hazard, such as an extended drought, the middle and even the better- off will increase their consumption of wild foods.

Reduced expenditure on non-essential items: Middle and better-off households also reduce expenditure on non-essential items and use the income instead to buy staple food.

Livelihood Coping Strategies in Anosy Cassava, Maize and Livestock Livelihood Zone (MG26)

	Coping strategy	IPC phases of strategy	Rationale/justification
1	Increased reliance on agricultural and casual labor	Stress	Agricultural and non-agricultural labor such as house construction available throughout the year though limited in terms of opportunities. poor households will try to find more work or even opt to work for less than usual.
2	Seasonal labor migration	Stress	1-2 able bodied persons from poor households migrate to Tsivory to look agricultural labor mostly between October and February. Migration is a driven by the fact that there are limited agricultural labor opportuni available.
3	Increased sale of firewood and construction wood	Stress	Firewood and construction wood sales are usual self-employment activi in the zone. However, in a bad year, poor households increase firewood sa to almost double quantities.
4	Decrease expenditure on non-essential items	Stress	Expenditure on non-essentials such as clothes and transport are done av with. Expenditure on items such as salt, soap, torch batteries is also redu and more spend on food purchase.
5	Increase purchase of staple foods	Stress	Households focus more on purchasing cassava and sweet potatoes for poo households in a bad year or whenever their own production is depleted.
6	Consumption and sale of wild fruits	Stress	Wild food sale and consumption is 'normal' for poorer households. Howev in bad years all households resort to wild food consumption including better offs. To poorer households, sometimes it is the only available opt therefore they are forced to go further in search of wild foods if depleted their locality. This strategy continues into crisis and even emergency pha as long as wild fruits are available.
7	Reduce food purchase	Crisis	When conditions worsen, households reduce and limit expenditure on fo items, such as cassava, beans and sweet potatoes
8	Sale more animals	Crisis	Households will increase the number of animals sold as hardship progres
9	Harvest and consumption of immature crops (if available)	Crisis	Households will not wait for crops to get to maturity stage but will harv and consume them as long as they can be consumed at whatever stage growth
10	Purchase food on credit or borrow food	Crisis	As things worsen, households are forced to borrow food from those v could still be having some little or forced to purchase food from the mar on credit and pay later when the situation improves
11	Borrow money	Crisis	Some households also borrow money to be able to purchase food and back later when the situation improves.
12	Sell of household items such as cooking pots, beddings	Emergency	Poorer households at this point sell anything that can be sold from household to be able to purchase food with the little they get

13	Sell land	Emergency	Households are forced to sell all or part of their cultivable land so as to get money to buy food and cater for other essential needs as well as to repay debts.
14	Sell more livestock than usually	Emergency	When the situation gets tough, households are forced to sell more livestock than usual. However, at this point livestock body conditions are poor and the sellers many thus low livestock prices.
15	Consumption of seeds stocks	Emergency	In times of emergency, households will resort to consuming seeds reserved for the next planting season. This is usually a big challenge whenever it comes to the cultivation season as majority of the households would have nothing to plant after consuming seed stocks

Key Parameters for Monitoring

The key parameters listed in the table below are food and income sources that make a substantial contribution to the household economy in the *Anosy Cassava, Maize and Livestock Livelihood Zone*. These should be monitored to indicate potential losses or gains to local household economies, either through on-going monitoring systems or through periodic assessments.

It is also important to monitor the prices of key items on the **expenditure** side, including staple and non-staple food items.

Item	Key Parameter - Quantity	Key Parameter – Price
Crops	• Fresh cassava • Dry cassava • Maize • Cowpeas • Groundnuts	• Dry cassava – producer price • Cowpeas – producer price • Groundnuts – producer price
Livestock production	• Cattle sales • Goat sales	• Cattle prices • Goat prices
Other food and cash income	• Wild foods – cactus, bangy • Agricultural labor (weeding) • Construction labor (local house construction) • Firewood/construction wood sales	• Wild foods - cactus • Agricultural wage rates (weeding) • Construction wage rates (local house construction) • Firewood/construction wood prices
Expenditure (staple food)	• Dry cassava	• Dry cassava – Consumer price
Other Expenditure		• Maize – consumer price • Rice – consumer price • Sweet potato – consumer price • Soap

Program Implications

The longer-term program implications suggested below, prioritized by wealth group, include those that were highlighted by interviewees themselves and those made by the assessment team following detailed discussions and observations in the field. All of these suggestions require further detailed feasibility studies.

