



A visit to fish farmers in Kenya: A perspective on how fish farming is changing many lives in rural communities; (both nutritional values and economic impacts). Also a study on how solar energy (as an alternative source of energy) can be integrated into fish farming in these same communities

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Fish farming successes are being realized in many parts of Kenya and in the neighboring states, namely Uganda and Tanzania. Tilapia species has gained popularity to both farmers who have embraced it as a good source of diet (a good source of protein) and for its economic success. The government's (Kenya) initiative of supporting fish farming through its ESP (Economic Stimulus Program) introduced a couple of years ago has had considerable impact. Consumption of fish especially tilapia has also gained acceptance with the consumer and especially outside the traditionally fish consuming communities. It is no wonder that tilapia fish farming has gained importance in many parts of Kenya.

There's a real need however, to motivate the farmers and provide training (technical or otherwise) support that these farmers so desperately need. The challenges are many. But the opportunities are bound in fish farming. The farmers for example need to learn how to do sex-reversing of the tilapia, good feeding practices, etc. Reliable source of energy is a challenge to many; both in urban areas and in the rural communities. Providing low cost solar energy will not only help in this area (fish farming) but will improve the living conditions to many communities. Solar energy can for instance be integrated in the hatcheries. Simple solar water pumps would help immensely in pumping water from running streams and or rivers to the ponds. In all fish farming farms visited there was a need for pumps. **But as past experiences have shown some kind of pilot setups are needed for these recommendations to gain acceptance or to take hold.** Economic value and ease of use is important to these farmers. My observations and conversations with farmers were that for a successful integration of a low solar energy system one need to be set up for some kind of demonstration (pilot). Many farmers while welcoming or open to new technologies are shy from trying new things before observing or experiencing their usefulness and/or advantages. These views in my assessment are obstacles that would not be difficult to realize or overcome. There's a cultural mix to these views.

I Brookside show on Nairobi Show Grounds.

This event ran for 3 days at the Nairobi Show grounds. The main theme or focus was on livestock. However, I had gotten word that there would be fish farming pond demonstration and information during this event. I was not disappointed. The staff that was doing the demonstration was well informed and the traffic to this stand (fish pond) was quite heavy. Lots of interested public on fish farming (see photos). The information was on rearing both catfish and tilapia. The staff demonstrated how fish are fed, types of food and the nutritional value gained from eating fish meat. They also talked rather convincingly how one can have a successful fish farming business in a relatively small amount of land.



This group (Inspired Farming Solutions) also had fish for the public sampling. They also provided me with some information of other fish farmers in the Nairobi, central and eastern provinces. It was a worthwhile visit. Unfortunately I did not have time to take a tour on their aquaculture farm in Uthiru, just outside Nairobi. Schedule conflicts with their staff were the reason. On a future visit to Kenya this would be a site worth visiting.

II Mwea fish farm

The travel to Mwea fish farm was long and on an unusually cold day. I was both curious and excited on this visit to a new fish farm in Kenya. This farm has been assisted by the AquaFish program through US



AID. Other than phone conversation with my contact whom I had not met before, I had no information about this part of the country. I had no

idea what to expect after this long trip. My contact person in Kirinyanga (Chris) had informed me that it would take roughly 2-2 1/2 hours depending on the road conditions, traffic and the weather. In addition I had not actually talked to anybody at Mwea fish farm. Chris had promised me that he would make arrangements with the manager at the Mwea fish farm to make the visit possible. And at the end of the day I was pleased by all the arrangements he had made.

For the trip I hired a vehicle, a driver and another person just to add to comfort level during the trip. It turned out good because the extra person acted as my photographer after giving him short instructions on photographing. We made a few stops along the way to ask for directions or at least to make sure that we were heading to the right place. We made it to Kirinyanga at around 10:30am, changed a flat tire and picked up Chris from his place of work. On the way to the fish farm we picked up the manager (person who made it possible for us to visit Mwea fish farm).



Quite a few farmers in this part of the country grow rice. The tour started as soon as we got into the farm. The tour was conducted by gentleman who runs the farm and a student, Alex (who was doing his summer education/training from Eldoret University). He was one of about 6 other students at the farm during my visit. These two guys did a great job doing giving the tour. They definitely knew what they were talking about and did their best in answering most if not all of our questions.

