# TLP 2014 Trip Report

**Villages Visited:**

**Bahi Sokoni**
**Iwondo**
**Chilolo**
**Igandu**
**Mapinduzi**

# September 8

Spent time at the new office. Worked on the computer configuration with "Robert" from St. John's University. Worked to have all three computers able to use the internet at the same time. Also, eventually uploaded print drivers to the machines so they could access any printer, fax or scanner equipment in the office.

**Village Visit: Bahia Sokoni**

Met with Ward Councilor Ramadhani Mtawa and Robert Joackim (water "scheme" coordinator). These gentlemen brought us to meet the Bahia District Development Director, "Rachel."

**Bahi District Visit**

Vincent explained how TLP came about and what TLP does. Bahi District has many problems and would like TLP's help: need a well, desks, books, help for the women to water crops.

They are near the Rift Valley; water there is very deep and salty. A government plan promised by President Kikwete has decided on a water source 40 kilometers away that is going to be piped in to the district. This may take up to 5 years to complete and approximately 46,000 people will benefit. This government project will serve people in a 30 kilometer area from Bahi. Rachel asked if TLP might be willing to work with the government on this project! Our response: No, not possible...TLP has no money now and is currently already working on a water project.

Bahi District is approximately 50 x 100 kilometers in area. Two TLP water projects have been completed within the District (Isangha and Kisima cha Ndege).

**Village Visit (continued): Bahi Sokoni**

The village farmers thanked us for coming. A village report was read highlighting the following: Bahi is 56 kilometers from Dodoma. Their economic industry is rice farming, maize, ground nuts and fishing in the Rift Valley. The Bubu River (starts in Arusha Region) provides water for 3 months. The growing season for rice is May to July (one time per year). They yield 3 tons of rice per hector of land (1 hector = 2.471 acres). Following the rice season is the gardening season (July - November) done mostly by women in gardening groups. It was stated that there are 500-800ml of rain per year/season.

The village has the following problems:

- Main problem = shortage of clean water
- Getting trenches for rice farmers
- Public destroying main sources of water
- Marketing (lack of)
- Missing pipes, fertilizer, water equipment
- No reliable office (just renting)
- Seminars/education regarding farming

The village would be happy if TLP would pick some of the above areas to help. They also asked TLP to provide jerseys and futbols for the young people. The villagers are willing to help in any way. They wish to eradicate poverty.

We saw the site where the government thought they should drill; they're hoping it will not be soft/salty since some of the nearby traditional wells are not. A borehole at this site would provide water for the village and the gardens.

They have dug traditional wells in the dried up river bed and have a few manual/foot-operated pumps to pull water out of the wells and spray on the gardens. They are requesting help in purchasing gas-powered machines to pull water from these wells to be used to spray on the nearby gardens.

A 5-gallon bucket of river-source water (traditional well from the riverbed) is being sold for an unbelievable price of 500,000Tsh. Some people up near the mountain then re-sell it for 750,000Tsh.

# September 9

We drove to Igandu Village with Bago wa Bago, Hydrologist. During the long drive, we asked him what the average water needs are per person per day. He indicated 50 liters/person/day in the urban/city and 25 liters/person/day in rural villages.

**Village Visit: Igandu**

Report was given in Swahili and needs to be translated. This village began in 1971 with 1,600 people. The current population is 12,860.

**Continued conversation with Bago wa Bago**

He uses topographical maps (1:50 scale) and geological maps which are 4 times the size of topographical maps. He uses two other methods to determine if there is the potential of water.

1. Magnetic Resonance
2. Resistivity (with electrodes)
   - High resistance = granite. Granite can have fissures where water might collect and the difference in readings can be very slight.
   - Low resistance = clay

The government has already performed hydrological surveys of much of the land in Tanzania. Now they only do surveys on government projects. Private contractors do surveys on private contracts.

Bago has an approximate success rate of 80-90% in finding water. His career was as a hydrologist for the government. He is currently retired and starting his own business. Bago will review the surveys of others.

