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Participatory research to support sustainable land management on the Mahafaly Plateau in south-western Madagascar

# Livelihoods of households in the Mahafaly Plateau region

## Results from socio-economic research of SuLaMa project

SuLaMa

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BTU Cottbus, September 2015

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# 1. Introduction

The households in the Mahafaly Plateau region make a livelihood from scarce resources in a very fragile natural environment. In this remote region, people depend often directly on the use of locally available natural resources, such as arable land, pastures and forests for earning their income. At the same time, many development and conservation challenges persist in the Mahafaly region. Rural infrastructure is not well developed and the households are poor and face frequently food shortages. Increasingly frequent droughts, locust invasions and thunderstorm events due to climate change are placing additional burdens on local agriculture and thus livelihoods of households. In addition, the conservation of the precious natural forests in Tsimanampetsotsa National Park and beyond is a key concern.

NGOs and governmental organisations address these problems in a number a projects in the region, which always involve activities targeting the local population. Nevertheless, detailed knowledge about the livelihoods of local households in the region is not readily available and often remains a superficial result of rapid assessments. This detailed knowledge is however urgently necessary to anticipate effects of planned project actions and to plan relevant and well-placed measures for sustainable development. Key concerns are here distributional effects, i.e. which measure affects which kind of household?.

In order to fill this knowledge gap, this report compiles research results from a survey among households and additional data sources. Data on demographics, income-generating activities and livelihood strategies are presented making use of true population estimates for the project region covered.

The report proceeds with a short account on the methodology, followed by a description on main activities and income sources of households. Subsequently, the livelihood strategies as well as the wealth accumulation strategies of households and their coping strategies in cases of drought are presented.

# 2. Methods and data sources

This report draws mainly on the household baseline survey, but also on additional semi-structured interviews, market monitoring data and other information collected by the SuLaMa project team.

The household baseline survey (HBS) was conducted during July and August 2011 in an area of approx. 4000 km² in the former communes Beheloka, Beantake, and Masiaboay as well as the southern parts of Betioky Sud and Soalara (figure 1).

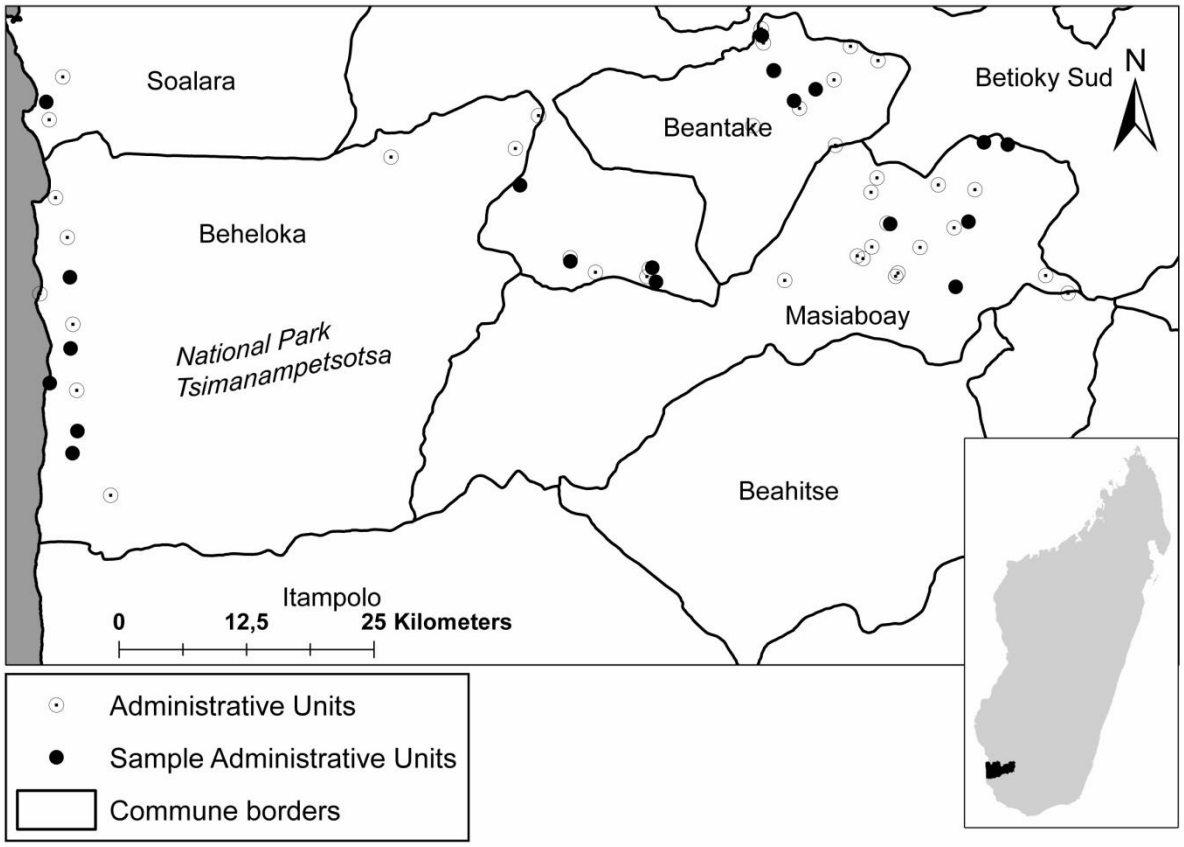


**Figure 1 Coverage of the Household Baseline Survey in the Mahafaly region**

Published in: Neudert et al. (2015); Source: Brinkmann et al (2015) for administrative unit (fokontany) locations, commune borders represent situation in 2012

In the HBS, a household is defined as a group of people typically related by blood or marriage, who usually eat from the same cooking pot and share income, expenses, and agricultural work. The bilingual HBS questionnaire (Malagasy and French) retrieved information on the location and composition of the household, farming, livestock keeping, use of natural resources, off-farm and non-farm activities, and a self-assessment regarding wellbeing, food expenses, and the relative importance of income sources (see questionnaire in Appendix 1).

The HBS is based on a two levels of random sampling, with the first level targeting administrative units and the second level, households. An administrative unit (*fokontany*) usually comprises one village, hamlets and households living isolated. The sampling of administrative units draws on results of a preceding village-level survey. The analysis of village-level data distinguished six village types, which vary according to their location in either of two sub-regions, their importance as a market place, presence of fishing activities, number of agricultural systems, number of zebu livestock, and the dominant ethnic groups. A sample of 19 administrative units (i.e. villages) was randomly chosen

for the HBS. In addition, we selected purposefully five study villages, where most of SuLaMa researchers worked.