Very poor	Poor	Middle	Better-off
Provision of more water points	Provision of more water points	Provision of more water points	Provision of more water points
Provision of livestock	Provision of livestock	Provision of livestock	Provision of livestock
Provision of veterinary services and drugs	Provision of veterinary services and drugs	Provision of veterinary services and drugs	Provision of veterinary services and drugs
Provision of seeds and cassava cuttings	Provision of seeds and cassava cuttings	Provision of seeds and cassava cuttings	Provision of seeds and cassava cuttings
Provision of human health services including drugs and personnel	Provision of human health services including drugs and personnel	Provision of human health services including drugs and personnel	Provision of human health services including drugs and personnel
Provision of diversified livelihood interventions	Provision of diversified livelihood interventions	Provision of diversified livelihood interventions	Provision of diversified livelihood interventions

ANNEXES

Annex 1: Madagascar Livelihood Zoning Workshop Description and Process

The workshop was attended by 18 people including from FEWS NET, the Ministry of Agriculture, the Bureau National des Risques et Catastrophes, WFP, ADRA, CRS, CSA, CARE and ACF (see below for the list of participants).

1. Before the workshop, a review of recent secondary information was made to supplement the background information that had been collected for the 2013 mapping exercise in a FEWS NET Madagascar desk review.[36] The information included agricultural/ecological maps; demographic, rainfall, and production data; and reports from partners.[4] These data were used as a guide to pose questions during the mapping workshop and to corroborate information collected during the workshop.
2. A base-map for the workshop was constructed at FEWS NET Washington and printed out in large size in Antananarivo. This was the template upon which the participants would insert suggested new zones and/or modifications to the existing zones. The map showed both the three livelihood zones of the Grand Sud and the 11 sub-zones, against a background of the administrative boundaries from region through district to commune, and in a separate version showing also *fokontany*: the lowest administrative unit including a village or set of villages. To this were added points (the red dots) denoting actual villages, showing settlement patterns and relative densities of population. Also shown were rivers, the road network and the main towns.

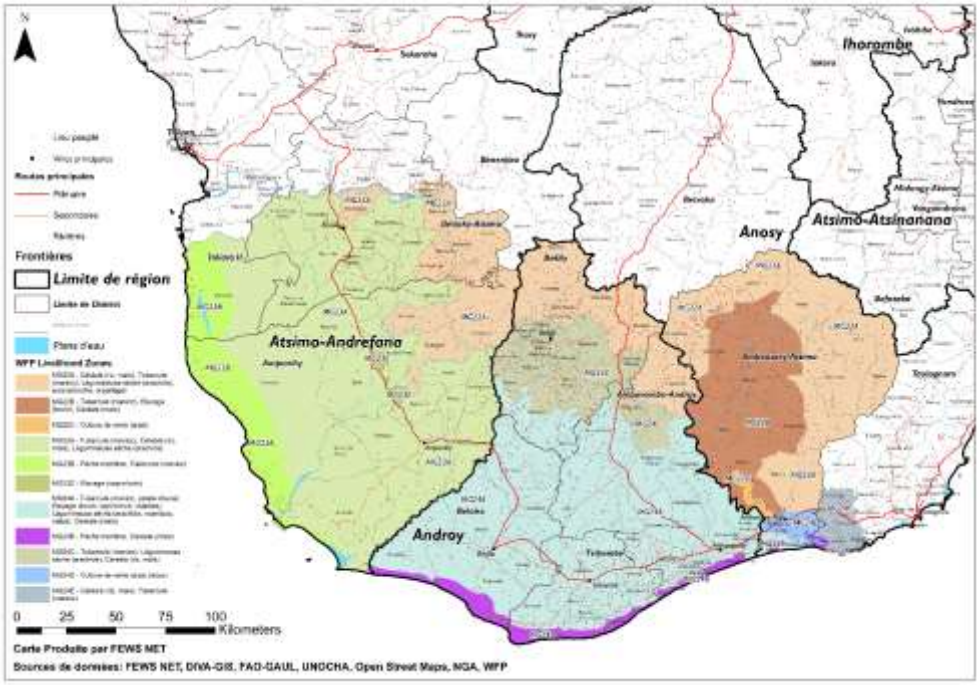


Figure 4: The base-map for the workshop (version with communes)

