Notes fieldvisit small-scale Jatropha project
ADDP-Fact Foundation

Location: Bilibiza, Bilibiza District, Cabo Delgado
GPS Coordinates ADPP Office (Bilibiza): S12 33.491 E40 16.046
Date: 11 – 17 April 2009
Marc Schut, April 2009



These fieldnotes includes:

1. Project details
2. Meeting with Anna Lerner and Flemming Nielsen
3. Fieldvisit Farmers Clubs Nalia and Ngeue
4. Fieldvisit Farmers Club Ngeue
5. Fieldvisit Farmers Club 1 de Maio
6. Encountered pests, diseases and viruses
7. Major findings and observations
8. Conclusions
9. GPS-coordinates
10. Map
11. References

All photos are taken by Marc Schut

1. Project details:

Project:	Jatropha Oil for Local Development in Mozambique
Subtitle:	Biofuel for Development and Communal Energy Self Supply
Location:	Bilibiza (North) and Chimoio (Central)
Implementation:	ADPP (Mozambique) and Arrakis (the Netherlands)
Starting date:	January 2007 - December 2009
Status:	In execution
Hyperlink:	
Budget:	€700.000 (for 5 years)

With 800,000 sq km and 18 million people, Mozambique has an extremely low level of national development, with a per capita GDP of $237 per year. The current population is approximately 85 percent rural subsistence farmers with little or no education. The United Nations ranked Mozambique as the sixth poorest country in the World (1999), in last position of the 14 SADC countries. The reason why Mozambique was chosen for a pilot project is because of:

- Urgent needs for income generation by the poor farmers;
- Availability of much land;
- Mozambique is for 100% dependent on oil imports;
- Stable government that allows foreign investors to start up businesses in Mozambique, e.g. fled Zimbabwe farmers;
- Good transport roads, from Harare to Beira (harbor);
- Existing partnership with good partners working at the grassroots, ADPP & GAIA Movement, already implementing Jatropha on a small scale.

On behalf of FACT Foundation, an investigation mission of 1 month to Mozambique was made by Jan de Jongh, Arrakis, in January 2006. The developments on Jatropha for bio-fuel production were investigated in four areas: around Bilibiza and Itoculo (North Mozambique) Chimoio & Gorongoza (mid Mozambique). Jacob Zula of GAIA-ADPP was participating in the investigation. Jacob is the national coordinator of Farmers Clubs in Mozambique. A workshop was organized in Chimoio where stakeholders were invited to exchange experiences and to discuss further developments. Some organisations present at the workshop are: ADPP, Caritas, IIAM (Agricultural Research Institute Mozambique), ICRAF (World Agroforestry Center), Environtrade (NGO based in UK), Bio-Oleo (company).

The climate and physical conditions in this country are very good for Jatropha. At several places there are full-grown trees, which were planted by the Portuguese some 20 years ago. ADPP (*Ajuda de Desenvolvimento de Povo para Povo*) has started with small nurseries and plantations in conjunction with its teacher training colleges (EPF) and small farmers. The target group of the project, i.e. the small vulnerable subsistent

farmers, have very little opportunities to generate cash income. There is presently no market for bio-diesel, but an eye-catching initiative is that by Brendon Evans, a local farmer (originated from Zimbabwe) who produces bio-diesel from cotton seed for his tractor. There is no national policy on bio-fuels yet, but there exists an inter-ministerial workgroup.

Bilibiza which is located in the Quirimbas National Park, Cabo Delgado, Mozambique. The park is relatively new – and was designated as such in 2002. To date most emphasis on the development of the park has been on the marine side and the only real tourist developments are on the islands and coast (Ibo, Quirimba, Matemo and on the coast at Guludo, with one bush lodge now under construction at Mipande).

The project will initiate the local production of *Jatropha curcas* seeds and develop a local market of end-users of the oil. The creation of capacity among the local small farmers and technicians is an important component of the project.

The overall objective the project is:
"To build an infrastructure and capacity to enable the autonomous upscaling of the activities after termination of the project. The project will initiate the local production of Jatropha seeds and develop a local market of end-users of the oil. The creation of capacity among the local small farmers and technicians is an important component of the project." (Nielsen, 2007 2)

The project took off to be established in different areas in Mozambique. Trails were established in Sussendenga (Manica province) and Bilibiza (Cabo Delgado). Growing conditions – and related farmer enthousiasm – in Cabo Delgado turned out to be favorable in Cabo Delgado.

At the moment there are 4 smallholders Jatropha projects (including Bilibiza-project) organized through ADDP. ADDP works in all Mozambican provinces except for Gaza, Tete and Inhambane. Reason is that Teacher Training Colleges had not started yet, through which the Farmers Clubs are usually implemented. The Bilibiza-project was the 1st project and is the only one having a research component. The other projects have similar set-up, "planting Jatropha hedges and getting oil."