In the selected administrative units, we asked the administration heads (*presidents de fokontany*) to compile lists of households including the names of household heads and the name of their hamlet. In two administrative units, where no household lists became available, we worked with the electoral list. Households were selected randomly from the household list or electoral list, respectively. In each sampled household, we interviewed a member above 13 years who felt able to answer the questions, e.g. the household head, spouse or an adult son or daughter. Table 1 gives an overview of the population and sample characteristics. In total, we sampled 994 households, or 15 % of the total population of households in the Mahafaly Plateau region.

**Table 1 Population totals for the study region Mahafaly Plateau and sample information for the Household Baseline Survey (HBS)**

| | **Item** | **Unit** | |
|---|---|---|---|
| Population | Administrative units (*fokontany*) | number | 59 |
| | Households[1] | number | 6811 |
| | Individuals[2] | persons | 40.866 |
| HBS random sample | Administrative units | number | 19 |
| | Households | number | 665 |
| | Population | persons | 4.080 |
| | Population > 18 yrs | persons | 1586 |
| HBS study village sample | Administrative units | number | 5 |
| | Households | number | 269 |

Published in: Neudert et al (2015)

[1]: Calculated from data on individuals (see note 2), assuming a mean household size of 6 persons.

[2]: According to commune statistics 2010/2011 collected by the SuLaMa Baseline Survey Team

For our analysis, we compiled descriptive statistics using the statistics program STATA. Weighting was applied according to the inverse selection probabilities on both the administrative unit and household levels, and by taking into account the stratification of administrative units according to village types. For the revenue calculation, missing or unclear data in the random sample and study village sample were cleaned listwise, resulting in 585 households out of 934 total interviews. In addition, 5 outliers in the revenue calculation and assets were cleaned, yielding a final sample of 580 households.

The HBS data was complemented with detailed data on land uses and other income-generating activities gathered in more than 350 additional semi-structured interviews in the Mahafaly Plateau region.

The report also draws on the results of a role-playing game on local livelihoods, which was designed and implemented in 2014 in four study villages within the SuLaMa project. The analysis of game results complemented the analysis of household decision behavior, especially asset accumulation behavior and drought coping activities (see SuLaMa material on the role playing game).

Additionally, we monitored prices from mid-January 2013 to mid-January 2014 on five markets in the Mahafaly Plateau region. For each market place, we engaged a local inhabitant of the village as a market monitor, who received the local half day salary for assistance for each monitored data set (3,000-4,000 MGA). He visited the market days at least in intervals of 2 weeks (in many cases even in weekly intervals) and recorded prices of available crops, livestock and other products. Full results from the market monitoring are available in a separate report (Neudert & Andrianjohary 2014)

# 3. Results

## 3.1. Demographics

The average age of approximately 19 years indicates a young and growing population. Of people above 18 years, 73 % are illiterate, and more than 80 % did not receive formal education. Only 8 % studied on high school level and beyond (table 2). With regard to ethnicity, the population is dominated by the Tanalana and Mahafaly groups, two subtribes of the Mahafaly tribe.

**Table 2 Characteristics of the population over 18 years and households surveyed in the Mahafaly region**

| Item | Category | Total |
|---|---|---|
| Educational level | No formal education | 86.97 (0.98) |
| | Primary school | 5.00 (0.71) |
| | High school and higher | 8.03 (0.87) |
| Literacy | Illiterate | 72.64 (1.71) |
| | Literate | 27.36 (1.71) |
| Female-headed households | Female | 14.67 (1.44) |
| Religion of household head | Traditional | 64.25 (3.79) |
| | Christian | 14.38 (2.33) |
| | No religion | 21.37 (2.38) |
| Ethnic group of household head | Vezo Sakalava | 0.79 (0.19) |
| | Tanalana | 29.90 (7.84) |
| | Mahafaly | 64.25 (7.96) |
| | Other | 2.55 (1.53) |
| | No ethnic group | 2.51 (0.46) |

Notes to the table:
Published in: Neudert et al (2015)
Table gives percentages on individuals; figures in brackets are standard errors
N= 665; weighting was applied
Educational level and literacy refer to persons of 18 years or older; other items refer to household heads

The Vezo Sakalava, whose traditional occupation is fishing, live only in the coastal region west of the national park. 64 % and 14 % of the households reported that the household head follows the traditional animist religion or Christianism, respectively. A substantial share (21 %) of the household heads stated that they are non-religious.

The mean household size is approx. 6 persons, with an average of 3 persons above 13 years. Only 15 % of all household heads are female. Polygyny of household heads is reported rarely with 5.4 % on average.

## 3.2. Main revenue-generating activities

The studied households combine activities generating subsistence income and cash income and, for the latter, engage in a wide range of income-generating activities (table 3). The average field size is 2.1 ha, and on average the farmers grow more than 6 different crops. Cassava (*balahazo*) and maize (*tsako*) are the most frequently cultivated crops, and 84 % of the farmers grow at least one kind of the six bean varieties found in the study region (Bambara groundnut (*voanjobory*), Cowpea (*lojy*), Hyacinth bean (*antake*), Mungbean (*antsamby*), Rice bean (*antsambim-bazaha*), Lima beans (*kabaro*)). Sweet potatoes (bele), pumpkins (*taboara, voatava*), and melons (*vamanga, voantango*) are also grown by the majority of farmers. About half of them grow peanuts (*kapiky*), while vegetables like tomatoes (*voatabia*), wild cucumber (*kiseny*), and eggplant (*mody*), as well as other crops and fruits (sugar cane, papaya, banana) play only a minor role.

Besides farming, 61 % of the households keep poultry (chicken, turkeys, and ducks) and the same percentage livestock (table 3). 48 % of the households keep zebu. Average zebu comprise 17 animals and average small ruminant herds 25 individuals, respectively. In all parts of the study region, more households keep goats than sheep.

