

**FNResearch Progress Report No. 1, 2007**

**Jatropha by FNResearch**

**Project: “Jatropha oil for local development in Mozambique”**

**Sub-titel: “Biofuel for development and Communal Energy Self-Supply”**

**Reporting period: January 2007 – July 2007**

**Author: Flemming Nielsen**

## Introduction

This is the first progress report for the research component of the project "Jatropha oil for local development in Mozambique".

A broad team of researchers from the national agricultural research system (IIAM) and Eduardo Mondlane universitetet (UEM) has been assembled. The team met at a workshop in July in Chimoio to elaborate proposals for the different components.

For the on-station variety trials two hectares of land was prepared in Mandong research forest outside Sussundenga. Jatropha seeds were obtained from Guatemala, Tanzania and two collections in Mozambique, namely Bilibize and Gorongosa. The seeds were planted at the research nursery outside Sussundenga. However, at the time seedlings were ready it was too far into the dry season to warrant transplanting the seedlings. In the nursery a scientific experiment was undertaken with various seed treatments to increase germination and growth rate. The result was that un-treated seeds performed best which is welcome news since it makes it easier for farmers to manage.

The on-farm research was hampered by the onset of the dry season. However, research protocols have been prepared for the coming season.

A reference list with more than 400 entries was prepared in bibtext format and shared among the researchers. Electronic and photocopies of important articles has been obtained.

A number of activities were undertaken to communicate present knowledge:

1. One field visit to Cabo Delgado included a training workshop for farmers;
2. The results from the nursery trial with seed treatment was published nationally in a IIAM newsletter;
3. A workshop was held in Chimoio where the Jatropha research team exchange knowledge and experience with farmers, extension workers and NGOs.
4. A website has been established for exchanging knowledge on Jatropha within Mozambique. Some material is confidential, not for public distribution or copyrighted so the site is currently only accessible with a password that has been shared with major stakeholders in Jatropha in Mozambique.
5. A poster about Jatropha research in Mozambique and about the major pest problems we have was presented at the FACT Seminar: "Jatropha curcas, Agronomy and Genetics" in Wageningen 26-28 March 2007.

Field observations were done on pests and diseases in nurseries and farmers' fields. A number of pests were identified but the most severe, a flea beetle could not be identified with certainty. Samples were consequently sent to Wageningen University for identification. Results have not been received yet.

It was organised that a student from UEM will do her thesis work on pests in Jatropha. Collection of field data has started.

## Project Objective

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."

## Contractual Assignment for FNResearch

To set up research which lead to the following expected main results: Knowledge acquired of:

- a. Most efficient jatropha varieties, cultivation of these;
- b. The possibility of Jatropha acting as host for various agricultural pest organisms;
- c. Combat of these with natural pesticides known

## Progress

### General Activities

I was invited for conference on Jatropha in Holland from 26<sup>th</sup> to 28<sup>th</sup> March together with a Jacob Zulu who is active in the development component of this project in Manica Province. Travel and accommodation costs were covered by the Dutch FACT foundation. I stayed two days more to participate in a planning meeting for the Mozambican Jatropha program and to do literature searches. I managed to obtain about 30 central scientific articles that are essential for our research in Mozambique.

In April the first payment of EUR 10,000 was received from FACT Foundation in the Netherlands. We also received a CD with all papers submitted to the FACT Seminar 2007 in Wageningen.

On 14<sup>th</sup> April a combined inception meeting and monitoring visit took place in Manica. HIVOS is in charge of monitoring our Jatropha research activities. For logistical reasons it has been decided that HIVOS Zimbabwe will be responsible for the regular monitoring. Since this was the first monitoring visit Harrie Oppenoorth from HIVOS- Netherlands participated too. The program included a visit to the Mandong research site and Sussundenga Research Station. I organised the visit and prepared a presentation of the progress and problems we are facing. The participants were:

- Mr. Harrie Oppenoorth, HIVOS, Netherlands
- Mrs. Soneni Ncube, HIVOS, Zimbabwe
- Mrs. Felicity Dennis, project leader project of ADPP, based at EPF-ADPP in Bilibiza
- Mr. Ernesto, technical project leader of ADPP, based at EPF-ADPP in Bilibiza
- Dr. Flemming Nielsen, IIAM, Mozambique
- Mr. Christian Fenger, GAIA-Movement, Switzerland
- Mr. Jacob Zulu, GAIA-Movement (EPF-ADPP), Chimoio
- Mr. Jan de Jongh, FACT Foundation (Arrakis), Netherlands

A report about the meeting has been compiled and is available on the FACT Foundation website.