Location:	*District:*	*Province:*	*# of FC*	*# of Farmers*	*Remarks:*
Bilibiza	Bilibiza	Cabo Delgado	36	1.800	Inside NP
Itoculo	Monapo	Nampula	34	1.700	
Macuse	Namacurra	Zambezia	10	500	
Gorongosa		Sofala	10	500	Inside NP
		Total:	90[1]	4.500	

[1] Total # of Farmers Clubs in Mozambique is 220, so 41% of the Farmers Clubs is involved in the Jatropha project.
Source: Jacob Zulu, National coordinator Farmers Clubs Mozambique, 16-04-2009

2. Meeting with Anna Lerner and Flemming Nielsen

Thursday , 9th of April 2009 (9:00 – 11:00 hr)
Meeting at Mundos, Maputo, Mozambique
Present: Anna Lerner (GTZ-ProBec), Flemming Nielsen (Agricultural Research Consultant Fact Foundation) and Marc Schut (WUR PhD-researcher)

This project is completely funded by Fact-Foundation. Flemming is responsible for the agricultural research part.

Report on pests and plagues in Jatropha, but they made some errors/ mixed up some insects and plagues. The report is already being used 'on the ground' as I saw it in Chimoio.

Flemming on pests: Flee-beetle is probably the most damaging one. In Chimoio you have the 'Yellow Flee-beetle' which is the most damaging one. I haven't seen it yet in Cabo Delgado, but this might be spreading.

In India a lot of Jatropha plants (60-70%) are virus-infected. This might spread towards Africa.

Flemming: "Pest research is key"

"The main pest appears to be the Golden Flea beetle (*Aphthona* spp.) that has also been reported as a pest on Jatropha in Zimbabwe and Kenya. Only in the younger plants did we see Flea beetle damage. The total destruction of Jatropha plots that yellow coloured Flea Beetles have caused in Manica Province has not been observed in Cabo Delgado." "On the old Jatropha plants (15+ years) large numbers of Rainbow Shield Bug (*Calidea dregii*) was observed. They are known as a pest of cotton but also breeds on sunflower, sorghum, tobacco, castor oil and other crops. They feed by piercing young seeds, causing seed shedding. We observed them sitting on green and yellow seeds of Jatropha curcas as well as inside dried seed pods. Further studies will be required to establish what damage they cause in Jatropha" (Nielsen, 2007 3).

You have the African Mosaic Virus which can spread by using the same tools in e.g. Cassava and Jatropha. There is so much uncertainty, because few Jatropha projects are older than 8 years.

Fact Foundation is working on a Jatropha Handbook. This is an updated version of the first version which was published in 2006

A lot of knowledge at the moment is non-research based. It is practitioner-based. That explains partly why – worldwide – a lot of people are doing the same research (e.g. how to put the seeds in the seed-bags; horizontally or vertically). “It will take a number of years before formal science will be the main provider of knowledge”.

Flemming explained that the majority of “soils in Chimoio are too heavy”; there are “no optimal conditions”

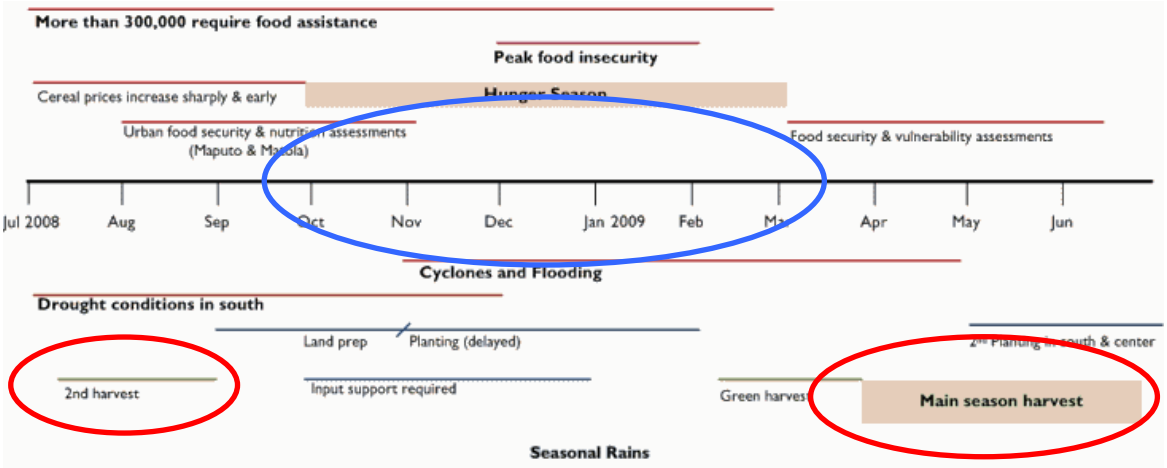
On pressing the Jatropha seeds: The Binga-press is problematic because it gets stuck using Jatropha-seeds. The Director Biofuels Association of Zambia - Tyson Bruno Chisambo claimed during the IIR-conference that: *“The Binga-press is the best thing that has ever happened”*

Flemming told about Sun Biofuels being in trouble, because though they formally applied for land, they started planting on an old Tabacco Farm.