The topics during the tour touched on many subjects relating to fish farming. The farm has catfish, tilapia and the ornament fish. They talked about the fingerlings production, how they rear the fish, introduction of hormones to reverse the sex of fish (sex-reversed tilapia fry procedure) etc. They addressed issue of fish feeding, demonstrated how they summon the fish to feed them and the type of food (mix of rice brand and maize germ). The students demonstrated how they use nets to catch fish and asses populations. At this farm they do have cage culture experiments (for better control) in 2

ponds. There are over a dozen fish ponds at this farm. The standard size of the ponds at the farm is about 300 sq. meters which are about 1.5 meters deep. The gentlemen talked about the economic benefits of the fish farm. It not only provides employment to the local community (roughly 20 people) but it's a place where local famers come to get fingerlings for their ponds. And as mentioned students from universities come here to get their practical training.

The hatcheries and in the pumping systems is where I saw the need for solar energy use. Reliability of energy, as in many other farms is a problem. The cost of electricity is quite high and not always reliable. Solar energy in the hatcheries can be of added value. I saw a need where solar water pumps can come in handy. It would be a good backup to the old ones being used presently and/or to the generators.







III Gatanga fish farmers, in Muranga district

On this trip I ventured out with a driver and a female guide, who has a fish farm in this area but lives in Nairobi. This contact was quite helpful because she had already contacted another female fish farmer (Mary Wanjiku) in the area who had alerted other fish farmers of my impending visit. The drive which started at 9:30am did not take that long. The day was long having visited one farmer after another nonstop. Mary had so much energy and except for a small tea break at her house, we had no lunch. And in fact we did not visit all the farmers that she had arranged for me to meet. We were back in Nairobi around 5:30pm having visited 5 different fish farms.

Tea is the main cash crop in this area. The land is hilly with very steep hillsides but otherwise very beautiful country. Driving in this part of the country can be challenging if you are not familiar with the landscape. Most farmers in this area own about 3-5 acres on average and grow mostly tea in these steep hill side landscapes. There does seem to be a lot of running streams in all the farms I visited. The fish farmers have strategically trapped the water or directed the water to run to or close to their fish ponds. Most of the fish ponds are therefore located at the bottom or near bottom of these farms.

A majority of fish farming in this area was started through the ESP (Economic Stimulus Program) program. This government program gave farmers funding (was told 25,000 KES), to construct ponds, provided the lining and assisted in filling up the ponds with water. The government also provided each farmer with the fingerlings (did not get the number). It also subsidizes the fish food. Nothing else in the way of training/education has taken place according to farmers I spoke to. And while they appreciate being in fish farming, they conferred to me that they feel they could reap greater benefits if they had more information on fish farming management (fish population, management, water temp. control, etc.)

Farmer one (first stop) Nyina wa Muthoni



This farmer has 2.5 acres of land. There are 6 members in this family. The family has 3 girls of school age and 1 boy. They have a fish farm that is well kept but they weren't sure of the fish population at their pond. They feed the fish once in the morning and once in the evening. The wife does most of the work as it relates to the fish pond upkeep. They use fish farming to generate extra income for the family. They don't sell all of their fish; they use

some of it at home. Mama Muthoni was kind enough to take me down to the area where she has a pump that pumps the water to her pond. The pump is old & quite run down (see pic). The farmer stated that it works for the most part but she would definitely consider having a simple solar water pump. The stream she gets the water from does run all year round but for a good solar water pump I told her she would need to trap more water. They would like to increase their production, sell the fish and use the proceeds to pay for the children's education or even have another pond. After I mentioned to her the usefulness of fish water in growing plants she wanted to have information on the subject



so she can grow collard greens, cabbages lettuce tomatoes, etc. There's a definite need for education to these farmers on how to clean the ponds and on better use of fish water, population control, etc. Right now they let this water goes to waste.

Farmer #2: Mr. and Mrs. Kariuki Gitau (in Gatura or Kariara location).