In addition to fields and farm animals, 97 % of the households use timber and non-timber forest products from pastures and forests. The use of medicinal plants and construction material (different kinds of wood, reed, and grasses) is especially common. In addition, 59 % of the households collect alimentary plants to support their diet, particularly in lean times. 23 % of the households also hunt or gather forest animals. Although the endemic and endangered radiated tortoise is collected for illegal trade in the study region, but only one household mentioned this activity explicitly. Fishing and the collection of seafood is the mainstay of households from the Vezo Sakalava ethnic group in the coastal region. But farmers in the coastal region also supplement their livelihoods by gathering seafood, especially in lean times.

Table 3 Revenue-generating activities of households in the Mahafaly region

| Item | Unit | Total | |
|---|---|---|---|
| **Farming** | % | 97.2 | (0.8) |
| Mean field size | ha | 2.1 | (.12) |
| Mean number of crops | no. | 6.3 | (.18) |
| Cassava | % | 98.6 | (0.9) |
| Sweet potatoes | % | 62.0 | (3.0) |
| Maize | % | 88.5 | (2.6) |
| Grains | % | 7.7 | (1.4) |
| Beans | % | 84.2 | (1.4) |
| Pumpkins and melons | % | 45.2 | (3.4) |
| Other vegetables | % | 87.9 | (1.3) |
| Peanuts | % | 53.5 | (5.8) |
| Other crops and fruits | % | 5.6 | (1.9) |
| **Poultry keeping** | % | 61.1 | (4.1) |
| **Livestock keeping** | % | 61.1 | (2.2) |
| Zebu keeping | % | 48.3 | (2.1) |
| Mean zebu herd size | no. | 16.9 | (3.5) |
| Mean size of small ruminant herd | no. | 25.1 | (3.6) |
| **Use of timber and non-timber forest products** | % | 98.1 | (0.5) |
| Collection of alimentary plants | % | 59.0 | (3.1) |
| Collection of medicinal plants | % | 89.7 | (3.1) |
| Collection of construction material | % | 84.8 | (2.4) |
| Charcoal production | % | 8.5 | (1.9) |
| Hunting & collection of wild animals | % | 23.2 | (3.5) |
| **Fishing & gathering of sea products** | % | 13.4 | (2.4) |
| Gathering of sea products | % | 12.5 | (2.2) |
| Fishing | % | 3.5 | (1.6) |
| **Off-farm income sources** | % | 70.9 | (3.7) |
| Permanent salaried work | % | 4.9 | (0.9) |
| Wage work (farm) | % | 19.7 | (3.1) |
| Wage work (non-farm) | % | 2.9 | (0.4) |
| Temporary migration | % | 5.9 | (2.0) |
| Trade | % | 15.1 | (1.6) |
| Weaving of mats | % | 44.0 | (5.3) |
| Handicrafts | % | 4.6 | (0.7) |
| Renting of zebu carts | % | 11.4 | (1.9) |
| Other forms of economic activities & remittances | % | 3.7 | (0.9) |
| **Number of income sources** | no. | 6.1 | (.09) |

Published in: Neudert et al (2015)

N= 665; weighting was applied; figures in brackets are standard errors

Percentages and means for subcategories in the farming and livestock keeping section were calculated using data only from households that engage in this activity; other percentages were calculated from total sample.

Off-farm income constitutes the fourth major category of income-generating activities in the study region. In total, 71 % of households have at least one source of off-farm income. Only 5 % of households obtain income from permanent salaried jobs, and if so, mainly from low-level administration jobs. Wage labour in agriculture is a more common source of off-farm income (19 % of the households). Wage labour in the non-farm sector, e.g. in the construction or the tourist sector, is less important. Weaving of mats is frequently carried out by women. Temporary migration leads people to the regional centre Tuléar and rural regions north of it, where there are opportunities for slash-and-burn agriculture during the wet season. Cross-regional temporary migration is rare. Trade and the renting of zebu carts are frequent occupations among richer households. Zebu carts are the main means of transport in the study region.

In total, an average household engages in more than six income generating activities, or more than one activity per adult person. Statistics on overall revenue shares (table 5, see below) confirm that arable farming has a high overall importance in the region with on average 37% contribution to the households' revenues, while also zebu-keeping, poultry keeping and non-agricultural activities/agricultural wage labour contribute on average more than 10% each.

## 3.3. Seasonality and food security

The marked seasonality of the climate in the Mahafaly region strongly affects the livelihoods of local households. According to local definitions, the year is divided in three seasons: rainy season (asara, January to March), early dry season (asotry, April to August) and late dry season (faosa, September to December). Seasonality is most pronounced in arable farming activities, where most seed crops are sown in January when first heavy rains come down. Maize is harvested in April to May, while the main cassava harvest typically takes place in June/July. Cassava may be pre-harvested from April for daily eating.

The seasonal agricultural cycle leads to a typical pattern of harvest and lean seasons with varying food security for the households. Figure 2 shows annual curves of staple foods purchases based on responses to the household baseline survey for the agricultural year 2010/2011, in which agricultural production was good. The purchase of cassava was recorded separately from that of rice, maize and other staple foods. Rice and maize were reported as the superior substitute to cassava and are preferred especially during festivities and times with relaxed budget constraints. Purchase of all staple foods is clearly seasonal: the purchasing rates are lowest shortly before and during the harvest season (May, June, July), while in the lean season (January and December) over 70 % and 65 % of the households buy rice and cassava, respectively. Only 7.3 % of the all households did not report any food purchases.

The purchase of staple crops by almost all households is substantiated further by the data on agricultural self-sufficiency. Only 4.5 % of all farming households reported that the crops they grow are 'always sufficient' for feeding the household members. In contrast, 54 % of the respondents said that their harvest is 'never sufficient' for providing food for the household. The remaining households reported that their crops are 'sufficient except in times of drought' or 'only sufficient during years with much rain'.