The project in Bilibiza is not worried about sustainability criteria, because they are working on a small-scale. This might change under the current growing attention of the project. Flemming also told that they discovered a big oil field just north of Bilibiza, so that might have consequences for the project in Bilibiza as farmers might go up there to work.

Labor Calendar:

Jatropha is favorable over other biodiesel-producing crops such as sunflower, because it can be harvested outside of the traditional harvesting season (April – June) (see figure)



(USAID, 2009)

Harvest when Yellow, oil content drops a little when you leave them on the plant (the seeds will not fall off), but this makes Jatropha more flexible in terms of when to invest labor in it.
Pruning should be done in the dry season (main thing that cost labor)
Weeding mainly during first year (depends on the growth)

Another option proposed by Anna Lerner is the integration of Moringa Trees in sustainable livelihood systems. Moringa trees contribute to food security (eat the leaves like salad, crunched leaves are used to feed babies/ children) and can be used to clean drinking water.

At the workshop harvest time was discussed with farmers. They told that they currently harvest Jatropha throughout the year and that this regime suits them better than a short intensive harvest season (Nielsen, 2007 3).

Flemming: “The unique thing about the Bilibiza project is that decisions and changes were based on research.”

About the Mozambican Biofuels Strategy: The strategy is approved, but the document is not finished yet. However it made it to the World Press. Should contain blending targets, selected crops, tax issues

Zoning exercise:

- Lot of interest/ speculation
- Government got nervous
- Let us zone the country

www.jatrophabook.com

Friday 10th of April 2009: Traveling from Maputo to Pemba
Saturday 11th of April 2009: Traveling from Pemba to Bilibiza
Sunday 12th of April 2009: Office work in Bilibiza

3. Fieldvisit Farmers Clubs Nalia and Ngeue

Monday, 13th of April 2009
Fieldvisit Farmers Clubs Nalia and Ngeue
Present: Bashia (ADPP extension officer), Flemming Nielsen (Agricultural Research Consultant Fact Foundation) and Marc Schut (WUR PhD-researcher)

Chronological summary:

We took off at 06:00 in the morning to go from the ADDP-complex in Bilibiza to Pemba. On our way to Pemba Bashia talked about the progress of the project. He explained that someone promised the farmers 5MT per kg of Jatropha Seeds, which is on the high side taking into account that you need 4 kg (20MT) to make one liter of biodiesel. To be competitive with conventional fuels (one of the project's objectives) the price probably has to be lowered, taking into account that the 20MT do not cover processing and transportation costs of the fuels. 2,5MT per kg is probably more reasonable.

The project is reaching 1800 farmers now, spread over 36 Farmers Clubs. The original project goal was working with 25 Farmers Clubs. Total # of Farmers Clubs in Mozambique is 220, spread over most of the Mozambican provinces (except for Gaza, Inhambane and Zambezia). Bashia explained that more and more farmers want to join the network to grow Jatropha. The original proposal for the project was focusing on Manica province, where trials had been established near the AAIM-research station in Sussendenga. However, growing conditions in Manica were not optimal, because growing conditions were quite hard (heavy soils), and the Jatropha had a lot of pests (amongst other the extremely harmful Yellow Flee Beetle). Farmers saw the pest problems and were not so interested in producing Jatropha anymore. They rather focused on cash crops for the local market and larger market of Chimoio, which were relatively easy to reach due to good infrastructure in the area. Jatropha is a low value crop (2,5MT per kg), so then it becomes more attractive to grow tomatoes and sell them on the local market. In the area contacts had been established with ADPP who also runs Farmers Clubs in the Manica Province. Conditions to get the project started were though difficult. The trials in Sussendenga still exist, however largely overgrown by weeds because of lack of management.

Through Jan de Jongh of Fact Foundation they got into contact with ADPP in Cabo Delgado, situated in an old Soviet military training centre in Bilibiza, some two hours from Pemba. By that time they had the assumption that the problems they had been facing in Manica would be less in Cabo Delgado. They kicked-off the project and established trails both on the ADPP-complex as well as in Farmer's fields. Seeds were collected from different parts of the country. The initial idea was planting Jatropha on plots, but farmers turned out to prefer hedges around the plots where they grow food

crops. This eventually proved to be successful as hedges (1) keep smaller animals out of the plots while not being eaten (toxicity of Jatropha), (2) Jatropha hedges do not compete with food production and (3) hedges form a natural intercropping system which also prevent the spreading of pests. Moreover, planting hedges reduces the risk for small farmers, for whom Jatropha was (and in many cases still is) a blackbox with regard to the knowledge they have about the plant. The smallholder farmers involved in the projects just could not afford to take the risk of scarifying food production for Jatropha; they rather diversify and spread the risk.