3. In the workshop, after a brief overview of the HEA approach and baseline information, and an introduction to the aims and methods of livelihood zoning, the base-map was reviewed with an explanation of the existing livelihood zones and the 11 subzones (see Annex 2 for the workshop timetable). Participants were then asked to begin suggesting modifications to the map, roughly sketching their suggestions on the base-map.
4. After discussion of these, and agreement on the overall propositions to work on, the participants were divided into working groups to consider in detail the shape of the modifications, basing themselves on the *fokontany* as the unit to define the zone boundaries. When they had completed this work, it was reviewed in plenary and the results were consolidated on the base-map.

[36] http://www.fews.net/docs/Publications/MG_deskreview_2012_11_en.pdf

5. The final step in the workshop was to establish descriptions of the new zones. To this end a form was given to working groups to fill with information about the given zone, which gave the basis for the summary descriptions offered in the final section of this report.

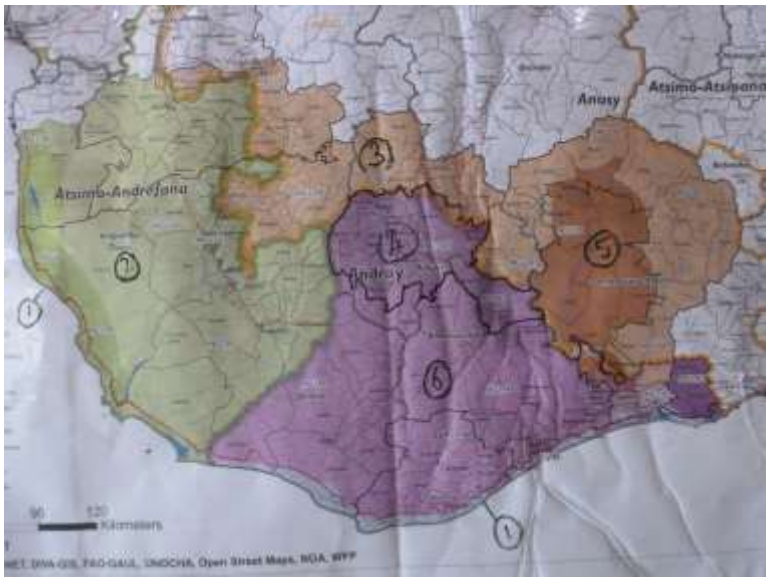


Figure 5: Final definition on the base-map of six livelihood zones for the Grand Sud (version with *fokontany*)

The three original livelihood zones MG22-24 were taken as the base upon which to insert other potential zones, as this was the approach of the sub-zones study. No new zone beyond the sub-zones was proposed. Therefore, the discussion turned to the validity of the 11 sub-zones. In the event it was not so much a discussion of the reality of these sub-zones as of their significance for practical purposes, as mentioned above. In other words, there was no reason to deny the existence of, for instance, the particularly concentrated rearing of goats and sheep in an area covering parts of just half-a-dozen *fokontany* in the commune of Ejeda in Atsimo-Andrefana region (sub-zone MG23C, covering a tiny corner of the original MG23 zone). But there was every reason to decide that there would be no practical use for such a small zone in any feasible survey or surveillance program related to food security in the huge overall area of the Grand Sud. It was observed that one could probably identify further sub-zones on a similar basis, for instance areas of concentrated market-gardening.

However, it was also appreciated that one area (Figure 6), roughly comprising the two small zones MG24D and MG24E in the extreme south-east of the Grand Sud area under consideration, was of particular interest to WFP and other partners. This was because of the precarious position of farmers who had lost a proportion of their land to the major new industrial sisal plantation in the area, as well as people settled in the dry forest area to the east; and these vulnerable people might merit extended food relief distributions. After discussion it was concluded that this particular area could not technically or practically be defined as a livelihood zone, but should be noted as a priority area for special study on a separate basis.

