SUPERGAS - Introduction of family based biogas plants in Zanzibar.

In June 2004 we conducted our first information seminar in Zanzibar with the aim of explaining the technology for a wider invited audience from the target group. At the same time we discussed the project concept and the model for micro credit. There was wide support for the intervention and after further discussions and appraisals in Zanzibar and a couple of application rounds to the Danish Mini Fund's group of consultants, we could eventually, set out the implementation in December 2006.

December/January 2006-07.
Our Danish partners were the Superflex group and engineer Jan Mallan who previously has installed biogas plants in Tanzania and Thailand and our local partner in Zanzibar is ZALWEDA, Zanzibar Livestock Welfare and Development Association. We were in Zanzibar December/January 2006-07 to run a information workshop for the target group and install the first 2 plants and had in advance agreed with the leading plastic producer Simba Plastics, that they would supply the tanks and pipes we needed, and were also informed that all other fittings, sockets and valves were available

locally. On top of that, Simba had promised to lend an expert to us for the welding of stubs on tanks, joining of parts for the hydraulic valve and closing of the manhole on the top of the tanks.
Unfortunately this did not work out as expected. When we together with our local team of technicians had dug the tanks down, after removing a 1,5 meter layer of coral stones, and started up the plant testing it with water, almost all the places welded by the expert from Simba, were leaking. Water was also streaming out of the 2 hydraulic valves, that also had pipes and stopcocks welded on. Patel Import, whom we were told

could supply all dimensions of pipes and fittings, did not live up to the promises, with the consequence that we ourselves had to hunt for the necessary inputs in shops and Zanzibar and Dar es Salaam.
We also had to discuss dimensioning of the plants and other technical changes in the construction adjusted to the realities in Zanzibar and at the same time make a new design for the gas tank. In Thailand the group had used a thin PVC balloon floating in a pond, but that solution was for many reasons not appropriate in Zanzibar. We therefore had to leave before starting up the plants, and agreed to be back in a couple of month.

Back in Denmark we got in touch with a plastic workshop and had 2 new hydraulic valves produced following our design and secured other inputs that were difficult to trace in Zanzibar. We also realized that it was necessary for us to be able to do the welding ourselves, so we purchased a welding machine and PE thread and took a short training in how to use the machine.

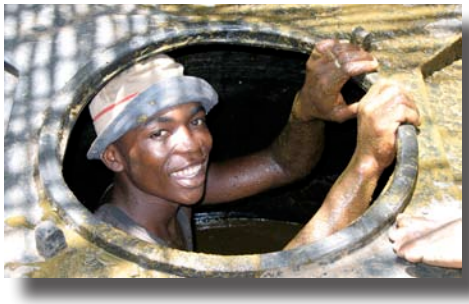
March/April 2007.
Then back to Zanzibar March/April carrying the hydraulic valves and the rest of the equipment. We trained a couple of technicians in the skills of welding and then together covered the manhole and the poor welding with new plates, which we ourselves welded on. After start-up of the plant in Fuoni, it showed, however, that leaks still occurred when the pressure in the big tank increased, with the result that we had to do frequent repairs. The main reason for this was that the welder from Simba had applied a too high temperature when welding with the result that the plastic material close to the welded part was damaged.
The other selected site in Kitope was cleared and levelled and the holes for the tanks prepared, but then a

2 weeks downpour began, washing both mud and cowshit into the holes.
During a day with dry weather we had the holes emptied and the tanks placed and connected with the pipes underground, but then the rain started again, and we feared that the clay and mud would cave in and spoil the tanks. We then had to lift the tanks up in Kitope and keep them in a safe place and made an agreement to return in a couple of month when we could expect a drier season.

October 2007.
The agreement of returning after some few month was delayed and pushed to October by Superflex, but even this postponement was not respected by them, - so DANTAN was continuing the work together with the local team during October. We were doing several repairs of leakages and smaller adjustments of the plant in Fuoni, still caused by the poor workmanship by the welder from Simba, but we found it still difficult to maintain the process inside the plant. Therefore we decided to open the installation to ascertain what was blocking the process. It showed that a hard crust of cowshit had developed in the big tank as a result of the period it had been out of function. So we had to empty the tanks and rinse them with water, before we welded them together again and restarted the fermentation process. However, we still experienced minor leakages causing the process to slow down.
As we still were in the pilot phase of the project, we then decided to replace the 2 big tanks at both sites and work out a model together with Simba, where the top part of the tank is strengthened and instead of closing the manhole in the tanks by welding, it should now be covered during the moulding process at the factory. At the same time our engineer Jan Mallan agreed to our proposal to reduce the pressure in the tank, as it would not result in a considerable difference in gas production.

February/March 2008.
Two new improved tanks were ordered and Superflex were committing themselves to participate in Zanzibar during most of February and March, when the tank in Fuoni has to be replaced and a perfect installation of the plant in Kitope is going to take place. This is important in order for the whole team to understand and follow the entire process. Last time we installed a plant the work was characterized by changes in materials, dimensions based upon what we could find locally and adaptations of the technology to the local conditions.