This is a family of seven. They have 3 boys and 2 girls. Essentially it is a family consisting of 4 males and 3 females. They have 2 acres of land. They have a fish pond that does not have a lining. The pond seems to hold water pretty good but spots where soil has given were evident. It is well maintained however. And as with farmer #1 the fish population is not known. They estimate they have tilapia in the hundreds since they had not harvested for some time. When they do harvest they sell it to market which sells for about 150-200 KES depending on the weight (which is usually estimated, they have no scales). The farmer indicated to me that even though fish has not always been popular in this region, it has become a preferred source of meat. The community has gradually come to appreciate the nutritional benefits of fish farming and its economic potential.



Farmer #3

This household has 8 family members in 1.3 acres of land. They have 3 boys and 3 girls. They therefore have 4 males and 4 females. They have a fish pond of size 100 X 40 meters. The lady of the house said

they sell their fish on a regular basis or when they think the fish are big enough. They use the proceeds to supplement for the kids school needs.

Farmer #4: Mr. Chege.



The farmer is a veterinarian by profession but practices on a part time basis if at all. There are 9 members in this family. There are four girls and three boys. He has 5 acres of land and has 2 fish ponds. Unlike the other farmers visited, his ponds are not as big and the pond water was quite dirty compared to the others' farmers. This farmer was different also in the kinds of fish he reared. While he had a few tilapia he mostly had catfish (lots and big ones too). His ponds were also situated right behind his house. This had an added advantage because he is able to keep away the predators (birds). He is also able to keep off people from stealing his fish he stated.

Farmer #5: Mr. & Mrs. Henry Maina

This fish pond lies in a 3 acre piece of land. Most of this land is used to grow tea. The family does not live here. The household consists of 7 family members, 2 females and 5 males. They are professionals in Nairobi. The lady (Esther Maina) who facilitated this whole trip to Gatanga owns this land. Her husband is the chairman of the CDF (county development fund) in this constituency. He is responsible in assisting the farmers get the funding they need.

The pond is very well kept. There are about 3 workers who take care of the farm. It is fenced so no one without a key or permission can access it. In fact I was so unfortunate because the Esther had wanted to give me some tilapia but could not because one of the workers had run to the store with the keys to the pond. The fish pond was put up 2 years ago. The workers estimated that there are well over 3,000 fish in this pond. The water for the ponds is from trapped water on river/stream that runs most of the year.

Mrs Maina sells most of her fish to customers in Nairobi. Unlike the other farmers she is able to hire workers for a better upkeep of her pond. But again there was a common theme. None of the farmers had any understanding on how to take advantage of fish waste water. They all had a desire to have more information/ training on how to clean the ponds, not get fish water go to waste and how to do a good estimate of the fish population. On a follow up phone call upon my return to the US, this farmer advised me that they were going to harvest about 200 tilapias from this fish pond on august 3rd, 2013



St. Paul Secondary School fish farm (#6)



This fish pond is actually located at a secondary school farm/property. My estimation is that the compound is about 5-8 acres of land. The school has an enrollment of 370 students, ages 15- 18yrs. The fish pond is about 20 X 32 m.

The fish pond is located near the classrooms buildings. The tour was given by the school's bursar (Mr. Moses Wainaina). It is maintained by workers and none of the students are involved in the fish rearing or getting basic training/education on how to keep fish. I encouraged the Moses to institute student involvement in the curriculum. Next to the fish pond was a beautiful garden of collard greens, cabbages and other crops that would definitely benefit from fish water from this large pond. But the fish farm workers do not make use of the fish water waste to grow these crops. None of the workers knew how fertile and how useful the fish waste water could be to these plants. They said every time they needed to lower the fish pond water level, they let the fish water run down the hill, go to waste. According to the workers there are about 2,000 fish at this fish pond.



An assessment of how solar water pump could be used was discussed. The location is perfect for this use. The school already has tanks that would hold enough water though the person who had the information on tank capacity was not available. Also the distance from the stream to the holding tanks needed to be determined, so should the altitude.

The bursar stated that the alternative energy solution was something that they would be willing to know more about, especially the solar water pump and lighting of the classrooms.