The 1 million Tsh village cost for a water survey is actually to get a "copy" of the survey already done by the government.

# September 10

**MAMADO (Maji Na Maendeleo Dodoma)**
Matthew Msangu is the director of this NGO. Augustin is a Project Director (very good English). They are currently working in the Dodoma Region and just beginning in the Iringa Region. Their future vision is to work in all parts of Tanzania. They began in May 2000 and have water systems in over 100 villages. All of them have been Diesel engines and pumps except for their most recent village of Chilolo (population 3,043) which has a solar system installed (1.5 years old).

**Chilolo Solar System**
The new solar system is fenced in and has a security guard on duty in the evenings. Lower operational cost of the solar system allows them to only charge 25 Tsh/bucket (100 Tsh per bucket prior to that). Chilolo pays 7,500 Tsh to each attendant per month and there are 2 attendants at each DP from 7am-6pm...or until the water runs out. Prior to the solar system, Chilolo was incurring costs for diesel, maintenance, etc. of 550,000 Tsh per month. The village has already saved enough money to buy 2 hydrological surveys for two new boreholes.

**MAMADO Offices**
They currently are renting space in a house near The New Dodoma Hotel for 1 million Tsh per month. They have acquired property in the Kasasa area which is 8 kilometers East of Dodoma, just before St. Gaspar's on the right. Their hope is to build a brand new building there which will be large enough to hold WASH training sessions.

Their annual budget is 1.8 billion Tsh. They have a fundraising/development department and their own finance department. They also have an engineering group including 2 grad students volunteering for a year. They build capacity in their organization by inviting students to join them for internships. During that time they can determine if they are good candidates to hire.

Augustin told us of the National Ministry of Water and their policy regarding water management within the villages. They recommend a COWSO (Community Owned Water Supply Organization). COWSO has a separate constitution and is registered as a separate entity (separate from the village) and therefore can be sued if they mismanage the resources. COWSO is made up of villagers appointed by the village leaders. COWSO is to be transparent in their reporting to the entire village. The village leadership has an oversight responsibility but cannot directly influence this group and is NOT PAID (e.g. corruption). COWSO is responsible for collecting money and managing the operation, maintenance, and repair of the water system. The Tanzanian government requires that they have a water fund and a bank account. There are training programs the government has created to help villages implement a COWSO organization and understand its roles and responsibilities. MAMADO provides this training for their village water installations. COWSO may work with the village to use excess funds to expand or extend its operation. The DP collectors appointed by COWSO are given a small allowance for their work.

MAMADO Selection Process

1. They take requests from villages.
2. They consult wit he District water engineers to understand which villages the District views as most in need of water.
3. They review the village's water account and based on the balance determines the village intent and capability.

MAMADO implements a "WASH" program (Water - Sanitation - Hygiene). This is a training program they do in all villages where a water system is installed. We believe this is a training program created by the government.

MAMADO Sources of Funding

1. Water Aid Tanzania (receives funding from the U.K.)
2. Funds through the European Union (past funding was under the umbrella of climate change in Tanzania)
3. The E.U. Commission in Dar advertises that they have funding opportunities for which NGO's can apply. The E.U. Commission comes to monitor and evaluate the outcome of the project which will determine future opportunities for funding. An example of a recent project was MAMADO working with 6 other partners to apply for a very large, broad project which included water, agriculture, forestry, energy, community development and _____. The money flows through a local lead agency (we believe a local university). This local lead agency then reports back to the commission in Dar.
4. Simari (Dutch based)
5. Water Can (Canadian based)
6. "Heart HealthAustrailia-Tanzania" which focuses on sanitation in rural primary schools.
7. Embassies (e.g. French, Irish, Danish)
8. U.S. Aid
9. In 11 villages, the British are funding aid for the WASH program.

Matthew stressed that they strive to be good stewards of the funds received by being mindful of those fetching water.