On 4<sup>th</sup> July a workshop was held in Chimoio for the Jatropha research team. It was focused on elaborating research protocols and finalising budgets. The following day the workshop was opened for the public. Representatives from the extension service, private farmers and NGOs participated.

Collaboration was agreed in a number of areas including:

1. Farmers will participate in variety trials
2. IIAM will establish contact points where *Jatropha* plant material affected by pests and diseases can be handed in for analysis.
3. IIAM will undertake a national survey of established *jatropha* plots.

#### Reference List

A reference list of literature on *Jatropha* was made in standard Bibtext format using Jabref. It contains more than 400 entries and has been shared among the involved researchers. Electronic and photocopies have been obtained of major documents.

#### Field Visit to Cabo Delgado

Together with Jacob Zulu I visited the research & development sites in Cabo Delgado in May. It was the end of the rainy season with occasional showers still occurring.

A workshop was held with representatives of farmers groups that have already planted some *Jatropha*. Field visits took place South-West of Bilibize and to the West, inside the national reserve.

The many *Jatropha curcas* plants that have been planted over the last year are growing well but growth is very uneven between and within plots. This is common and probably related to the genetic diversity of the seeds. Growth also appears to be slower than in Manica Province but sampling and measurements will be needed to confirm this.

Seedlings from nurseries as well as direct seeding had been used. Many farmers did not know what planting distance to use so it varied significantly. Row inter-cropping with sesame (*Sesamum indicum*) was common as was boundary planting. At several locations water logging had resulted in die back. The ground water was at many places within a meter of the soil surface and waterlogging is common during the rainy season. *Jatropha* is known to be highly sensitive to water logging so it is important that farmers are made aware of this fact when choosing planting sites. This issue was emphasised during the workshop.

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.

Farmers were encouraged to intercrop with nitrogen fixing crops (legumes) because *Jatropha* is known to respond well to extra nitrogen (and phosphorous).

Due to the big genetic variation in *Jatropha* farmers were encouraged to be careful in their selection of seeds for propagation by only using seeds from the best performing plants. Bulk harvesting of *Jatropha* plots should therefore be avoided if the seeds are to be used for propagation. Pest damage was common but not severe. 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. The *Jatropha* plants we observed were either less than two years old or more than fifteen years old. Only in the younger plants did we see Flea beetle damage. I got the impression that Flea beetle damage was more severe in areas where the vegetation suggested low soil fertility. More investigation is required to test this hypothesis but if true we may have to focus on soil fertility instead of organic pesticides etc.

The total destruction of *Jatropha* plots that yellow coloured Flea Beetles have caused in Manica Province has not been observed in Cabo Delgado.

A green larva was also observed a few times on damaged leaves of young plants together with spots of white spin. It appears to do less damage than the Flea Beetles.

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*. In cotton the pesticide Permethrin is used to kill Green Shield Bug.

A full trip report with photos of pests was produced.

#### Field Visit to Elaion Africa Ltd.

On 20<sup>th</sup> June I visited Markus Speiser who is establishing a *Jatropha* farm in Sofala Province. Elaion Africa has obtained a lease for 1000 ha and is currently setting up a 200 ha trial plantation. At the time of the visit 20 ha had been established from seeds obtained in Zimbabwe. Attack by the Golden Flea beetle (*Aphthona* spp.) were observed to have stunted some plants. The nursery was unusual in that it had no shade. Markus Speiser explained that trials had convinced him that shade is not needed for *Jatropha* seedlings. This is an interesting observation because it will make nursery establishment easier and cheaper.

We exchanged seeds. We will include the seeds from Zimbabwe in our variety trial at Mandongwe and Markus Speiser will test our seeds from Guatemala.

Elaion has calculated a production price of 500 EUR/t of dry seeds. They expect break-even after four years.