Tour at the University of Eldoret

This is one event that almost did not take place. I took a chance of driving to Eldoret and in the end it worked out great. This institution is located about 200 miles from Nairobi. The drive was quite okay for

the most part but did encounter considerable road construction delays from the town called burning forest area all the way to Eldoret. I met with Julius Manyala the following day given late arrival. He was able to give me a tour of the fish ponds on campus. He showed me the research project taking place there. There's considerable experimental work going on there. This included those experiments being done in conjunction with Dr. Kevin Fitzsimons of the University of Arizona. There are 42 ponds at this university. Students at this institution are able to do a lot of work on the fish pond projects. The area allocated to the fisheries department on this campus is quite large. Farmers are able to come to the institution to learn more about fish farming. In fact Julius informed that the week prior to my visit 60 farmers had come through.

He and I explored the use of solar as an alternative source of energy. He talked about how frustrating it gets sometimes when there no electricity in the area. Areas of possible use of solar were at the hatchery. There are plans of digging boreholes. If this is the case then, solar water pumps could be installed. Julius will keep us updated on those plans but as he put it "things do not always move fast around here."

Julius and I were on agreement that photovoltaic panels for aquaculture (in a hatchery, in use in boreholes, for example.) could be of add value to the projects that are already in place. Being a learning institution, there are advantages. If solar energy panels are shown to work say at the hatcheries or if a solar water pump is demonstrated to be of use at the boreholes then this is an idea that visiting fish farmers could take back to their communities for implementation. They could very well solicit CDF funding from their local community leader. Opportunities for solar energy integration in aquaculture definitely exist at this university and should be explored further.



Sagana fish farm

The drive to this Sagana took roughly 2 hours from Nairobi. Again I was fortunate to meet a Mr. Wanez,



a staff member at this station given the fact that I showed up unannounced. The gentleman was kind enough to plug me in into his schedule. The farm hosts a lot of students who visit and/ or live in the compound. Students come here to do their research and also get some training. Students are not only from Kenya but from the neighboring countries. The station also receives a lot of visits from farmers and scientists from around the world. This site has

a lot of history that dates back to the early 1950s according to the staff that conducted the tour. There are 9 ponds for example built way back in 1960 by the Japanese. It's my understanding that the farm covers 146 acres. As you enter the farm you attention is captured by this big pond to your left that I understand cover 2000 m sq. You also notice that fish are feed by use of a boat that runs twice during the day. There are research projects, fingerling production, fish food production and growing of fish. They also keep cattle and chicken.

The system is canal fed. The water from Rageti River feed into the canal. The water from the canals is feed into ponds. Each pond has an inlet and an outlet. The electricity is from Kenya power but they also have a generator as a backup.

The location presented yet the best possibility for solar energy as an alternative source or energy. The farm has a borehole and a couple of tanks already in place. The tour person thought the idea would be welcome by the director (the director was in Nairobi during my visit unfortunately). He suggested that we make a proposal to the director. I saw a possible need for both a solar water pump and a solar dryer.



Mr. Wanez gave me a great tour and in addition he gave me another contact fish farmer in the area.



Green Algae Highland fish farm (just outside Sagana town).

Prior to my departure from Sagana fish farm Mr. Wanez recommended that I make an effort to visit another fish farm in the area. And when I got to Sagana town I managed to get a local young man (who agreed to take a ride with me to this fish farm) Before I headed to this fish farm I phoned the owner so we could get permission to enter the farm. Mr. William Njaremwe the farm owner was in Kirinyaga but he was kind enough to alert his workers that we will be dropping by. He also said he would try to head back to the farm to meet us if he was able to. It was a 10 to 15 minutes' drive to the farm.

This fish farm is impressive. It has roughly a dozen or more fish ponds. It has catfish, tilapia and ornamental fish. The tour guide works there and he had a good understanding of what's all in the fish pond. He explained the methods of feeding, food, the way the water systems are set up (gravitational), etc. Unlike most fish farms visited this is more weighted towards the commercial aspect of it. However, it's well managed and they are trying different methods, in the way they use electricity. They are also in the process of constructing a new building where they can make presentations on what they are doing and educate visitors and farmers on fish farming.