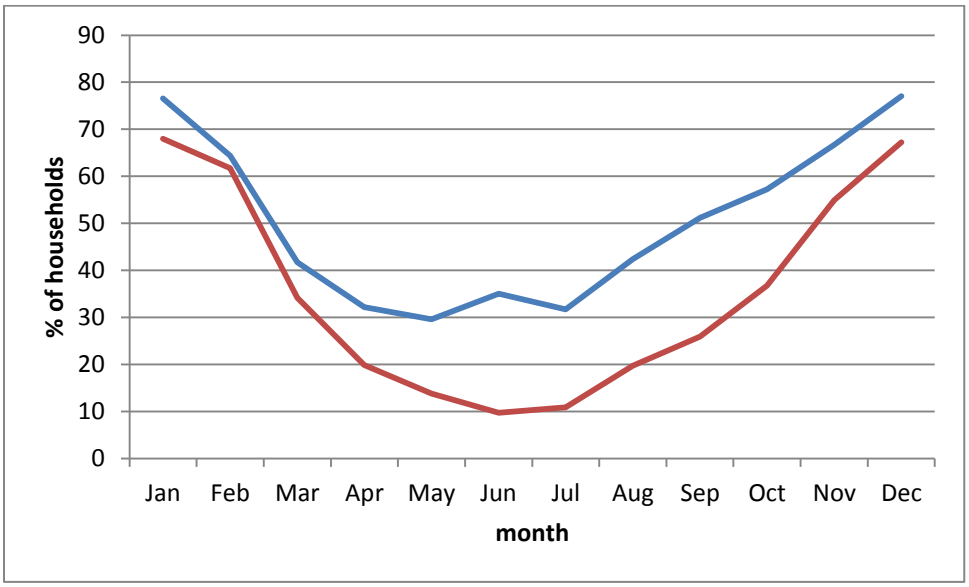


**Figure 2: Share of households in the Mahafaly region that purchased staple foods in 2010/2011, by month (red: cassava, blue: rice, maize, and others)**

Published in Neudert et al (2015); Source: HBS data

The seasonality of crop availability also has strong effects on the market prices. Figure 3 shows the price development for Lojy beans for five markets in the study area in 2013. The prices are lowest during the harvesting season in June/July and highest in the lean season in December/January. Similar patterns can be observed for other crops as well (see market monitoring report). This has important implications for income from arable farming for local households: Since many households sell crops directly after the harvest in order to purchase other basic needs items, they sell their harvest when prices are lowest. On the contrary, they have to buy basic food stuffs mainly during the lean season, i.e. at the time when prices are highest. Only richer households can afford to stock crops directly after the harvest or even purchase crops from poorer households, and then are able to sell crops later when prices are higher.

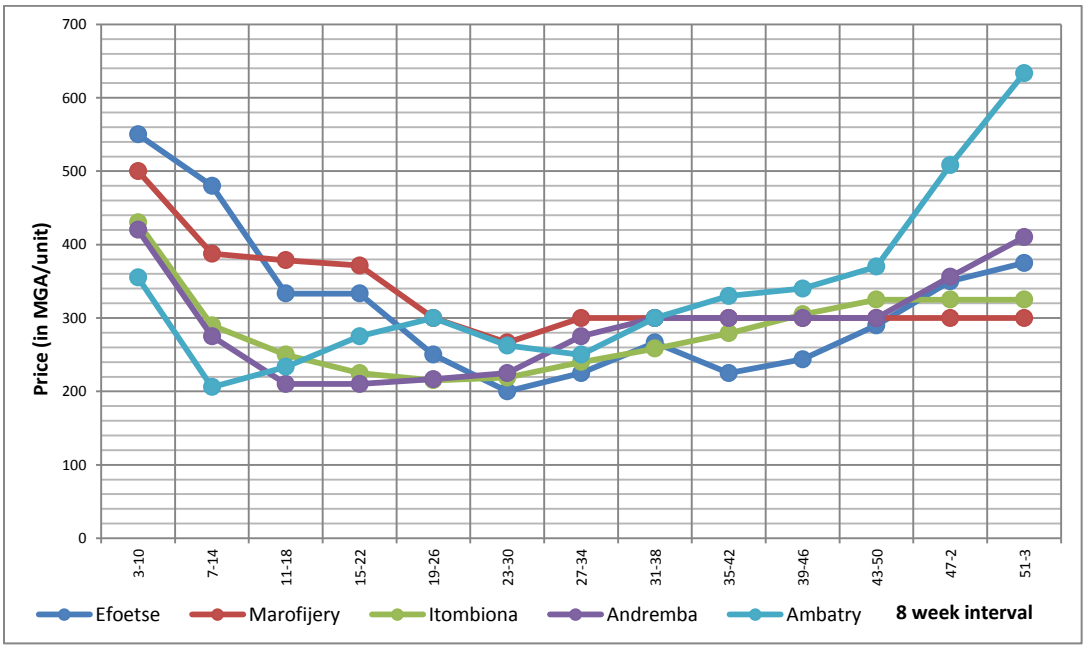


**Figure 3 Seasonal price development for 1 kapoaka (small tin cup) of lojy beans**

Published in Neudert & Andrianjohary (2014)
Source: Market monitoring data from 2013

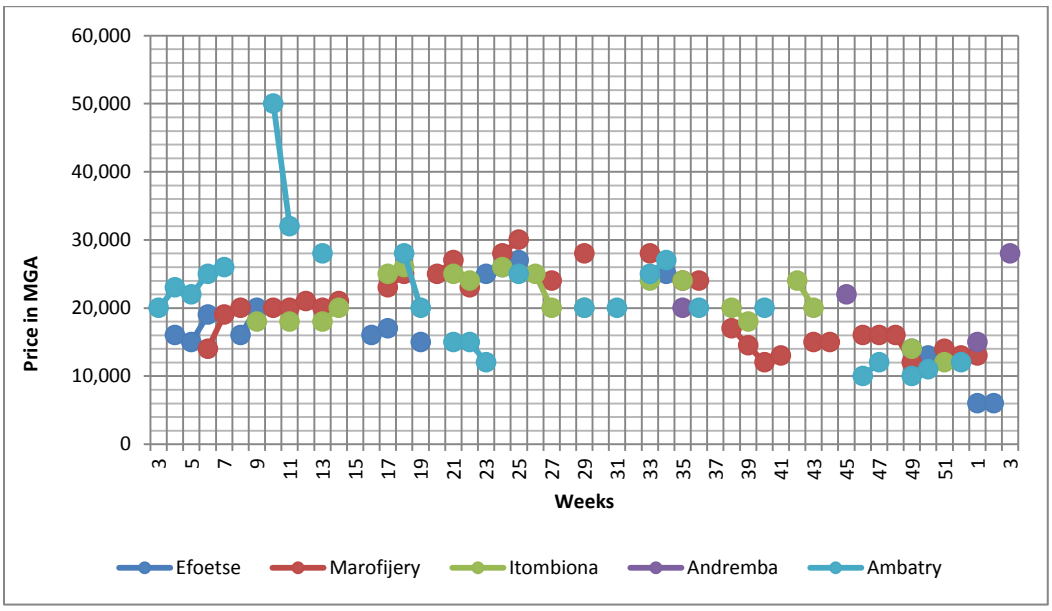


**Figure 4 Seasonal price development for female young sheep (category tongaline)**

Published in Neudert & Andrianjohary (2014)
Source: Market monitoring data from 2013

Seasonal price differences for live animals are not as pronounced as for crops. A slight trend to higher prices in July/August is visible for goats and sheep. Figure 4 shows the price development for female, young sheep in 2013. In contrast to crop prices, livestock prices tend to be higher in the harvest season, which can be explained with increased demand due to the upcoming festivities and investments of earnings from harvest sales (see section 3.5). However, for zebu nearly no seasonal price differences were observed. More information on market prices can be found in the report on market monitoring data (Neudert & Andrianjohary 2014).

