Project report on visit on Unguja island, Zanzibar archipelago

Island description and farm observations

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Introduction

I spent seven weeks volunteering for the CAAA (les collégiens Akadiens et leurs Amis Africains) on Unguja island, Zanzibar islands archipelago. This Swiss organisation supports the population on the island by lunching different schools in order to give them an education, which in the organisation's opinion is the best weapon against poverty. In their second project, they are opening a training school for farmers and hotel management and a hostel. Thus, besides the education, the students can already have their first training at the hostel and on the farm field next to the school. The island's income is mainly ensured by tourism. With the training that this school offers local people have a better chance to connect to the job market on the island.
During my stay, I visited some farms around the school area to get a better understanding of the local farm practices and to figure out possible subjects that could be taught at school.

Unguja Island is part of the Zanzibar islands archipelago in the southwest of the Indian Ocean and is located between 4° 30' and 6° 30' latitude and 39° and 40° longitude (Bron Sikat, 2011). Unguja island is about 35 km far from the African east-coast and has a total area of about 1'554 km^2 (Encyclopaedia Britannica, 2015). The archipelago is part of the United Republic of Tanzania since 1964 and nowadays it is a semi-autonomous region of Tanzania (Encyclopaedia Britannica, 2015). In 2011 editors of countrySTAT estimated a population of 794'000 inhabitants (99 % of them are muslim) on Unguja island (Editors of countrySTAT, 2011).

The master thesis written by Bron Sikat (2011) compiles a comprehensive view on physiography, geology, hydrology, soil types, climate and land use. The climate on Unguja Island is characterised by two rain seasons (long rains during March-Mai and shorter rain intervals during October-December) and two different monsoons (warm and dry northeast monsoon in January-February, and cooler southwest monsoon in June-September) (FINNIDIA et al., 1991). In the northern and southern parts of the island the precipitation amounts are lower than in the middle of the island. The average temperatures fluctuate between 28 °C in January down to about 24 °C in August.

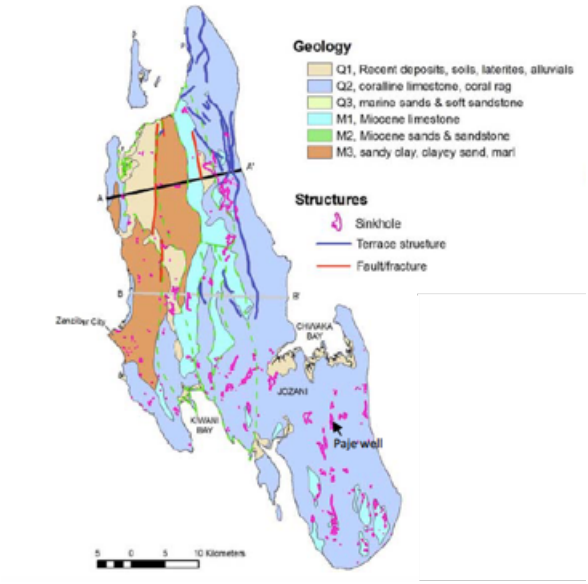

Figure 1: Geology of Unguja Island. Picture taken from Bron Sikat, 2011 (modifications of Johnsons review (1984)). Q stands for quaternary age and M for Miocene age.

The figure showing the geology of the island (Fig. 1) presents six different types of stones. Coralline limestone (Q2) is evidently the most often found stone type, followed by sandy clay soils (M3), Miocene limestone (M2) and recent deposits (Q1). These types of stones may deduce the developing of the soils during time.