The project uses no fertilizer and/or pesticides, also because the farmers just cannot afford it. However they applied pesticides once at Cassave which was planted only 1,5 meters from Jatropha to prevent a pest spreading from Cassave to Jatropha. Although pest problems within the project have so far been low and manageable, there is a 'big concern' for huge pest outbreak. You often see that it takes some time for pests to become active in plants. During the first years you hardly see any problems, but after pressure has been build up, new pests might become a potential threat.

After we got supplies in Pemba, we went to Nalia, where we saw extremely good Jatropha planted in February 2008. The Jatropha had lots of fruits, and Bashia explained that the farmers already sold 200kg in February 2009. They did not pay the farmers so far. As comparison Bashia explained that Sunflower is sold for 25MT per kg and Sesame for 25 MT per kg. They also planted a Jatropha hedge in January 2009, which also looked very good. Bashia explained that farmers were first quite reserved towards starting to plant Jatropha. This had largely to do with government stimulation to grow Jatropha in Mozambique's rural area, which was not followed up by any kind of collection or market system. Their initial reaction was: "We won't grow it anymore!" This definitely shows the trust-issues which I have experienced during different field-visits in other parts of the country. In Nalia we also witnessed a 'Rope Pump' which is also provided by FACT. The pump has a low-technology design, using rope, a pipe and small rubber rings to pump up the water. The first pump was provided for free to the Farmers Club, if any individual is interested they can purchase it for 2500MT which is around US$50.

We also discussed the opportunity to use a press for more than one purpose, e.g. pressing sesame-seeds and Jatropha seeds, which would increase the efficiency of the pump. This should be no problem as long as the pump is cleaned properly. Then it is absolutely no problem.

After the visit we continued to Ngeue where the project had established two Jatropha trails. The first trail was established in 2007. The plants looked good, but we saw termites (eating the living parts of the plants) and Golden Flee Beetle in the Jatropha. The plants which were planted in 2008 were really suffering, most of the plants dead or in a very poor state. We saw African Striker growing which is an indicator species for very poor soils. The farmers acknowledged that the area was intensively cultivated with Maize and Cassava before the Jatropha was planted. This particular example puts question marks with the assumption that Jatropha can be grown on very poor, even exhausted soils. Taking into account the number of dead plants and limited growth this example indicates that soil has impact on the growth and development of the plant. It will take much longer before the plants start giving fruits and yields will be considerable lower on these soils. We will return tomorrow to conduct further interviews with the farmers and work in the field.

On our way back to the ADPP-complex we made a stop in N-Tessa, which is the village before Bilibiza. There we saw some Jatropha plants which were overgrown by weeds. Although the area was weeded, we could observe the plants had almost no leaves, but the leaves were starting to grow again. The plants survived, but lack of sunlight and space to grow has impact on the plants' development. From this I conclude that Jatropha needs proper management and weed-control, especially in the first year(s) (depending on the growth-speed).

Bashia explained about the oil-fields they discovered just North of Bilibiza towards the Tanzanian border. He said they are drilling in different places (both in sea and inland), probably to check-out the size of the oil field. It is uncertain how these developments will influence the region as it might provide employment for the local communities. Bashia also explained that he was huge, old Jatropha trees in the area and that people asked if Jatropha-seeds could be sold to the ADPP-project.

At 15.30 we returned to the ADPP-complex where we started writing fieldnotes and analyzed our data.

Livelihood typology:

On our way we concluded that people hardly own cattle in this area, as well as in other parts of Mozambique. There is a lot of Tsetse-fly (a.k.a. sleeping sickness) in Mozambique and no effective disease control programme, which makes it very risky for farmers to invest in cattle. There used to be a government subsidized programme for disease control, which drastically reduced Tsetse in Mozambique. But after the government decided that farmers should pay for treatment themselves, the livestock-system collapsed. Nevertheless livestock keeping could be a logical next step in development, as animal traction makes it possible to cultivate larger pieces of land.

Farmers live in typically square houses mainly constructed from wooden frame, clay and straw roofs, some have iron roofs. Main crops are Cassave, Maize, beans. Bananas and groundnut are sold along the roads.

4. Fieldvisit Farmers Club Ngeue

Monday, 14th of April 2009
Present: Bashia (ADPP extension officer), Flemming Nielsen (Agricultural Research Consultant Fact Foundation), Hendersson (Manager Teacher Training College ADDP) and Marc Schut (WUR PhD-researcher)

Chronological summary:

We left the ADPP-complex around 07.30. Change of plans was that Jacob Zulu (National Coordinator Farmers Clubs) is arriving in Pemba today, so we again have to drive to Pemba to pick him up. Before leaving I witnessed that at 07.00 o'clock all students stood in line, that the flag was raised and the national anthem was sung by all present. In a way it reminded me about a military regime (socialist/ communist) with strict, but clear rules for everybody. Other example of this is that ADPP-auditors come to Bilibiza every two weeks to control the bookkeeping. A regulatory regime. In a sense this might be one of the success factors of this Jatropha-project. The ADPP institutional space is to a certain extent self-created and self-regulatory, ánd the institutional space is – besides bio-physical, economic and legal space – very determining for any development.