#### Objective 1: Most efficient *jatropha* varieties, cultivation of these

Procurement of seeds turned out to be more difficult than anticipated. More than 30 potential suppliers were identified but only the following seeds were available during the period covered in this report:

1. *Jatropha curcas* from Diligent, Tanzania obtained by FACT;
2. *Jatropha curcas* from Oregon, Guatemala obtained by FACT;
3. *Jatropha curcas* from Environtrade in Gorongosa collected from old trees;
4. *Jatropha curcas* from Zimbabwe provided by Tree Africa; and
5. *Jatropha curcas* from ADPP in Bilibize collected from old trees;

The seeds were planted in polyethylene bags in the research nursery outside Sussundenga town. Experiments were made with soaking the seeds for different lengths of time to see if it would increase the germination rate. The results showed that untreated seeds performed the best. The results have been written up in Portuguese and presented at a workshop in Chimoio and published in a national newsletter from IIAM.

At a demonstration plot made with the extension service in Sussundenga manure was applied to one row of *Jatropha*. The response was immense resulting in plants growing almost at double the speed and in most cases setting seeds after just one year whereas only few of the unfertilized plants had

seeds at this age.

## **Objective 2: The possibility of *Jatropha* acting as host for various agricultural pest organisms**

A student from UEM, Sra Pommès Gagnaux has started collecting field data on pests in *Jatropha*. Her study will provide information about what pests are affecting *Jatropha* and to what extent. It will also be documented if any of these pests affect other crops.

During field visits a number of pests have been identified and some of them are known to be pests in other crops, e.g. the Rainbow shield bug (*Calidea dregii*). However, more studies are needed to assess if *Jatropha* poses a risk for other crops.

Dra. Luisa Santos from UEM is looking into the possibility of getting a UEM researcher specialised in plant viruses involved in the *Jatropha* research.

## **Objective 3: Combat of these pests with natural pesticides known**

Experience from the research nursery and field observations showed that in Manica Province the most severe pest is a yellow flea beetle. Its appearance is similar to that of the Golden flea beetle (*Aphthona* spp.) but the damage it causes is much more severe. In many cases in 2006 a mortality rate of 95-100% was experienced in nurseries and in fields with *Jatropha* plants up to three years old.

A poster with photos of the yellow flea beetle was presented at the FACT Seminar: "*Jatropha curcas*, Agronomy and Genetics" in Wageningen on March 26-28 in the hope that participants would be able to identify it. However, nobody appears to have observed it before.

In Mozambique we were not able to get a certain identification and therefore samples of the Flea Beetle samples were sent to Wageningen University and Research Centre (WUR) in April:

*Plantenziektenkundige Dienst - Diagnostiek*  
POBox 9102  
6700 HC Wageningen

We have still not received an answer but had confirmed that they are working on it.

The pest pressure appears to be highest during the rainy season and experiments with natural pesticides will therefore be undertaken when the rain starts.

## **Expected results - second half of 2007**

### **General Activities**

#### **Website**

The website will be expanded in two areas:

1. The internal document repository will be much more comprehensive; and
2. A section open for the public will be established to inform about on-going and planned research activities.

## **Objective 1: Most efficient *jatropha* varieties, cultivation of these**

### **Seed procurement**

Despite having contacted a large number of potential seed suppliers few varieties were obtained and included in the trials. It is expected that more suppliers will come forward before the beginning of the next rainy season.

### **Nursery practise**

A farmer claims that unshaded nurseries are as good as shaded ones. This will be tested in a scientific trial. Getting rid of the shading is attractive for farmers because it reduces the work involved in nursery establishment and maintenance.

### **On-station trial**

The 2 ha that were prepared for *Jatropha* variety trials will be planted with a number of *Jatropha* varieties.

### **On-farm trials**

Farmers will be implemented according to the protocols developed during the reported period.

## **Objective 2: The possibility of *Jatropha* acting as host for various agricultural pest organisms**

Preliminary findings from the recently started survey of pests in *Jatropha* are expected to be available. This will include an assessment of the danger that *Jatropha* acts as an alternate host for important crop pests.

## **Objective 3: Combat of these pests with natural pesticides known**

Protocols prepared by entomologist Louisa Santos from UEM will be used for both on-station and on-farm trials with natural pesticides.

It was agreed during a visit to Cabo Delgado that a competition will be made for farmers that want to develop natural pesticides to combat pests in *Jatropha*. This is a farmer-led approach supplementing the researcher-led approach used with the researcher designed protocols. When the rainy season starts farmer groups participating in the project are expected to undertake their own experiments with natural pesticides. Prices offered may include radios or bicycles.