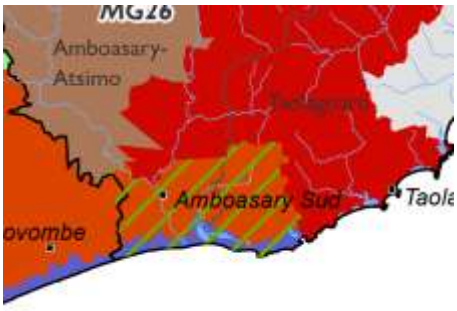


Figure 6: Area (green stripes) noted for priority humanitarian study

For the above reasons, a total of four small sub-zones were ruled out of contention. Setting aside the three very large sub-zones MG22A, MG23A, MG24A which are effectively the 'default' original zones from which new sub-zones were carved out, this left four other sub-zones. And here it was found that the Geosystems study had identified valid and substantial areas that justified definition as livelihood zones in their own right. These were sub-zones MG22B – *Tuber (cassava), Livestock raising (cattle), Cereal (maize)*; MG23B – *Maritime fishing, Tuber (cassava)*; MG24B – *Maritime fishing, Cereal (Maize)*; and MG24C - *Cereals (rice maize), Tubers (cassava), Dry pulses (groundnuts)*.

Two aspects of sub-zone MG22B (Figure 7) that distinguish it from the surrounding area of high rice-producing MG22A were immediately observable on the map: the comparatively sparse population, and the high tendency for villages (the black dots) to be situated along the rivers. In this semi-arid environment, the 'empty' spaces are mainly grazing grounds for livestock while people cultivate the more moisture-retentive and fertile clay/silt soils in the river vicinities, where they are therefore settled. This became new livelihood zone MG26.

Figure 7: Sub-zone MG22B

As regards the two maritime fishing sub-zones MG23B and MG24B that rim the Grand Sud, it was clear that there was a distinct, if thin, line of villages along the coast, but two questions arose. First, was there really an important difference between the two sub-zones in terms of livelihoods? In other words, did the fact that on the western coast the staple food cultivated was more cassava than maize while on the southern coast it was the other way around? It was concluded that it was not actually clear that maize was dominant all along the southern coast as opposed to along certain stretches, and that anyway by far the dominant livelihood factor was the income derived from fishing. Therefore, it was reasonable to propose a single maritime fishing zone. Secondly, did the population represented by the thin line of villages add up to a sufficient population to justify a livelihood zones? This may have been what prevented the original mappers in 2013 from identifying a fishing zone, but it was firmly concluded that all the villages along 500-600 km of coastline did add up to a sufficient population. The two coastal sub-zones were joined as new livelihood zone MG27. As regards identifying the boundaries of the zone, it is noteworthy that this was the only zone where it was not possible entirely to stick to the rule that the *fokontany* boundaries should be used. On the west coast in particular several *fokontany* are slivers of land stretching far inland, while the actual villages are only near the coast (see Figure 8), and indeed maritime fishermen would not reside up to 40 or 50 km inland. There was no option but to cut across these *fokontany* in order properly to place the livelihood zone boundary (Figure 9).

Figure 8: Villages vs *fokontany* on the west coast

Figure 9: The new Livelihood Zone MG27 (blue) – west coast detail

The question of whether to accept sub-zone MG24C (Figure 10) as a full livelihood zone caused the most discussion. The sub-zone was carved out of the north of the original livelihood zone MG24. The main question discussed by the workshop participants was whether sub-zone MG24C was in reality simply a transitional area between the higher rainfall and lusher environment of MG22 and the low rainfall, semi-arid environment of MG24, or whether it was to be seen as a zone in its own right. The precisely-drawn boundaries of rural livelihood zones are always something of a necessary fiction: in reality, insofar as the fundamental difference between zones is ecological, there is always a transitional area through which the boundary is drawn. But that area is usually some 10 or at most 20 kilometers in width. In the present case we have 'transition' spanning 60-70 kilometers from north to south. In the event, not only for this reason but because the conditions in the area allowed an especially voluminous groundnut cash production as part of a different mix of crops than to the south or to the north, it was decided that the area should be considered a livelihood zone apart.

Figure 10: Sub-zone MG24C in relation to its neighboring zones

Annex 2: Background Information for Summary Descriptions

In the summary descriptions provided, the description for zone MG 22 has been revised from the 2013 version, although there was little substantial new information. In the workshop it was decided to change its name from *Center-South: staple crops, industrial sisal, zebu* to *High rice and onions production.* For zone MG23 - *Mahafaly Plain: cassava, goats and cattle*, the recent HEA baseline field study has provided information that has been used to update its description. The name has been changed from Mahafaly Plateau to Mahafaly Plain because livelihoods are about people, and the vast bulk of the zone's population live in the eastern plain areas rather than in the mostly unpopulated western plateau (see Figure 11).