Around 8.30 we arrived in Ngeue, where the farmers of the Clube de Camponeses were already waiting for us. We went directly to the field and sat under a big Mango-

tree. We were told that 3 of the Farmers Clubs have female presidents now. There used to be men, but they were not re-elected. Flemming had prepared a participatory exercise, which Bashia was leading, also because of the (local) language barrier. Farmers explained that they see Jatropha mainly as crop they can earn some money from. Other crops are for food security. On Bashia's question "How do you see this tree?" People answered that they "Could see it as a tree, but also as something they could make oil and soap from, but we do not have the machine." They added: "If we would have the machine and training we would not sell the seeds, but make soap and oil and sell that!"

Hand Press	1 liter	1 hour
Small Motor Press	60 liter	1 hour

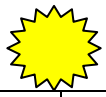
They discussed pricing with the farmers. Petrol in the area costs 40MT, which is very high, but explainable taking transportation costs into account. They would sell their biodiesel for 35MT to make it more attractive than conventional petrol. "Others can buy from us and sell it for 40MT." Bahia explained that for every liter you need 4 kg of Jatropha seeds. To prepare the discussion on the pricing of Jatropha they took the practical example of a carpenter making and selling a door (there was a carpenter in the group). You need: 150 for wood, 145 for glue, nails, etc, it is four days of work (4x3 meals = 680) which would bring the total price to 975MT. Bashia asked the carpenter for how much he normally sells a door. He replied: "500MT, ask the people here…" They all had to laugh, but it symbolized to a certain degree how people think about calculating their cost-price. This exercise was followed by talking about Jatropha. When Bashia asked about what price they would like to receive per kg, someone came up with 30MT. They did the below exercise:

1kg	*4kg (= 1 liter)*	*Conclusion*
30	120	Too high
15	60	Too high
7,5	30	Too high
5	20	Could work
2,5	10	Could work

Some farmers even said that they would sell for 1MT, as long as they would earn some cash income. General idea was that they wanted to be cheaper as the normal price, so other people will come to buy our fuel.
Taking the local fuel prices of 40MT (higher as result of isolated area) as point of departure was actually an eye-opener. By focusing on the local market farmers in isolated areas could actually earn a bit more, because they don't have to compete with national or global oil prices. Their isolated position might benefit them in a way. The project initially thought about a maximum selling price of 20MT per liter, but this can simply be higher in some parts of Mozambique. Later in the car Bashia was quite proud that he had been able to lower the price so much, ánd that the farmers still agreed with that.

It would be very interesting to learn more about the amount of labor input the production of 1kg of Jatropha needs.

The next step was creating a labor calendar with the farmers, to learn more about where the labor peaks are. They drew a calendar divided in raining and dry season. Harvesting and transporting the fruits is considered the main work, but according to the farmers weeding does take similar time. (Compare with above crop calendar)

<table>
<tr><td colspan="3">  </td><td colspan="6">  </td><td colspan="2">  </td></tr>
<tr><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>June</td><td>July</td><td>Aug</td><td>Sept</td><td>Oct</td><td>Nov</td><td>Dec</td></tr>
<tr><td></td><td>1st Jatropha harvest</td><td></td><td></td><td></td><td></td><td colspan="3">Prepare fields</td><td>2nd Jatropha harvest</td><td colspan="2">Some Jatropha weed control</td></tr>
<tr><td colspan="2">Planting food crops</td><td></td><td></td><td colspan="2"></td><td></td><td></td><td></td><td colspan="3">Planting food crops</td></tr>
<tr><td colspan="2">Weeding</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">Weeding</td></tr>
<tr><td></td><td></td><td></td><td colspan="3">1st main harvest season</td><td colspan="2">Optional 2nd harvest</td><td></td><td colspan="3"></td></tr>
</table>

Flemming added that: "The fruits can be left on the trees, there is no absolute need to pick them in February. They will become yellow, brown and eventually black… but they will stay on the tree. You can pick them also at another stage when you have more time. Just do not pick them when they are green!"

People were also asked what they earn is they get hired in as laborers. This question was very difficult to answer, as this hardly ever happens here. They came at around 30MT per day of work. We concluded that people in this region are not used to making money-related-decisions. They were even willing to sell their Jatropha for 1MT per kg.

After the participatory exercise we made a group picture. Flemming promised to bring it next time! After the group broke up, Flemming and Hendersson put coloured labels on the trails. We discussed some methodological issues and took off to Pemba to pick up Jacob. There we waited for approximately 4 hours at the BIM-bank in Pemba because of long waiting lines (Jacob had to arrange some financial issues). This is probably also the reality where the extensionists and other project members have to deal with on a daily basis; plans change all the time! ADPP created their own world till a certain degree, but you cannot escape from the bigger system.