# September 11

**Meeting with Ramdan to Discuss Iwondo**

The village broke their contract with Ramdan and selected a new water agent named "Kasawa." Chitemo says the people have enough water but Jim has concern that the villagers are only using about 1.68 liters/person/day (versus the 25-liter average Bago wa Bago referenced). It was also stated that about 700 large buckets are being filled each day. We speculate that it's going to take time for them culturally to shift to using the volume Bago wa Bago suggests.

Ramdan is the water agent for the village of Matumbulu. They charge 50 Tsh per bucket. He recently got the village to agree to raise the price to 100 Tsh per bucket, using the additional 50 Tsh to build a dormitory for girls near the school so they won't have to walk the 5 kilometers to school. They all agreed and a contract is in place for this purpose.

**Office Space**

Jim wants to explore options for new office space to move to when the current lease expires. Options for consideration:

- Rent space from MAMADO in their current location or at their new location once it is built.
- Buy a plot and build our own office space. However, plots in the city are expensive.
- Rent another space in town with the help of a broker who finds property called a "dalali."
- Rent space that will be newly built behind the former CCT Center.

**Village Visit: Iwondo**

Vincent advised us of the problem at Iwondo when we first arrived in Tanzania. Apparently, water was poured on a hot engine to cool it down and the cylinder head cracked as a result. After a couple days of quick work by Tibby replacing the cylinder head, the system was up and running for our visit. The visit included a ribbon cutting ceremony, the planting of trees, and a special covered area for the U.S. visitors and the village leaders. Tibby served as the master of ceremonies!

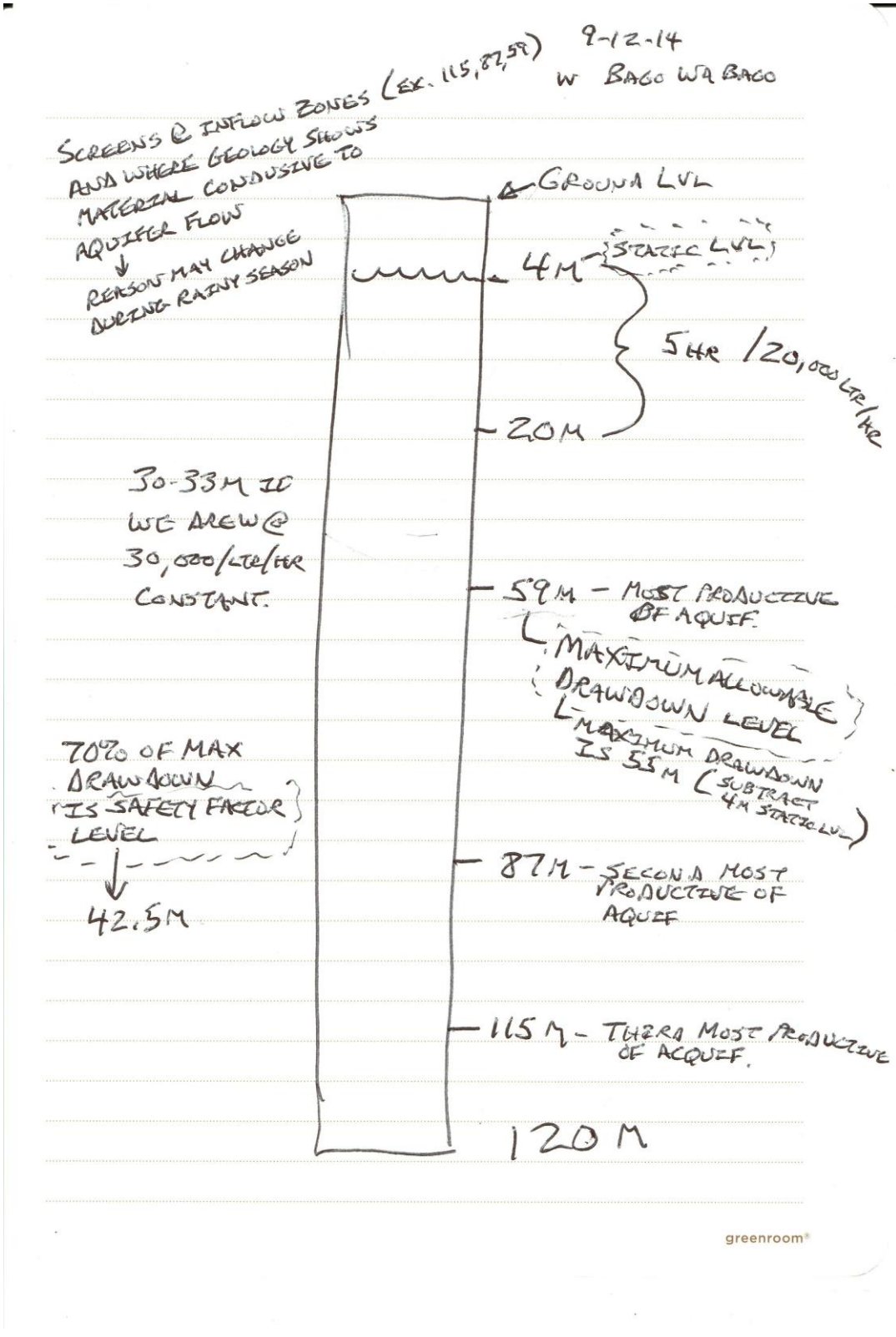
The village read their report. They listed the following needs:

1. They would like one more borehole for the animals (1,000 animals need water; large animals drink every other day).
2. The women would like economic activities.
3. Buy books and uniforms for the OVCs.
4. Build a fence around the borehole for security.
5. Buy a motorbike for the operators to use between DPs and to inspect the lines.

**Meeting with the Iwondo Women**

The women would like the following help with two of their economic enterprises:

1. Poultry business - they request funding for vaccines to protect the 1,000+ chickens they currently keep. One bottle of medicine costs 10,000 Tsh and will be enough to vaccinate 100 chickens. They would need 10 bottles of medicine. A long-term desire is to have a building for the chickens.
2. Tea/breakfast business - Their current rent is 30,000 Tsh/month. They only had minor capital and explained they did not fulfill their goals. They were provided a governmental council loan of 600,000 Tsh; payments on the loan begin in November and will continue for 30 months. They request a startup supply of oil (20 liters is 50,000 Tsh), sugar (50 kg is 6,000 Tsh) and flour (25 kg is 27,000 Tsh).


9-12-14
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SCREENS & INFLOW ZONES (EX. 115, 87, 59)
AND WHERE GEOLOGY SHOWS
MATERIAL CONDUSIVE TO
AQUIFER FLOW
REASON MAY CHANGE
DURING RAINY SEASON
GROUND LVL
4M
STATIC LVL
5 HR / 20,000 LTR/HR
20M
30-33M ID
WE AREW @
30,000/LTR/HR
CONSTANT.
59M - MOST PRODUCTIVE
OF AQUIF.
MAXIMUM ALLOWABLE
DRAWDOWN LEVEL
MAXIMUM DRAWDOWN
IS 55M (SUBTRACT
4M STATIC LVL)
70% OF MAX
DRAWDOWN
IS SAFETY FACTOR
LEVEL
42.5M
87M - SECOND MOST
PRODUCTIVE OF
AQUIF
115M - THIRD MOST PRODUCTIVE
OF AQUIF.
120M
greenroom®

IWONDO - MIN DISTANCE BETWEEN BOREHOLES AT LEAST 100-200M "DOWNSTREAM"

DO MAINTENANCE ON-WELL EVERY 5 YEARS

PUMP AT SAME TIME

DO SOONER FOR IWONDO BECAUSE PUMP IS NEAR BOTTOM OF BOREHOLE

COST ROUGHLY $4,000 - $5,000 US DOLLARS

# September 12

**Meeting with Bago wa Bago**

Bago says 2 1/2" pipe from pump to reservoir is sufficient but you should understand and consider the village demands. 30,000 cubic liters/hour pump is about the largest you can buy (4" diameter). Lower voltage would cause the pump to go slower at the same rate. At Iwondo, a 4,500 cubic liter maximum pump was used for their 4,500 cubic liters per hour well.