## 3.4. Livelihood strategies

As known from other African countries, most households do not simply maximise the number of their income sources or specialize in one activity, but combine sources with different risk structures and seasonal characteristics in a strategic way. This behavior is known as **diversification of income sources**.

Table 4 Combination of income-generating activities of households in the Mahafaly region

| Income source category combination | Total |
|---|---|
| F | 0.1 (0.1) |
| R | 0.4 (0.2) |
| O | 0.1 (0.1) |
| LR | 0.2 (0.1) |
| FL | 0.3 (0.1) |
| FR | 6.3 (1.9) |
| LO | 0.1 (0.1) |
| FO | 0.6 (0.4) |
| RO | 0.8 (0.4) |
| FLR | 21.8 (2.3) |
| FLO | 0.4 (0.2) |
| LRO | 1.1 (0.5) |
| FRO | 12.8 (3.4) |
| FLRO | 54.9 (2.7) |

Published in Neudert et al (2015)
F = farming, L = Livestock & poultry keeping, R = Use of natural resources (timber and non-timber forest products, fishing and seafood) and O = off-farm income sources
Table gives percentages; figures in brackets refer to standard errors
N= 665; weighting was applied

We analysed the combinations of income sources by distinguishing four categories of income-generating activities: farming (F), livestock and poultry keeping (L), natural resources use (R), and off-farm income (O; table 4). While the percentage of households that depend on income from only one category is negligible, the majority of households combine income from all four categories. The

combinations FLR and FRO are also relatively common. This already suggests that many households rely on more than one income for their livelihood and that diversification of income sources is also common in the Mahafaly Plateau region.

For a closer analysis, we identified livelihood strategies of households by a cluster analysis of household revenue shares. Six groups of households were found which could be distinguished according to their livelihood strategies (table 5). The table presents detailed data on the contribution of each activity category to overall revenues in percent. Standard errors are given in brackets. The following paragraphs present two similar livelihood strategies each:

*(1) Arable farmers* obtain the overwhelming share (more than 70%) of their household revenues from arable farming. (2) *Poultry keepers-arable farmers* earn approx. 30% of their revenue in arable farming but rely to more than 35% on poultry keeping and to more than 20% on the collection of alimentary plants. Arable farmers and poultry keepers-arable farmers are poor and in most cases do not have livestock. Comparably frequently they collect alimentary plants. The collection of alimentary plants is a typical coping strategy for times when crop yields are not sufficient. This indicates that these households are struggling to fulfil their basic needs not only during crop failures, but also in years with rather good crop yields.

(3) *Zebu keepers-arable farmers* also rely on arable farming to approx. 17% of their revenue but predominantly draw on zebu keeping constituting 48% of their revenues. (4) *Goat keepers-arable farmers* rely to 26% of their revenues on goat keeping, but obtain approx. 30% of their revenues from arable farming. Goat keepers-arable farmers and zebu keepers-arable farmers belong to the richer part of the population in the Mahafaly Plateau region. Livestock can be sold to satisfy daily needs and can be used for cultural reasons, e.g. for funerals and marriages. Moreover, livestock has an important function to buffer income gaps from crop failures.

*(5) Non-agricultural and agricultural workers-arable farmers* get more than 50% of their revenues from non-agricultural activities and agricultural wage work, but also obtain on average 20% of their revenue from arable farming. (6) *Ocean product collectors-fishers* have a livelihood based on the ocean since their draw for the overwhelming share of their revenues on the collection of ocean products and fishing. They obtain only approx. 16% of their revenues from farming. The livelihood strategy groups 5 and 6 shows some specialization in the livelihood and earn medium revenues. Education is an important determinant if households follow livelihood strategy 5. Livelihood strategy 6 contains members of the Vezo Sakalava ethnic group, who are known to base their livelihood on fishing, but also comprises Tanalana households making frequently use of ocean products. As these groups base their livelihoods on activities other than arable farming they are most likely less affected by crop failures.

Arable farmers (livelihood strategy 1) and zebu keepers-arable farmers (livelihood strategy 3) are the most widespread livelihood strategies while the strategy ocean product collectors-fishers (strategy 6)

is least widespread. All strategies except ocean product collectors-fishers obtain on average approx. 20% or more of their total revenues from arable farming.

Having a closer look at the cropping strategies, differences according to livelihood strategies are found, as well. Not surprisingly, cassava has the highest overall contribution to revenues from arable farming, followed by maize and beans. Only among collectors of ocean products-fishers cassava is substituted by sweet potatoes as the main crop. Arable farmers, who receive a high contribution of their revenues from farming activities in general, also generate fewer revenues from cassava, which is substituted by maize revenues. Poultry keepers-arable farmers seem to follow the opposite strategy as cassava has a high contribution to their crop revenues, while less emphasis is put on maize.

A more detailed analysis of revenues from non-agricultural activities and agricultural wage labour also shows differences between the revenues derived from activities and the types of activities carried out the different livelihood strategy groups. The highest average revenues per household are derived from non-agricultural salaried work, permanent work, trade and handicrafts, while lowest revenues are generated from remittances, transport services and agricultural wage labour. Mat weaving and trade have the highest overall contributions to revenues from this category. Mat weaving is also carried out most frequently (n=187), followed by agricultural wage work (n=108). Trade, which has the second highest overall contribution, is carried out by 98 households in the sample. Regarding differences among livelihood strategies, non-agricultural workers-arable farmers derive the overwhelming share of their non-agricultural revenues from mat weaving and trade, while agricultural wage labour is carried out less among this group. In contrast, agricultural wage labour has a high contribution among poultry keepers-arable farmers, while revenues from trade are not common among this group (similar to arable farmers).