5. Fieldvisit Farmers Club 1 de Maio

Wednesday, 15th of April 2009
Present: Bashia (ADPP extension officer), Flemming Nielsen (Agricultural Research Consultant Fact Foundation) and Marc Schut (WUR PhD-researcher)

Chronological summary:

This morning – after the normal waiting – we took off for fieldwork in 1 de Maio, a village south-west of Bilibiza. When we arrived we first took a look at the former

nursery, which was waterlocked because of the rains. There are two rope-pumps in the nursery. Flemming explained that this is quite amazing as Jatropha does not like 'wet feet.' The plants in the trails – like in Ngeue – were not so big (30-50 cm) and the leaves were a bit pale, which could indicate a lack of nitrogen. In the farmers field we also spotted African Striker, indicator plant for poor soils.

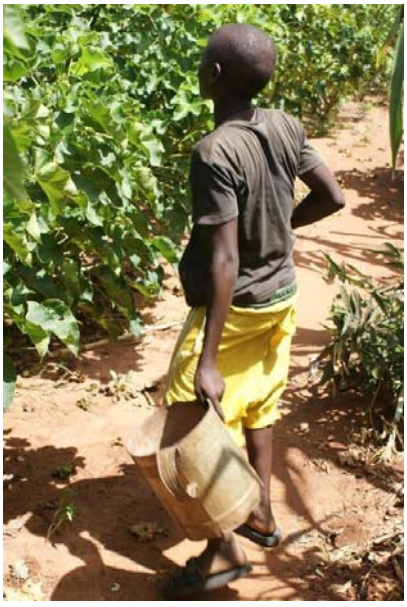
When the group of farmers (this time all men) had gathered we drove to one of the farmers plots (3.75 ha). There Jatropha was planted as hedges. We first took a look at the plants. There were some cases of mildew and we saw a plant completely cut-off by termites. The general condition of the plants was good. We intended to do three experiments with the farmers; (1) a fruit-picking game to get an idea about the kg per person per hour which one could harvest, (2) cropping calendar – other version than yesterday, and (3) a wealth ranking exercise with the president of the *Clube de Componeses*; also the big farmer owning the 3,75 ha. Local fuel prices are around (a stunning) 50MT.

The first time two farmers were asked to pick as many seeds as possible within 15 minutes. They took the seeds out of the fruits while picking them which were quite

remarkable. The fruit-shells therefore stayed close to the Jatropha plants. They put the seeds in their pockets. After 15 minutes they had collected 1.570 kg of seeds.
Then they were asked to harvest as many fruits as possible in 15 minutes and then get the seeds out after collection. They harvested using a sack and a bucket. All the fruits were centrally cracked and the seeds were taken out, which took them an extra 26 minutes. The result was 2.457 kg of seeds.

Experiment	*Method:*	*Time:*	*# of people*	*Kg*	*Type*	*Jatropha*
1	Pick	15 min	2	1.570	Seeds	Hedges
2	Pick	15 min	2	?	Fruits	
2	Peel	26 min	2	2.457	Seeds	

So experiment 1 shows that one farmer can harvest 3.14 kg per hour if they take the seeds directly from the fruits.



Experiment 2 shows that one farmer can harvest 1.80 kg per hour if they peel the fruits after harvesting. This is very strange because you would expect that peeling the fruits after getting them of the trees would be far more efficient. This last experiment has the advantage of having the shells at a central point, which would make processing a lot easier.

An average of the two experiments shows that harvesting around 2.5 kg of seeds per hour per person should be possible. This would mean around 20 kg of seeds per person per day would be realistic. People earn around 30MT per day, so that would be 1,52MT per kg. 1 Liter of biodiesel needs 4 kg of seeds.
Another point of attention would be who do the harvesting of the fruits normally. There is little known about gender-issues in the Jatropha harvesting so far.

Experiment 1	3.140	kg/person/hour				
Experiment 2	1.798	kg/person/hour				
			Costs per kg:		Costs for 1 Liter	
Experiment 1	25.120	kg/person/day	1.19	MT	4.78	MT
Experiment 2	14.382	kg/person/day	2.09	MT	8.34	MT
Average:	19.751	kg/person/day	1.52	MT	6.08	MT

2nd Exercise we did with the farmers was making a cropping calendar for their normal crops (grey rows) ánd for their activities with Jatropha (white rows). We used 50 and 25 seeds to devide. I have multiplied these with resp. 2 and 4 to get them to 100%.