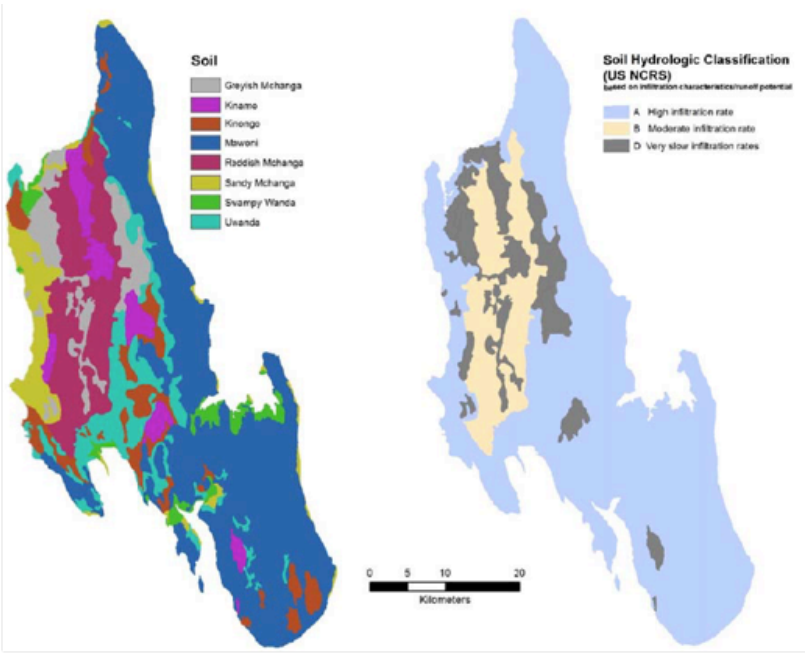

Figure 2: Soil types on Unguja Island. Figure taken from Bron Sikat, 2011 (based on Hettige, (1990)). On the left: distribution of the eight types of soils present on the island (grayish mchanga, kinamo, kinongo, maweni, reddish mchanga, sandy mchanga, swampy wanda and uwanda). On the right: three water infiltration rates (A: high infiltration, B: moderate infiltration, C: very slow infiltration).

Mchanga ("sand" in Swahili) are sandy soils and have high to moderate infiltration rates. Sandy mchanga is built on recent, non-calcareous sediments and partially from greyish to white limestone containing hard siliceous bands (Hettige, 1990). Greyish mchanga soils (ferric and gleyic acrisol) are imperfectly drained and partially anoxic in the lower soil layers and have pH values around 4.5-5.0. Most of the fruit trees are growing on this soils (bananas, citrus, coconut and durian), as well as pineapple, cassava and sweet potato. Reddish mchanga soils (haplic acrisol) are well leaching, have low soluble salt contents and slightly acidic pH (about 5.5), which does not decreases with increasing soil depth. There is an evenly distributed calcium availability and about 1% of organic carbon present. On these soils, the same crops as the greyish mchanga can be produced, and additionally, also clove trees can be planted well. Sandy mchanga (arenosol) are almost pure sandy soils. There are two main sub-groups present, areni-dystric aresonols and ambic arenosols. The first one is composed of a 50 cm loamy sand stratum followed by a uniform sandy clay loam layer, while the second has a more pronounced loamy sand stratum (about 100 cm) (Hettige, 1990).

The Kinamo group derives from clayey parent material and has very restricted drainage flow. They show high cracks in the soil structure, and clumps are sometimes very hard to break. Subgroups following are part of the kinamo group: gleyic cambisols, cambic arenosols, nitisols, eutric and calcic vertisols.

Kinongo soils are mostly built on weathered limestone material and have a high infiltration rate. There are five subgroups of kinongo soils: rhodic ferralsol, calcaric cambisol, chromic cambisol, mollic leptosol and lithic leptosol, In general, they have a pH around 6.4-7.0, an organic carbon content of 2-20 % and medium cation exchange capacity. They are used for the production of different fruit trees (coconut, mango, citrus, banana and sometimes cloves), pineapples, cassava, sweet potatoes, and for arable crops. They differ in clay particle ratios, which give them different cation exchange capacity and moisture ability (Hettige, 1990). There are two particular subgroups that are obvious in higher amounts on Unguja Island. Uwanda (mollic leptosol) is characterised by a reddish colour, high humic contents (organic carbon of about 6.8 %), neutral or slightly alkaline pH (6.5-7.0) and a soil depth of about 30 cm over the porous limestone parent material. It also has a high content of boehimite clay and the rest is results of vermiculite, which is almost the only source of water holding

capacity. These soils are mostly used for open grassland, without any type of intervention. The second soil, Maweni (rendzic and lithic leptosols) encloses black humic clumps, has a high organic carbon content (about 20.3 %), an alkaline pH (about 8) and a typical forestry soil. Sometimes cultivation shifting takes place after cutting and burning the present vegetation. Cassava, banana, papaya, tomatoes and chilli are possible crops for this rotation. Swampy wanda is also part of the kinongo soils, but no further description will be given here.