On the Igandu borehole, the most productive area of the aquifer was found at 59 meters; second most productive at 87 meters; least productive at 115 meters. (See diagram.) If the 59 meter point should ever go dry you could lower the pump but you'd need to do a new pump test prior.

Bago knows running a pump constantly for 72 hours is not a problem. Seventy percent of the total maximum drawdown gives you the safety factor level. Where the pump is placed is determined by the pump test. The shallower the pump sits the less energy it takes.

**Village Visit: Mapinduzi**

Population 4,513

They claim that the infrastructure and source doesn't meet the demand. The well that is established in this village doesn't operate efficiently. One part of the village gets water but the other part does not. The two areas of the village are described as the "upward" area and the "downward" area. Only the "downward" area has access to water and that is at the site source (the DPs are not functioning). This village is requesting either a new source of water for the upward area or to connect both upward and downward with a functioning system.

Village leaders say the village needs a total of 183 cubic meters of water per day; 113 cubic meters water per day for villagers plus 70 cubic meters per day for livestock. Their well that serves half the village currently produces 96 cubic meters per day. Their borehole is 43 meters. The yield is 4.2 cubic meters per hour. Apparently, water only filled the reservoir once. It is 5 kilometers between the borehole and the reservoir with a change in elevation of only 5 meters. The reservoir holds 90,000 cubic meters. There are 7 DPs; 3 upward and 4 downward. They state only 500 people get water at the source (downward area). The current charge for water is 50 Tsh/bucket. The water committee has over 1 million Tsh in their bank account. They currently use a mono pump. They propose a new well near the existing source.

**Meeting with Ramdan Ndahogora**

Ramdan provided estimates for the cost of cleaning a borehole and pump. In his home village of Nala (152 meter borehole with 6"casing and mechanical pump set at 144 meters) he said it costs around 3.5 million Tsh. This money includes the cost of a crane if there are more than 30 pieces of pipe in the borehole. It is the water agent who is to save and eventually pay for this cleaning process.

Again, Ramdan manages his business in the following way from the money collected:

15% goes to the village so they may save it for machine replacement
45% goes to fuel, overall maintenance, DP maintenance, pipes, service
40% goes to salaries: payment for workers and Ramdan

He also stated approximately every 5 years the motor in the submersible pump needs to be cleaned. His experience with Lister-Peter engines is that they can last 7-10 years but repairs after that are costly (piston = 500,000 Tsh versus a Chinese piston = 50,000 Tsh).

# September 13

**Meeting with A. J. Tibby**

After discussion, Jim and Tibby agreed to continue the pumping schedule currently being implemented by Kasawa (Iwondo Water Agent) because the people are using the water very conservatively. There are approximately 700 buckets being sold per day x 20 liters/bucket = 14,000 liters. 14,000 liters / 8,300 (population of Iwondo alone) = 1.68 liters/person. The reservoir holds 39,000 cubic liters of water.

| Iwondo Water Needs | Neighboring Fufu Water Needs |
|---|---|
| 8,300 people @ 25 liters/day<br>= 207,500 liters/day/person | 4,500 people @ 25 liters/day<br>= 112,500 liters/day/person |

320,000 liters/day/person (for both villages)
+ 25,000 liters/day/livestock
345,000 liters needed/day (for both villages)

With the engine running a maximum of 6 hours and resting a minimum of 3 hours per duty cycle, in a 24-hour period the maximum output would be 72,000 liters. Currently, Kasawa is only running the pump for two duty cycles (12 hours). 12 hours x 4,500 liter yield/hour = 54,000 liters/day pumped. Tibby told Kasawa to record from the meter how much water is pumped/produced each day. As time goes on and people start using more, the meter recordings will reflect this change and then changes to the pumping times can be made.

Regarding the damage to the cracked cylinder head, the best explanation using the facts we have are that a trained worker left the pump house at the end of a pumping period to "go to the forest" to answer a call of nature. A villager came into the pump house and poured water on the engine in an attempt to cool it down. Since the engine was still very hot, the cold water poured on the engine caused the cylinder head to crack.