Jan	*Feb*	*Mar*	*Apr*	*May*	*June*	*July*	*Aug*	*Sept*	*Oct*	*Nov*	*Dec*
++	++	++	+	+	+	+	++	++	+	+	+++
10	10	8	6	6	6	6	10	10	8	8	12
W	W	W	Harvesting season								W
++	+++	+++	+++	+	+	+	+	+	+	+	++
W	Harvest Jatropha		Cutting/ pruning								W
12	16	16	16	4	4	4	4	4	4	4	12

W = Weeding (main labor consuming activity)

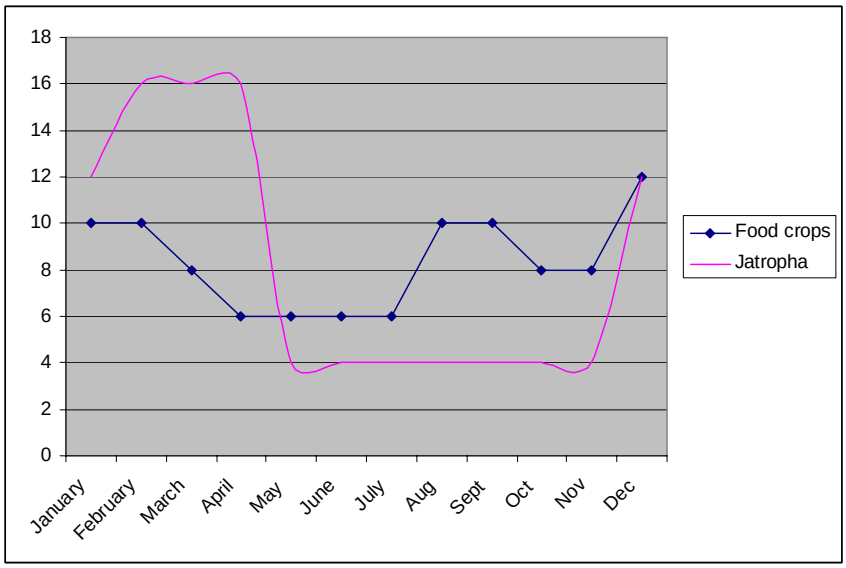


Figure takes total labor input as 100 units (100%) for one year.

Third activity, the wealth ranking exercise with the president of the Clube was cancelled, because the community has more than 350 households, which would become very time consuming.

We did label the trails with different colors and left afterwards.

Other issue is that people have two places to stay in 1 de Maio. This has to do with the season and protection of the plots from wild animals. In the dry season people will live close to their field because they have to protect their crops from wild animals such as Elephants and Baboons, who come to take the crops. They do surveillance, make fires and play the drum to keep the animals to a safe distance. It explains the large number of empty, abandoned houses we saw along side the road. All people were now living

6. Encountered pests, diseases and viruses during field visits:

	Problem: Rainbow Shield Bug (*Calidea dregii*) Date: 11-04-2009 Location: ADDP complex Bilibiza GPS: S12 33.582 E40 16.101 Remarks: Can transfer viruses
	Problem: ? Date: 13-04-2009 Location: Nalia Jatropha trails GPS: S13 05.629 E40 17.113 Remarks:
	Problem: Termites eat the Jatropha, not stopped by toxicity of the plant. Date: 13-04-2009 Location: Ngeue trails GPS: S12 51.816 E39 56.980 Remarks:
	Problem: Golden flee beetle (*Aphthona* spp.) Date: 13-04-2009 Locations: Ngeue and ADPP Trails GPS: S12 51.816 E39 56.980 (Ngeue) and S12 33.582 E40 16.101 (Bilibiza) Remarks:

	Problem: Exhausted soils/ shortage of nutrients Date: 13-04-2009 Location: Ngeue Jatropha trails, 1 de Maio Jatropha trails GPS: S12 51.816 E39 56.980 (Ngeue) and S12 28.003 E39 52.411 (1 de Maio) Remarks: African Striker (see box) which is an indicator species for poor soils.
	Problem: Lack of weed management Date: 13-04-2009 Location: N-Tessa GPS: S12 30.209 E40 10.328 Remarks: Jatropha was overgrown by weed. The plant survived, leaves are starting to grow again.
	Problem: Mildew Date: 15-04-2009 Location: 1 De Maio (hedge) GPS: S12 28.816 E39 52.991 Remarks: Plant was full with Mildew, on fruits, branches, everywhere.
	Problem: Termites Date: 15-04-2009 Location: 1 de Maio (hedge) GPS: S12 28.816 E39 52.991 Remarks: Plant totally broke off, plant was already quite big and well developed

7. Major findings and observations:

- Heterogeneous development and growth of the Jatropha-plants, which seems to correlate with;
  - Soil fertility (availability of nutrients like nitrogen)
  - Water availability (drought, but also water locking)
  - Good Agricultural Management (labor inputs in weeding),
- Soil fertility, water availability and agricultural management has impact on the grow speed, overall development of the plant (# of branches), and subsequently has impact on how fast it will give fruit and the # of fruits.
- Different types of pests and viruses were observed
- Project is using minimal external inputs
- Pests and viruses may lead to nature-controlled pruning
- Institutional structure ADPP…
- Sustainability criteria hardly respect the contextual conditions and dynamics of small scale projects, where different boundaries and economies of scale are present.