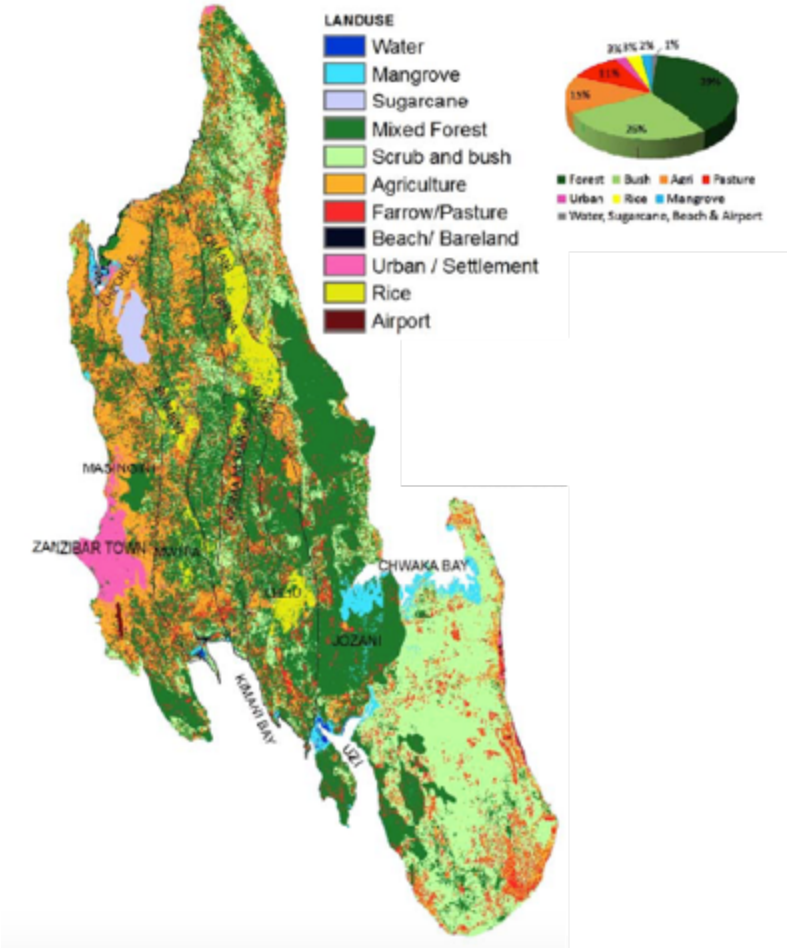

Figure 3: Land use and cover. Figure taken from Bron Sikat, 2011.

The land use and cover are very important factors to define how most of the soils are used and how high the exploitation rate might be. Forest and bushes cover more than 50 % of Unguja Island followed by agriculture with only 15 %. On Unguja island farmers produce root crops (sweet potato, yams, cassava and taro), vegetables

(tomatoes, onions, pepper, chilli, squash and pumpkins), leguminous (pigeon peas and peanuts and groundnuts), cereals (paddy rice, wheat, sorghum and millet and corn) and different fruits (papaya, pineapple, mangoes, bananas, passion fruit and coconut) (Editors of countrySTAT, 2012).

In agricultural practices some external substances are applied on the soil. Unfortunately only the fertilizer amounts and not the types of fertilizers are given by the editors of countrySTAT. It might not be excluded that the most applied fertilizer is urea and only a small part of superphosphate is used (2008). There are no data about pesticides applications.

Different farm types visited

The visited farms where in Makunduchi and one in Bungi. Unfortunately I cannot speak Swahili, which made it very difficult to me to get very technical information but I am very grateful to Apro, who helped me as simultaneous interpreter. The general information and land estimation presented should though give an idea on the agricultural practices.

Figure 4: Main cities on Unguja Island. Figure taken from http://landenverzamelaars.nl/img/kaarten/zanzibar.gif on 28.03.2016

Farmer mkulima wa mbogamboga producing vegetables

The first field visited is from a farmer, mkulima wa mbogambog, producing vegetables. The land was passed on from his father. He has no particular educational background, is married and has two children. He is managing about 0.4 ha of land on its own. At the moment the field is split into two main parts. He does a rotation in which one part is left to rest and on the other part of land he produces pepper, tomato and onions.