For assessing the outcomes of the different livelihood strategies for the individual household, total revenues and self-assessed wellbeing was analysed. Table 6 displays boxplots of total revenues according to livelihood strategy. Mean total revenues reached 646 €/household and year or 118 €/person and year. Zebu keepers-arable farmers (1284 €/household) and ocean product collectors-fishers (1074 €/household) achieve the highest mean revenues, while poultry keepers-arable farmers (276 €/household) and arable farmers (316 €/household) gain lowest revenues. The differences in total revenues between livelihood strategies are significant in statistical tests.

Table 5 Revenue shares of activities in percent according to livelihood strategies in south-western Madagascar

| | Total | Arable farmers (1) | Poultry keepers-arable farmers (2) | Zebu keepers-arable farmers (3) | Goat keepers-arable farmers (4) | Nonagricultural workers-arable farmers (5) | Collectors of ocean products-fishers (6) |
|---|---|---|---|---|---|---|---|
| n | 580 | 150 | 99 | 114 | 97 | 71 | 49 |
| Arable farming | 37.3 (1.3) | 71.8 (2.8) | 29.4 (2.1) | 17.4 (0.8) | 29.8 (1.2) | 22.7 (1.7) | 7.8 (1.9) |
| Alimentary plants collection | 8.0 (0.9) | 7.9 (1.8) | 22.5 (4.1) | 1.8 (0.4) | 3.6 (0.8) | 9.0 (1.1) | 1.5 (0.4) |
| Collection of ocean products | 3.6 (0.7) | 0.4 (0.2) | 1.9 (0.6) | 0.6 (0.2) | 2.3 (0.7) | 0.7 (0.5) | 46.4 (5.1) |
| Fishing | 1.7 (0.7) | 0.0 | 0.0 | 0.0 | 1.2 (1.1) | 0.1 (0.1) | 27.3 (8.4) |
| Charcoal production | 0.9 (0.3) | 1.4 (0.5) | 0.0 (0.0) | 0.2 (0.2) | 1.3 (0.7) | 1.6 (0.9) | 0.1 (0.1) |
| Zebu keeping | 12.8 (1.6) | 1.5 (0.5) | 0.5 (0.2) | 47.9 (1.1) | 12.5 (1.6) | 3.5 (1.4) | 2.4 (1.5) |
| Goat keeping | 7.3 (0.9) | 1.0 (0.3) | 2.1 (1.0) | 9.7 (2.0) | 25.5 (1.7) | 1.5 (0.4) | 2.7 (0.7) |
| Sheep keeping | 4.2 (0.5) | 1.0 (0.4) | 2.2 (0.8) | 10.2 (1.3) | 7.7 (1.3) | 0.5 (0.3) | 2.6 (0.7) |
| Poultry keeping | 11.5 (1.6) | 5.6 (1.0) | 35.6 (2.4) | 7.7 (0.9) | 9.9 (1.4) | 7.3 (1.6) | 3.5 (0.8) |
| Nonagricultural activities | 12.8 (1.3) | 9.2 (1.6) | 5.8 (1.2) | 4.4 (0.8) | 6.3 (0.8) | 53.1 (2.3) | 5.6 (2.6) |
| Sum of revenue shares | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Published in: Neudert (in preparation)

Source: HBS data

N=580; Table displays shares of revenues in percent. Standard errors are given in brackets

**Table 6 Mean total revenue per household according to livelihood strategy**

| | Total | Arable farmers (1) | Poultry keepers-arable farmers (2) | Zebu keepers-arable farmers (3) | Goat keepers-arable farmers (4) | Non-agricultural workers-arable farmers (5) | Collectors of ocean products-fishers (6) |
|---|---|---|---|---|---|---|---|
| Total Revenue | 2,100,868 (254,190) | 1,026,640 (107,658) | 896,893 (110,610) | 4,172,013 (709,971) | 2,625,850 (367,034) | 1,470,474 (141,802) | 3,489,932 (321,460) |
| Total Revenue | 646 (78) | 316 (33) | 276 (34) | 1,284 (218) | 808 (113) | 452 (44) | 1,074 (99) |

Published in: Neudert (in preparation)

Source: HBS data

N= 580; Table displays means on total revenue per household measured in MGA (Madagascar Ariary), in brackets: standard errors

Table 7 displays a cross-tabulation of self-assessed wellbeing vs. livelihood strategies. The differences in self-assessed wellbeing according to livelihood strategies are statistically significant. Zebu keepers-arable farmers and ocean product collectors-fishers rate their wellbeing more often as "good" and less often as "bad", while arable farmers and poultry keepers-arable farmers do the contrary. An ordinal ranking from best to worst average wellbeing yields the same ordering of livelihood strategies as the ranking of total revenue.

**Table 7 Cross-tabulation on self-assessed wellbeing and livelihood strategies**

| | Arable farmers (1) | Poultry keepers-arable farmers (2) | Zebu keepers-arable farmers (3) | Goat keepers-arable farmers (4) | Nonagricultural workers-arable farmers (1) | Collectors of ocean products-fishers (5) | Total |
|---|---|---|---|---|---|---|---|
| Very good | 2.4 | 2.7 | 8.2 | 4.9 | 4.8 | 5.7 | 4.5 |
| Good | 13.4 | 8.3 | 24.9 | 19.3 | 11.3 | 26.5 | 16.4 |
| Average | 31.6 | 22.7 | 33.3 | 35.6 | 42.6 | 36.0 | 33.0 |
| Bad | 52.6 | 66.3 | 33.6 | 40.1 | 41.4 | 31.7 | 46.2 |

Published in Neudert (in preparation)

Source: HBS data

N = 580; table displays column percentages

Table 8 summarizes the information about livelihood strategies collected before. In addition, the last row summarizes determinants of the livelihood strategies. Arable farmers are distinguished from livelihood strategies 2, 3 and 4 mainly by their lack of capital in livestock. Non-agricultural workers are on the medium level regarding revenues and self-assessed wellbeing and seem to have mostly a higher education, which opens for them more possibilities in non-agricultural income sources. Only collectors of ocean-products-fishers follow a very distinct livelihood strategy based on the ocean.