Tibby is to produce receipts for parts and labor. Jim proposes the following payment solution:

- Tibby should be responsible for the labor and pay that portion. (approx.. 150,000 Tsh)
- The village is to pay half the cost of the parts. (approx.. 350,000 Tsh)
- TLP will pay half the cost of the parts. (approx.. 350,000 Tsh)

Tibby has instructed his trained technicians to stay at the machine. Security of the pump house is absolutely imperative! Anytime a worker must leave, the pump house should be securely locked. The village leadership needs to inform the villagers that only trained technicians have access to the pump house.

Tibby is going to look into establishing a solar system for a 30,000 liters/hour pumping estimate and the estimated solar panels required to run the system (this assumes a 2 ½" pipe to the reservoir).

**Meeting with Ramdan Ndahogora and Bonaventure Lipende**

Bonaventure was recommended by Ramdan and this meeting served as an interview to consider him as a possible engineer for a future water system installation. He is retired from the Ministry of Water (7 years ago). He worked in "mechanics" while Chitemo worked in "reservoirs." He has his own company now. He is a specialist in engines and serves as a mechanical engineer. While he worked for the government, he

dealt with all village wells in Dodoma. Since retiring, he's dealt with private wells and those set up by donors.

While he worked for the Ministry of Water, he worked on Lister engines; now he works with Chinese engines. He has recently worked in 4 villages with Chinese engines using mono pumps. He's been to China and Korea for training on engines.

He has experience working on engines and generators like we use. At Nala, the bishop worked with Bonaventure on their system (submersible pump with generator). His specialty is all the equipment in the pump house).

He has experience instructing the villagers where the pipelines should go. He does not do survey work. He is familiar with using a survey that already indicates the DPs.

He has worked on only 1 solar system (Ipala Village) in 2000. The size was 3,000 liters/hour and used 4 solar panels (1 x 1 ft. square). The pump ran 8 hours/day x 3,000 = 24,000 liters per day. They used a tank instead of a reservoir.

He has experience with a pump as big as the one we will use in Igandu. This experience was at Mzakwe where the whole of Dodoma gets water. Within a 100 sq. kilometer area, Mzakwe has 20+ wells; one borehole produces approximately 1,000 gallons/hour. The wells are separated by a distance of 100 meters, 2 kilometers, 1 ½ kilometers, etc. There he used submersible pumps that were donated by the German government to Tanzania (1993). These pumps were for new wells drilled by the government to increase the water supply.

At one time, submersible pumps were only used in government projects. Pumps used in villages went from reciprocating pumps to mono pumps.

Bonaventure believes a large solar system could run the water system in Iwondo.

*Ramdan interjected a 15-20,000 submersible pump is normal. He is not aware of a submersible pump that pumps 30,000 liters/hour. He believes it would take a solar system of not less than 15 KW. Bonaventure believes 4 panels (1 ½ meters x 2 meters). This would need to be researched to understand the efficiency of these panels.*

Since retiring, Bonaventure has worked in 4 villages and a church project. The villages were 100 kilometers away (past Bahi District). Bonaventure's office is in the Chamwino District (opposite direction from these projects). Because of this great distance, Bonaventure made arrangements to stay in each village for the duration of the repairs (2-3 months). Apparently EFAM in Dar es Salaam (a dealer of water pumps and other equipment from Europe) was contracted by the World Bank to repair the pumps in these 4 villages. None of these villages had an outside water agent as these village systems were all handed over to the government.

Bonaventure has done some work for the organization Water Aid.

He can work on either English or Chinese equipment. He has no personal preference; it is up to the needs of his client. The difference in equipment is durability.

He provides a 6-month warranty after handing over to the village. Even though Chinese engines come with no warranty, he will negotiate a warranty period with us.

Bonaventure is licensed. He also has a mechanical engineer certificate in 1985 from the Water Institute in Dar es Salaam. He studied 2 years and then spent 8 months in Russia to practice (this at a time when Tanzania was also a socialist country).