He has a water tank of 5'000 L capacity and an irrigation system for half of the cultivated land. The water is supplied by a water pump source, about 50 meters away and this source is also used by other farmers and inhabitants of the village.

He has started to mulch part of the soil used for cultivation (particularly under the pepper plants). There is no other kind of protection of the soil and no shadow. The soil and the crops are thus directly under the strong radiations of the sun.

He has about 10 cows, 10 goats and 20 chickens. All of them are free to walk around the nature during the day, and are then collected before dawn. The excrements produced during the night are collected from the stable and put into a barrel and let resting with water for about three days and then spread over the cultivated land. The manure of the cows is the only fertilizing source he applies to the field.

He only sells the vegetables in the village market, he is not connected to the city market of Zanzibar town.

Water scarcity is what he thinks is the main problem of his cultivation. Even though he has a 5'000 L tank, he cannot fill it up because the water pump pressure is too low. Furthermore, every district of the village is only supplied with water about two hours per day. He usually directly uses the water to irrigate the crops (even though the water arrives during the afternoon, when the sun radiations are still very high).

The idea about mulching the soil was its own. He noticed that with mulching, the soil gets less warm and there is a little less water evaporation.

Picture 1.a: Manure production

1.b: Detail of the irrigation system


Picture 2.a: Tomato production **2.b: Soil on the field**

Association of different families producing vegetables

There is an association between neighbours of 15 people (6 women and 9 men) are managing a part of land. They aggregated the different pieces of land to have a bigger production area and to help each other in the agricultural management. The land used for agriculture is about 1/5 of the land they would actually have available for farming. They also have a 5'000 L capacity water tank. They produce the same type of vegetables as their neighbour, pepper, tomatoes and onions. In November they harvested about 7'000 kg of tomatoes on a parcel of about 0.03 ha and sold their product in Makunduchi and some other villages nearby. At the point of visit, there were still a lot of tomatoes on the plants. If still edible they are eaten by the families cultivating the land or sold to produce tomato sauce concentrate (quantities are though quite low).

Same as for the neighbour farmer, water scarcity and no safe connection to electricity to use the water pump to fill up the water tank are considered the main problems. They cannot fill up the water tank because the pressure of the pump is too weak. They fill up another water tank that has been excavated (no pressure pump needed) that unfortunately has a small capacity. Then the used parcel is watered with cans. In contrast to their neighbour, even though they are an association of families, they do not have the finances to invest in an irrigation system.

They do not use pesticides, but prepare own solutions to fight some insects (mix of onion leafs and chilli fermented in water and then applied on the plants). They do not believe in commercial pesticides and do not have the money to buy them.
The farmers would like to produce other types of vegetables, get variation in the crop rotation, but the local population is not really interested in other crops and they are not able to produce enough vegetables to sell them to the nearby hotels. Another problem that could then probably appear is the lack of storage. They are not able to store big quantities of food.
The money they earn from the harvests is split into the families and spent for the children's education and to invest into the agricultural management.

Hectare managed by different families

In the village next to Makunduchi, Sokoni, there is an area that is cultivated by different farmers. There are some parcels managed by the whole families and others cultivated by women. Every family has its own parcel (area less than 0.1 ha), but they all plant rice before the rain season (well flooded area). Most of the families only practice subsistence farming, but a few also sell their products in the bigger markets in Zanzibar town.
Besides the rice production, every family has a different agricultural management. Some do not produce anything during the rest of the year, while others plant tomatoes, green beans, peanuts or other crops.
Some farmers get some information about new agricultural practices by the consultants working for the ministry of agriculture. They come to the village one day per year and inform the farmers about how to be more efficient in planting a certain crop, which mineral fertilizers to apply and so on. Most of the farmers apply mineral fertilizers that the ministry of agriculture suggests to use, but they would like to have better information about the products they are applying on their own fields. There is a lack of communication between consultants and farmers.