**Table 8 Summary on livelihood strategies**

| | Arable farmers (1) | Poultry keepers-arable farmers (2) | Zebu keepers-arable farmers (3) | Goat keepers-arable farmers (4) | Nonagricultural workers-arable farmers (5) | Collectors of ocean products-fishers (6) |
|---|---|---|---|---|---|---|
| Which sources of revenue do the households have? | More than 70% of revenues come from arable farming, no other major revenue source | Poultry keeping, arable farming and the collection of alimentary plants are main sources of revenue | Zebu keeping is main source of revenue, although these households also have large fields | Highest shares of revenues come from goat keeping, arable farming and zebu keeping | High share of revenue comes from non-agricultural work or agricultural wage labour (particularly from trade) | Base their livelihood on the collection of ocean products and fishing |
| How much total revenues earn the households? | Second lowest revenues, i.e. mainly poor households | Lowest revenues of all groups | Highest revenues of all groups | Medium revenues | Medium revenues | Second highest revenues of all groups |
| How do they rank their wellbeing? | More than 50% of households rank their wellbeing as bad | More than 66% of households rank their wellbeing as bad | Comparably many household rank their wellbeing as good or very good | Medium ranking in self-assessed wellbeing | medium ranking | Least households rank their wellbeing as bad from all groups |
| What determines this livelihood strategy? | Own approx. 2 ha of arable land, but do not engage much in other activities | Have more poultry compared to arable farmers | Have much more livestock than other households | Have more livestock and poultry than arable farmers | Have often higher education and less agricultural land than arable farmers | Live close to the sea, have some livestock and own frequently boats |

Source: compilation based on own data

## 3.5.Strategies for asset accumulation

Asset accumulation is an important goal in the livelihoods of local households. The analysis of livelihood strategies revealed already differences in wealth status of households, which are associated with self-assessed well-being. Assets, i.e. wealth or capital, is needed to satisfy needs of the households, e.g. basic material needs, but also social and cultural obligations and needs. In addition, assets are necessary to cope with risks and uncertainties, such as crop failures and personal health risks. The most important assets for local households are zebu cattle, but also small stock, zebu carts and having money in general are used for local classifications of richness.

Accumulating assets is thus the pathway out of relative poverty for the local households. We could identify a distinct pathway of asset accumulation, which applies to most Tanalana and Mahafaly households in the Mahafaly Plateau region (see also SuLaMa 2011):

- The mainstay of local households is their arable land. Asset accumulation mainly starts with a **good harvest**, which is sufficient for establishing a stock to cover the subsistence needs of the household and selling some part of the harvest to obtain cash.
- With small sums of excess cash, the household may **buy poultry**. One hen costs only around 4,000 to 5,000 MGA. Raised chicks may be sold for satisfy other needs of the household or may be consumed.
- If the household has obtained larger sums of excess cash, he may **invest in goats or sheep**. One goat may be obtained for a price of 15,000 to 20,000 MGA or a sheep for approx. 30,000 MGA. The value of a goat herd may increase quickly by good reproduction. Animals are also sold for everyday needs and are a very important complement of the livelihood for herd owners. People frequently sell animals when they need cash money.
- If a household has obtained a larger goat or sheep herd, he may decide to exchange part of this herd for **zebus**. A small zebu may be obtained for 100,000 to 200,000 MGA. Zebus reproduce rather slowly, but also the value of animals increases with the age, especially for male zebu. Thus, they represent an ideal capital stock, which slowly reproduces itself. Occasionally, zebus are also sold to satisfy basic needs of the household, but to less extent than small ruminants. Normally, even rich households keep also small ruminants besides zebus.
- If a household has already accumulated a large zebu herd and does not want to increase the herd size further, he may invest in other capital goods, e.g. **good houses**. This behaviour may occur if households consider having a large zebu herd as risky, e.g. if there is a high threat of cattle raids.
- **A small shop** in the village has an important function in asset accumulation as well, but also requires larger investments in buildings and a liquid capital. Richer households frequently sell livestock in order to obtain the liquid capital for a trade activity. As trade activities are often lucrative even in drought periods, a trading business is a very useful complement of household activities to buffer own crop failures.

- Similarly, having a **zebu cart** is a useful asset to complement own agricultural activities and a trading business. It was also included in wealth rankings to describe wealthy households. Similarly to trading activities, households sell livestock (zebu or small ruminants) to obtain the cart itself, while cart oxen can be also recruited from the own zebu herd. Very rich persons are said to have even more than one zebu cart.
- Enabling children to obtain **higher education**, e.g. going to college or to university in Tulear, is possible only for richer households. Normally, households support children with food supplies, charcoal and sometimes housing. Having a higher education may enable children to obtain better jobs in the city, which may widen the security web of households.

## 3.6. Strategies for coping with harvest failures ("kere")

As many households in the Mahafaly region rely on arable farming as the main source of household revenues, harvest failures have a big impact on the household livelihood. Harvest failures are mainly caused by lacking rain/droughts, but also thunderstorms or locusts may damage crops on village level. Households have to compensate the loss of the harvest and income from harvest with other activities or the sale of assets.

With regard to risk of income failure, one can distinguish the **ex ante preparation against income failure** and the **ex post coping**. While the ex ante search for activities can involve strategic decisions, ex post coping occurs after the failure of major income sources when the survival of the household is threatened. However, coping strategies which tapped successfully income sources after a desperation driven search may alter the asset portfolio of the household and influence strategic decisions on household activities in the following years. The best ex ante preparation for harvest failures is indeed a strategic diversification of activities and accumulation of assets as described in the preceding chapters.

In the following, we list asset sales and other coping activities, which are in each list roughly ordered in the sequence of occurrence during harvest failure period.

*Sales of assets:* Generally, the asset accumulation chain presented before can be partly reversed by the sale of assets.

- In case of harvest failures, households may sell and consume at first own harvest stocks. Also the seed stocks are frequently consumed, which causes considerable problems for the households in the following year.
- Poultry sales are an option for poor households, but generally, the importance of poultry for coping with harvest failures is not so high since it represents relatively small sums of capital.
- If the household has accumulated livestock, this plays a large role in coping with harvest failures. However, households are generally reluctant to sell livestock as they try to preserve their asset stock even at the expense of own wellbeing. Generally, small stock is more readily sold compared to zebus. As especially zebus are strongly affected by the lack of fodder

during drought periods, this may cause additional expenses for households, which must be covered from the herd, as well. Thus, also preventive sales of zebu or risk minimizing strategies in zebu management (such as selling big and old zebu and buying smaller ones) can be found among zebu keepers.