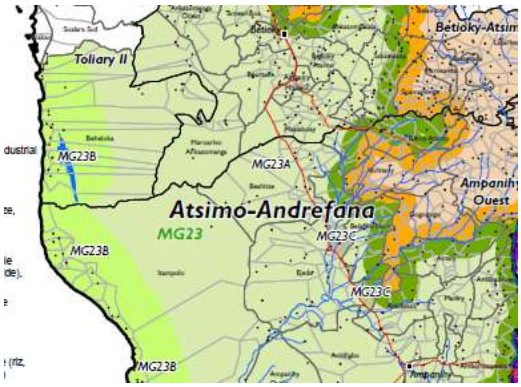


Figure 11: MG23 detail – village locations

For MG24 - *Androy semi-arid cassava, maize, sweet potato and livestock*, again the recent HEA baseline study has informed the updated description. For the new zone MG25 - *Staple crops and cash crops (groundnuts)*, the information taken in the workshop has been used to construct the description. For the new zone MG26 - *Anosy cassava, maize and livestock*, the description comes from both the workshop information and again from the new HEA baseline study. For the new zone MG27 - *Maritime fishing and staples cultivation*, the description comes from the workshop information. In addition, for all the zone descriptions the Geosystems sub-zones report has been consulted. It is to be hoped that HEA baseline studies will be carried out soon in MG22, MG25 and MG27, when the zone descriptions can be revised.

Annex 3: Workshop participants and time table

Name	Organisation	e-mail
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Révision de la carte et des descriptions des zones de moyens d'existence au Sud de Madagascar, 5-7 octobre 2017 à Tuléar

Jeudi 5 octobre	
horaires	**agenda**
8h30 – 9h00	Ouverture de l'atelier Introduction des participants Normes de l'atelier/aspects administratifs
9h00 – 10h30	Présentations: 1. Introduction à l'approche économie du ménage (HEA) 2. Les principes et la pratique du zonage des moyens d'existence
10h30 – 10h50	*Pause café*
10h50 – 13h00	Description de l'approche du PAM pour l'identification des sous-zones Revue détaillée de la carte actuelle: zones et sous-zones, avec référence aux rapports descriptifs de FEWS NET et de Geosystems (pour PAM) et identification des sources supplémentaires d'information Discussion sur l'echelle pratique pour les zones de moyens d'existence
13h00 – 14h00	*Déjeuner*
14h00 - 16h00	*Plénière:*: Premières propositions de modification de la carte esquissées sur la grande carte de base
16h00 – 17h00	*Groupes de travail:* Revue détaillé et modification des limites des zones proposées esquissées sur des cartes de base
17h00	*Café*
vendredi 6 octobre	
horaires	**agenda**
8h30 – 10h30	*Groupes de travail:* Revue et modifications achevées Présentations des groupes de travail et discussion *(plénière)*
10h30 – 10h50	*Pause café*
10h50 – 13h00	*Groupes de travail:* identification des limites précises des zones par rapport aux limites administratives et aux fokontany limitrophes. Liste des villages dans chaque zone Les modifications finales des zones transférées à la grande carte de base
13h00 – 14h00	*Déjeuner*
14h00 – 15h00	*Plénière:* Revue des points-clés des descriptions des anciennes zones et sous-zones

15h00-17h00	*Groupes de travail:* Révision/réformulation des descriptions pour les nouvelles zones
17h00	*Café*
samedi 7 octobre	
horaires	**agenda**
8h30 – 10h30	*Groupes de travail:* Révision/reformulation des descriptions des zones achevée. Revue des facilitateurs par groupe
10h30 – 10h50	*Pause café*
10h50 – 12h00 12h00 – 13h00	Révision/réformulation des calendriers saisonniers et d'accès à la nourriture et aux revenus pour application aux nouvelles zones *Explication en plénière puis groupes de travail* Discussion de la sélection de trois d'entre les nouvelles zones pour les études de baseline HEA Liste des questions sur le zonage à résoudre par vérification éventuelle sur le terrain. Clôture de l'atelier
13h00 – 14h00	*Déjeuner*
14h00 – 16h00	Séance restrainte de FEWS NET pour planifier le travail de terrain HEA baseline: choix de villages, contact avec les résponsables de district, logistique