They pump their water from the same river that Sagana fish farm gets its water from. It's pumped to this huge tank that sits high above the ground (about 10ft). They use plastic pipes to move water from pond to pond downstream or when they want to drain/clean the ponds. They have developed a system where fish are not sucked into the pipes. This farm had more ornamental fish than other I had visited. They also had lots of catfish. This is one farm that is trying to experiment in the integration of different energy source. For example they have a German built battery they are using in their hatchery. It is a fish farm well suited for the integration of solar energy in its systems.

More information needs to be gathered on how this farmer with his elaborate fish farming is benefiting the communities around him. It is obvious he's providing employment as there were a few workers at the farm. I got the impression was that he is a good example or inspiration to other farmers in the area who would want to get into small scale fish farming business. Any opportunity for a future visit with this farmer would be valuable and of interest on what works and what doesn't in the fish farming business in this part of the country. A future follow-up visit to meet with the owner of this fish farm is highly recommended.





A visit to Nyandarua farmer: Mr. Sammy Gichohi

The farm is on the border of Kiambu and Nyandarua provinces on the way to Naivasha in the Rift Valley province. It is run by a young provisional (Financial Analyst) who lives in Nairobi but has a large farm in this area. He is one of many professionals I met that are beginning to find interest in farming. Or who believe there is not only a need to get into farming but there are financial gains too that can be realized. Some of these young professionals have an edge over other farmers in that they are well educated and in some instances have the capital to invest in fish farming and growing green vegetables. Sammy has set up three huge greenhouses. He is growing tomatoes, cucumbers and bell peppers.

He has however taken interest in fish farming and has a small fish pond. He stated that he needs to put more time and effort into fish farming. This area of the country gets quite cold especially at night being so close to the Aberdare Mountains. For this reason the idea for solar energy as an alternative source of energy is very attractive for him. He would not only use it in the green houses but would integrate it in his fish farming. The land he owns is very fertile and flat. The location is just perfect. It is not far from Nairobi where his products would fetch good returns and the infrastructure is perfect. Water is not a big issue for him. He has dug wells and is in the process of digging up a borehole.

In short there are positive factors going for this farmer, location, ease of transportation, land and his level of education is far and beyond others I met. He is also aware of government's future infrastructure goals. There's a major road that's supposed to be built just yards from his farm. This will make his products reach more markets, Naivasha, Nakuru, Nairobi, Thika and surrounding communities

elsewhere. His plans also include hiring young unemployed youth in the community. Time did not allow us to discuss some more about solar or fish farming. It is worth noting that a follow up visit would be a welcome one by this farmer.



SRA/Koins 4Kenya visit in Myenzi, Mombasa.

An evening trip from Nairobi to Mombasa and a good night's sleep prepared me for what would turn out to be a long and hot day. I had originally planned on taking a matatu (local mini buses then take a motorcycle) from the hotel to Myenzi. But little did I know how difficult that would have been. The place is quite a distance and the directions were not that easy to follow even for an experienced driver I hired to this place. It took us about one hour including getting lost a couple of times. (No landmarks to go by).

I did finally get to Myenzi where Koins4Kenya is located. The director, Ms. Leah Muthoni who runs the facility was there to greet me and also introduce me to a gentleman (Mr. Mwangi) who would be my tour guide all day and who has been with the organization for some time.

Koins4Kenya constructs and run schools in this part of the coast province, in Kenya. They have a number of schools and one for the physically challenged. They also run a very busy medical clinic. They do farming and help residents of the community to be self-sustaining. They have water projects and agricultural activities on the premises. A lot of their activities are run collaboratively with NGOs that are within and without the country.

The tour started by meeting with 5 staff members who wanted to know what I did professionally and also how we can work together to better the lives of the communities where they live and work for. All the staff specialized in different fields. There was one who specialized in crops, a nutritionist, an accountant, an assistant administrator and Mr. Mwangi.

I visited both the school for the handicapped (Doruma) and the Miyani Primary school (both of which are quite a distance from the organization's headquarters). The school for the handicap has about 21 kids. I also learned that the organization runs 20 schools in the area.