Picture 3.a: soil on the field

3.b: Tomatoes damaged by blossom end rot

Picture 4: Papaya and cassava production

Picture 5: Field used for rice production during December – April, other crops or let to rest for the rest of the year

Farmer managing a banana plantation

In the northern part of Makunduchi a farmer, mkulima wa migomba, is managing a banana plantation on its own. He has no agricultural educational background and bought this land about 4 years ago. The land was used for mango fruit production, but because the prices of mangos on the market were continually decreasing, he decided to switch to banana production. A high concrete fence surrounds the plantation in order to prevent the livestock to damage the trees. He applies manure, which he buys from other farmers.

The farmer bought an irrigation system about one year ago and has its own water pumping system inside the plantation. Part of the water is also distributed to the surrounding private houses.

The farmer gets consultancy by the government regarding crop management. Its production is sold mostly in Zanzibar Town. He is also planning to expand his production by buying some more land.

The irrigation system enables a more precise application of water and it is less time consuming.

The farmer was working in the food industry before as fruit trader between the small villages and Zanzibar Town and he was able to set enough money a side to built a very sophisticated banana plantation. His knowledge about the fruit market situation helped him to have a secure outlet market.

In my opinion, this farmer has a good connection to the islands market and has a successful banana production with enough water availability.

Picture 6: Soil in the banana plantation

Picture 7: Banana plantation

Picture 8: Banana plantation and irrigation system

Governmental fruit tree production site

In Makunduchi there is a governmental fruit tree production area. They grow fruit trees and then sell them to farmers for low prices. At the moment of visit they were growing citrus and mango trees. The soil is from the inner parts of the island, from the forest. There the soil is nutrient and humus richer and enables a stronger and faster growth. In the soil they use they also add some manure.

The production of these trees is based on the latest knowledge of the ministry of agriculture. The workers told me that they collaborate with the state university of Zanzibar. Unfortunately I could not find any department or program in agricultural research.

Picture 9: View of the seedling farm

Picture 10: Grafting of mango trees

Picture 11: Citrus seedlings production and coverage from the sun radiation

Farmer managing a big vegetable plantation

This was just an informal visit to the uncle of my friend Siaji, whom I met during my stay on the island. He has a big vegetable production farm in Bungi, close to Zanzibar University. It is a very advanced agricultural management system. He has several employees from the mainland of Tanzania who are doing all the field works, so my friends' uncle is mostly just managing the area.

Picture 12: Tomato production and overview of a field

He applies different NPK fertilizers and has some problems with a larvae harming the tomato fruit. He is producing different types of tomato species in order to decrease the chance of complete harvest loss. This is the main issue he mentioned.

Discussion and personal considerations

During my stay I only had the chance to visit a few farmers. I was able to get an overview of some of the agricultural practices, but it also made me realise how heterogeneous the level of these farms are. Some are still basic subsistence farms, others already have a good connection to the local market. This is connected to the liquidity of the single farmers. Some can invest in technology, while others highly struggle with their production.

Furthermore, I focused my visit on the southern part of the island, where there is only a small area used for agriculture, compared to the more expanded area in the northwest of Unguja island.

The high interest of the farmers in producing a more extended variety of vegetables and their willingness to connect to the hotels is a field that should be further explored. The variety in the rotation could be beneficial for the soil quality and avoid the possible development of crop diseases. Production contracts could thus be a solution. The hotels would not have to go to Zanzibar town to buy all their products, could sustain the local development and possibly store the products and avoid quality loss. But to enable a production security, the water unavailability has first to be solved.

I spent seven weeks on Unguja island to get a first overview of the farms in Makunduchi because I wanted to give some suggestions in the planning of the teaching subjects in the farmer training school that CAAA is launching in Makunduchi. In my opinion, the students should get an education on several subjects: crop production that they regularly eat in their own homes, but also about new varieties, that are consumed in the hotels; the importance of water management (how to use water in an efficient way); soil management (the importance of soil quality and tools to avoid soil degradation); economical and financial introduction to ensure a good communication between farmers and hotels/tourism.

I really enjoyed working for CAAA and to be part of this project. It gave me a first insight on agriculture in a developing country and the possibility to meet a new culture. I am grateful to have had this chance and would be very interested in continuing in this project.

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