- Other asset sales may occur, but are often the last option for households.

*Coping activities:* These activities are available also during harvest failure periods and do not require investments. Normally, these activities are less preferred than others for some reason.

- A widespread coping activity of households is to **collect alimentary plants** in the forest. Households frequently mention that these plants do not taste very good, but they can tide households over smaller lean periods and droughts. Even richer households collect alimentary plants in order to prevent livestock sales. However, collecting alimentary plants is insufficient for longer lasting drought periods since consuming only these plants seems to have a negative effect on body condition.
- In the coastal plain in villages near to the ocean, households frequently **collect ocean products**, which can be sold or consumed. This activity is also carried out as a normal complementary activity in the livelihood portfolio. Contrary to fishing, collecting ocean products during low tide does not require equipment. It was sometimes mentioned that people do not collect ocean product during June to September since the water is too cold during that period.
- **Petty trade of basic foodstuffs** is carried out by some households having still small capital stocks at the beginning of a harvest failure period. Since foodstuffs are scarce during these periods and many people have to buy food, petty trade is a remunerative activity compared to other times when most households eat cassava from their own fields.
- **Charcoal making** is for some households a way to obtain cash within a short period of time, not only during harvest failures, but also in times of personal cash needs, e.g. social obligations or to pay back debts. Generally, this activity is disliked or regarded as only suitable for young people, since it is very hard work and bad for the personal health. Interviewed villagers mentioned that during longer lean periods people lack strength to make charcoal. Nevertheless, for some households charcoal making becomes a regular part of the livelihood portfolio during dry seasons or year-round.
- **Temporary migration** to search work elsewhere is a strategy for coping with longer lasting, severe harvest failures as well as for organising capital for important social obligations with high expenses, e.g. funerals. However, households need knowledge, where they can go, which is provided e.g. within social relations to persons who already went on temporary migration. Precondition for emigration seems to be some family relation to places where to go and a household composition enabling migration, i.e. at least some grown up children or a wife staying at home who are able to maintain at least part of the farming activities in the home village. Also personal health problems, health problems of close relatives as well as old

age seem to prevent households from taking the decision to emigrate. Destinations of temporary migrations are the city of Tuléar (for various kinds of salaried work), areas with irrigated arable land near the Onilahy river (for sharecropping arrangements), as well as regions north of Tuléar (e.g. Manamby) suitable for slash and burn agriculture (for sharecropping and wage labour arrangements). Emigration offers the possibility of sending money back home, but also the aspect of reducing the number of eaters in the household is of interest.

*Other strategies:*

- **Reducing meals** is done by nearly all households in case of harvest failure. Typically, the meals are more reduced for adults than for elderly persons and children. However, together with changes in the diet this leads to loss of strength and worse body condition, which may reduce again the physical possibilities for other coping activities.
- **Taking children out of school**: School dropouts increase during harvest failure periods, either because parents try to save school fees or children need to carry out other activities in the household. A very common tradeoff exists between school visit of boys and herding labour. If boys go to school, households frequently need to engage a shepherd, who receives a salary of one to two goats per year for goat herding or one 2-year old zebu for zebu herding.
- **Relying on food aid**: During harvest failures, food aid or food from food for work programmes is sometimes provided by the World Food Programme and other organizations. However, the arrival of food aid is rather erratic.

*Effects on other activities:* One could assume that especially off-farm activities are carried out with increased intensity during harvest failures. However, actually the effect on off-farm activities is mixed mainly because the opportunities for off-farm activities during harvest failures vary. The results of the livelihood game suggested the following effects:

- **Agricultural casual labour** decreases during harvest failures, since during harvest failure less activity is needed on arable land.
- **Handicrafts**, e.g. zebu cart production, as well as **non-farm salaried work**, e.g. in house building, decrease during harvest failures. This effect may be caused by the general lack of liquidity and investment activities in the villages during harvest failure.
- Most trade activities, especially with food stuffs, are more remunerative during harvest failure since many people need to buy basic food stuffs and prices are high.

# 4. Conclusions

In this report, we compiled information about livelihoods in the Mahafaly Plateau region based on a survey among households and additional data. We could show that most households are very poor (in terms of material assets and revenue), but follow a diversified livelihood based on arable farming,

livestock and poultry keeping and diverse other activities. These other activities, which are not related to own farming and own livestock keeping, constitute important main or additional income sources, which are crucial for generating assets or coping with harvest failures.

We characterized six livelihood strategies, with different characteristics regarding revenue sources, asset possession, earning of total revenues and self-assessed wellbeing. While households relying solely on arable farming or combining arable farming and poultry keeping achieve lowest revenues, richer households with higher revenues draw additionally on livestock keeping. A special strategy is the fisher livelihood, which is based to a large extent on ocean resources. Furthermore, some households earn a large share from lucrative non-farm activities, which emerged as a livelihood strategy earning medium revenues.

A worrying result from the analysis of demographic characteristics was that 73 % of people above 18 years are illiterate, and more than 80 % did not receive formal education. Even though, education proved to be an important determinant if households take up non-farm activities or not. Current schooling rates are higher, but generally the level of education in the Mahafaly Plateau region remains very low.

During our research, a chain of asset accumulation emerged, which becomes visible in the different livelihood strategies as well as in the investment behavior of households. Important steps of asset accumulation are having poultry, goats or sheep, while having zebu cattle is only a late step in the asset accumulation chain. If a household has already many zebus, investments in other assets, e.g. a good house, in the higher education of children or other valuable material goods may occur.

Furthermore, harvest failures caused by low and varying precipitation, thunderstorms or locust invasions are a major concern for the households. In fact, households are obliged to accumulate assets in years with good harvest in order survive harvest failures. Additionally, they use various measures to cope with harvest failures, involving coping activities, e.g. the collection of alimentary plants, charcoal production, petty trade and temporary migration, and other measures, such as the reduction of meals.

In view of the poverty of the local population, many implications for development aid and conservation measures can be derived from this analysis. However, the emerging key issue in the Mahafaly Plateau region is the impact of climate change, leading to even lower precipitation and thus the loss of productivity in arable farming, which is the households' main income source. Thus, increasing the resilience of local households in face of natural disasters is the most important development challenge in the region.