The entire installation was also now to be documented for use in the installation manual. It also showed necessary to supply the toolbox with a generator, as it was difficult to go on borrowing.
The new improved tanks with thicker upper part and only a 2″ pipe as opening at the top were collected in the port and the old tank in Fuoni dug free, emptied for its content of more than 1000 litres cowshit mixed with water. Then it was removed from the site and the new was after fitting of stubs and stopcocks etc. placed into the



hole and connected with the underground pipes The. 1000 litres were poured in. At the pressure testing it showed that there are leakages round the 2″ pipe. We are contacting Simba and it is agreed that 2 new tanks are produced with a flange moulded into the top as support for the top pipe. They are collected in the port after a few days, and this time we are pressure testing the tanks before digging them down. Unfortunately this solution does not solve the problem with leakages where the pipe is penetrating the top. We then suggest another solution to Simba where the tanks are moulded without the top pipe, just leaving a 1″ hole at the tope for the plastic material to be blown in during the moulding process. We will then fit a lead-in socket at the top with a stopcock for further connection.

After again having collected 2 new tanks in the port and welded stubs etc. on, we are relieved to see that this time it is the right solution. Now we just have to empty more than 1000 litres of fermented material out and keep it in another tank for re-use. Up with the old tank and down with the new that are connected with the other parts of the plant. The fermented slurry is poured in and the plant is started up and gas is produced in Fuoni after a week's time.

In Kitope the selected site is levelled and holes are dug and the foundation is prepared. Stubs are welded onto the tanks and valves and sockets are fitted. The hydraulic valve is mounted on a cement pole together with the manometers measuring the pressure in respectively hydraulic valve and displacement tank. The gas tank is constructed after the floating drum principle and the gas pipe leading to the kitchen is connected. The stove in the kitchen is connected to the pipe and the lamp is installed and also connected. Then the masonry work completing the inlet basin and the manure collection chamber is taking place. After that, pressure testing again and starting up of the plant.

It is essential to follow the functioning of these 2 pilot plants; so much emphasis is put on the instruction of the ZALWEDA team in the monitoring procedures and recording of data in the logbook. What is filled into the plant and how much is coming out has to be recorded every day. The production of gas also has to be measured. At the same time consumption of gas and hours used is also recorded. Dry matter in the mixture fed into the plant and in the manure coming out has to be measured once a week, as well as content of CO2 in the gas and the temperature in the slurry. It is important with a smooth running of the plants for a period of a couple on months, before continuing the installation of new plants.

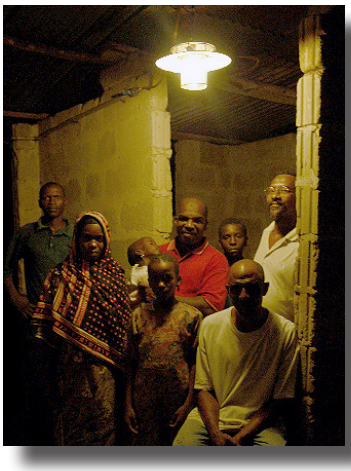
July 2008.

Both installations have been functioning since March. However, there still exists problems with the running and monitoring in Kitope, and we have several meetings with the owner, Bibi Lucy and her family in Kitope, as well as with the responsible persons from ZALWEDA in order to tighten up the routines.

The owner of the plat in Fuoni, Saidi Ramadani has several times asked whether we could find an oven that could be used in connection with the biogas. Bushter, who is the chief technician in the team, had seen a stove with an oven in a shop, and thought it could be used. He collected the stove and after slight modification of the burners it was taken to Fuoni to be tested.

The old smoke-filled kitchen in Fuoni.

The new kitchen with the biogas stove and oven.



Light in the biogas lamps

The new stove and the oven were working perfect and Bushter then arranged for his wife to come along to Fuoni to bake cakes together with Saidi's wife, both to teach Saidi's wife the skill and also to make her familiar with the oven. We also went to invite Bibi Lucy to the cake baking session for the entire team to be together, - learning and enjoying nice cakes and coffee in front of the biogas plant.

We have now also bought a stove with an oven to Bibi Lucy that will be installed when the monitoring routines are working there.

Enjoying coffee and cakes in front of the biogasplant in Kitope.

Saidi's wife is now baking bread, which she is selling in the morning, and Saidi is experimenting with different kinds of vegetables, in order to reap the benefits of the useful manure from the plant. We are also investigating the possibility to use the gas in a fridge to cool the milk from his cows before collection.

Newly installed biogas plant in Kitope.

A Micro Credit training course is now planned for 25 potential buyers of biogas plants and after this training we will embark on the next round of installations.

We are now trying to obtain discount from selected suppliers of pipes and fittings in an attempt to reduce cost and are also looking for sponsors for the continuing intervention.

October 2008,
jesper kirknæs

The motivation behind working with projects in Tanzania is the contact with people and the cultural meetings. Here are some of the persons we are working together with in Zanzibar

Pictures from the installation of the first plants in Zanzibar.