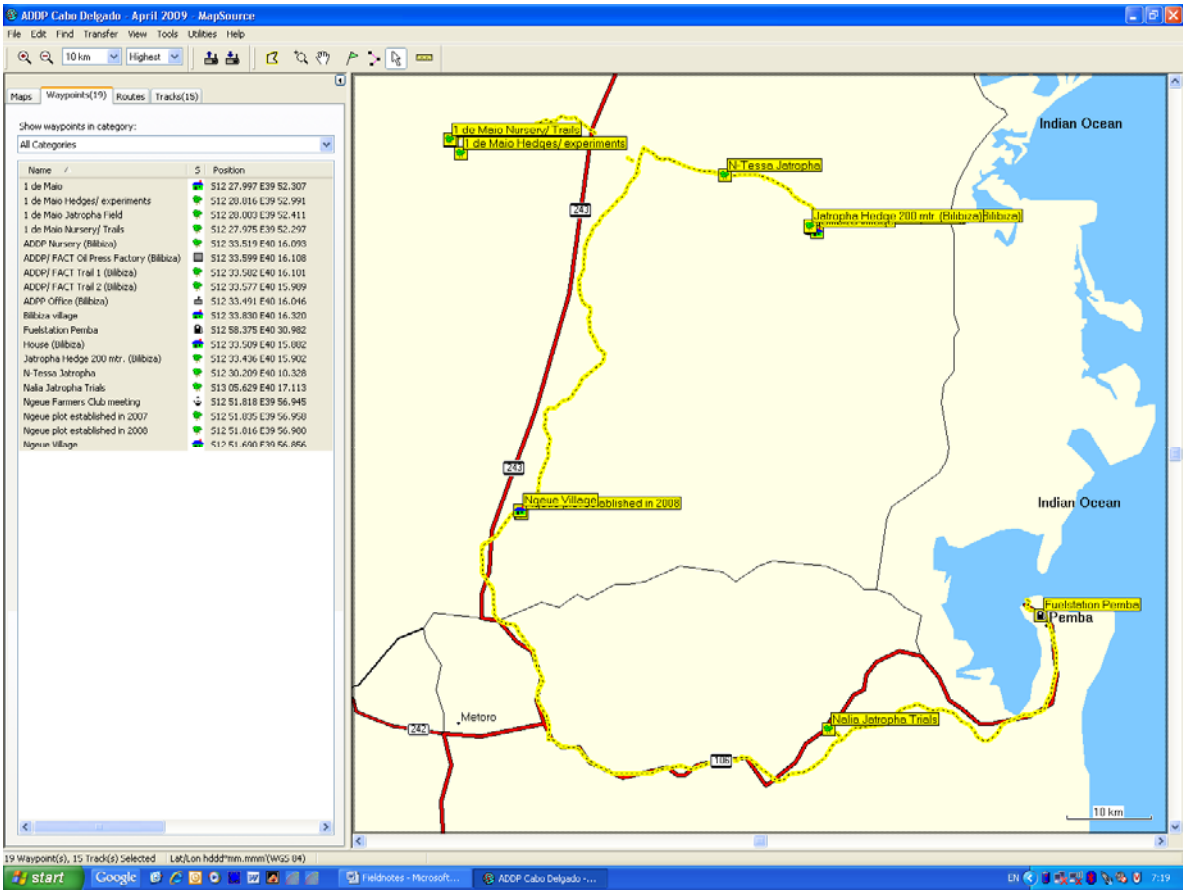
8. Conclusions:

To be written…

9. GPS coordinates:

Fuelstation Pemba	S12 58.375	E40 30.982
Nalia Jatropha Trials	S13 05.629	E40 17.113
Ngeue Village	S12 51.690	E39 56.856
Ngeue plot established in 2007	S12 51.835	E39 56.958
Ngeue plot established in 2008	S12 51.816	E39 56.980
N-Tessa Jatropha	S12 30.209	E40 10.328
ADDP Nursery (Bilibiza)	S12 33.519	E40 16.093
ADDP/ FACT Oil Press Factory (Bilibiza)	S12 33.599	E40 16.108
ADDP/ FACT Trail 1 (Bilibiza)	S12 33.582	E40 16.101
ADDP/ FACT Trail 2 (Bilibiza)	S12 33.577	E40 15.989
ADPP Office (Bilibiza)	S12 33.491	E40 16.046
Jatropha Hedge 200 mtr. (Bilibiza)	S12 33.436	E40 15.902
House (ADPP-Bilibiza)	S12 33.509	E40 15.882
Bilibiza village	S12 33.830	E40 16.320
1 de Maio village	S12 27.997	E39 52.307
1 de Maio Hedges/ experiments	S12 28.816	E39 52.991
1 de Maio Jatropha Field	S12 28.003	E39 52.411
1 de Maio Nursery/ Trails	S12 27.975	E39 52.297

10. Map:



11. References:

Nielsen, F. (2007). Jatropha oil for local development in Mozambique; "Biofuel for development and Communal Energy Self-Supply" Reporting period: January 2007 - July 2007. 4.

USAID (2009). "Seasonal Calendar and Critical Events Timeline." Retrieved 12-04-2009, from http://www.fews.net/pages/timelineview.aspx?gb=mz&tln=en&l=en.