My visit to the Myenzi Dispensary located nearby was quite enlightening. It is run by RN Noami Mwenda with help from another nurse plus 1 clinical officer. She has been a charge nurse at this facility for 7 years. She sees 70-80 patients and also attends to pre-natal care for families and for kids who are less than 5yrs. She confided in me that she's basically on call 24 hrs. 7 days a week. When mothers deliver they cannot stay for more than 2hrs, they have to be discharged to make room for other patients. The challenges are reliable electricity and refrigeration. When she gets a call at night she walks in the dark to the dispensary. I had no problem parting with my LED flashlight upon hearing this.

The facility works with about 125 families that are scattered within 6 villages. Water is a major issue in the area even though I saw a major river as we drove to the area. There were no dug out canals like I had witnessed in central province to catch some of this water. I spoke to staff about solar energy and how solar water pumps could be used to pump the water from this river. There are plans to dig boreholes and I talked to them how pumps could be of help to not only to pump this water from the ground but also distribute it. Some of these ideas I was informed would have to be run as pilot projects for the communities to embrace them. There's a need for real education in my view on some of these challenges. Fish farming would do well in this area given that the temperatures are fairly favorable.

My recommendations for this Koins4Kenya would be:

1. To talk to the community leaders in the area about ESP. This program would help farmers in the area start fish farming.
2. Have follow up visit by experts in fish farming through farmer to farmer programs or others. That these visits conduct short seminars and/or workshops in fish farming benefits and management. That a way of putting up fish ponds be looked into.
3. Have follow up visits by experts in solar energy who would study the feasibility of starting a pilot project using solar as an alternative source of energy. Solar would make a big difference in not only pumping water but also in water purification and distribution.
4. That all efforts be made to find and acquire low cost lanterns/flashlights. These can be done in collaboration of Mwanga Energy Technologies, groups like SRA and the like.

Given that there's an organization on the ground that is well run and managed I would think that coordination and collaboration to achieving these goals would not be too difficult.

Conclusion/recommendations:

Fish farming in Kenya has great potential. It has gained importance and acceptance without a doubt. My observation during my trip to Kenyan fish farmers is that fish farming in the country has great potential. It has not only gained importance in many communities but has gained acceptance in "non-traditional fish eating" communities. These communities including the ones I grew up in, fish was a delicacy that one could not get, let alone afford it. So for me this was an eye-opener and a good one at that. Fish

farming, especially growing tilapia represents a shift and has the potential to improve food security in Kenya and indeed the rest of the continent. It provides real opportunities to improving people's health but also improve incomes of small-scale farmers. However, there are challenges and constraints, lack of resources, investment capacity, education in fish farming management and information on fish nutrition, etc. Indeed this makes it even more worthwhile why this farmer to farmer program and experiments in the field that are being run for example, by Dr. Kevin Fitzsimons are so important. My recommendation is that follow up visits and/or short workshop on fish farming and on alternative sources of energy be conducted. There can be only one outcome, the betterment of these communities.

There were clear differences between my visits to places like Eldoret, Mwea and Sagana fish farms. Each of these places have their own niche and emphasis and on the level of scale on what they do. For example at the campus in Eldoret there are experts obviously on fish farming. At Mwea fish farm, the facility is well established and so is Sagana fish farming. But all three I must add are in a good position to educate and spread the word on fish farming. Not to mention all are in different locale so they have an added advantage in reaching many.

For the other fish farmers I visited the challenges are many but not ones that cannot be overcome with proper planning and education. The interest and will amongst the farmers is there. I would recommend that a study be commissioned to look at and develop an efficient tilapia supply chain to foster the development of viable markets to sell their products to. There sure need to be some information provided fish farming management as I have alluded to. All the farms I visited are located in areas that are heavily populated and hence consumption of fish or finding markets shouldn't be a problem. Logistics shouldn't be an issue either. I would recommend that one or two fish farmers be chosen where some of these issues are studied and/or design specific improvement measures that can be applied or put in place to other fish farms.

Finally, I would recommend ways to the integration of solar energy as an alternative source of energy implemented. Reliable source of energy was a common issue relayed to me by many farmers. There are some studies however that need to be done in all these locations. The altitude, sunny days, flow rates etc. I found tremendous amount of enthusiasm and willingness with all the contacts I made want to try or experiment new energy/lighting technologies. It'd just take a successful pilot program put in place and all others will follow. As I have mentioned opportunities to make major differences in fish farming and in communities all over Kenya exist.