

## **Report from CRS Volunteer Assignment: KE57**

Little Sisters of St Therese, Kiirua, Meru County, Kenya.

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### **A. Further Development of the Horticulture Short Course**

In the initial phases of the development of this project, Steve Hallett and Suzanne Nielsen visited the University of Nairobi (UoN) in summer 2015 and, in consultation with CRS and UoN began the development of the Horticulture Short Course program. The model for the program was to support a cadre of fee-paying students in a five-day certificate program while also reaching Kenyan small farmers by offering the program on-farm and five different farms.

Subsequently, Marcia Croft offered to co-teach the course with Steve and so Marcia and Steve developed a range of teaching materials based on the five-day five-farm model envisaged for the Nairobi environs. Drs. Catherine Kunyanga and Jane Ambuko of UoN also contributed materials pertaining to harvest and postharvest handling of vegetables. The course was developed on the cell- and tablet- friendly “weebly” platform. It currently holds about twelve posters and eight lectures downloadable in powerpoint. It is available at [www.hortshortcourse.weebly.com](http://www.hortshortcourse.weebly.com).

Teaching with UoN was postponed due to student rioting (2016) and strikes (2017) but Steve and Marcia accepted the F2F assignment taught this week (March, 2017) as a means to pilot the Horticulture Short Course with the Little Sisters of Saint Therese at their convent in Kiirua, Meru County, Kenya. We believe the course was a resounding success, and, as a result of the pilot course, have a range of recommendations.

Knowing very little of the educational background of the Sisters and having not seen the farms they were hoping to develop, we spent the first day in “learning mode”. We visited the small kitchen garden at the Kiirua Convent and the larger farm a few miles up the road in Machaka, collected soils samples for later analysis, administered a pre-teaching quiz, and taught a few simple lectures on soil science. We found the Sisters to be knowledgeable in many aspects. There were relatively strong in their understanding of human nutrition. They were deeply invested in their communities, in social welfare, and were deeply invested in their own education and the development of their farms, both here in Meru County and in their home communities. There were, however, a number of significant knowledge gaps and so we focused on those gaps over the remainder of the course.

In particular, we attempted to connect plant nutrition (poorly understood) to human nutrition (well understood), to stress the importance of both short- and long-term soil management, and to provide techniques and methods for

improvement. Specifically, in this regard, we taught techniques and methods for cover cropping, crop rotation, nutrition management, and composting.

Additional focus points for the course were farm design, budgeting, and IPM. We believe the course was well received – we certainly hope so because we learned in spades from the Sisters and had a wonderful time teaching.

What we learned from piloting the course:

- We believe the course concept is a good one.
- The course needs to be as versatile as possible.
- Our learn-first, teach-later approach worked well. It enabled us to ensure that we addressed the most pertinent issues in the course.
- The web-based materials worked well for us, but we will make a range of modifications, and will focus on some more materials that are general in nature. We will also develop materials to teach budgeting concepts. We realized that this needed to be taught and developed a teaching module for this purpose. Future teachers may benefit from some guidance.
- The five-day, five-farm concept for UoN may work for UoN, and we hope to be able to deliver that course in the future, but we will re-write the course to be more versatile for any teacher that may wish to use it. We will develop the materials to be as useful as possible to CRS F2F volunteers.
- We are confident that this course will work in a wide range of setting with a number of different teachers.

We look forward to further opportunities to develop the course, its teaching materials, and to trial the course in other countries and regions.

## **B. Suggestions for the Development of the Farms Visited**

First, we must offer some serious caveats to our conclusions and suggestions. We visited each farm once and spent at most two hours at each. We did this at only one time of year: the end of the dry season, mid-March, when crop production is at its lowest ebb. A two-hour observation of a farm during the off-season is hardly the basis for a comprehensive analysis, but here goes nonetheless...

### **Kiirua Farm**

The Sisters at the convent in Kiirua keep a large-garden/small-farm on the grounds between the convent and the hospital. We only had the opportunity to meet the Sister who is in charge of the farm on one occasion. We do not know her name, and we barely spoke to her because she speaks Italian rather than English --- but she is clearly an impressive farmer! Livestock are raised in small pens, and crops are produced on a steep-sloping piece of land of approximately one third of an acre.

A huge effort, and testament to the Sisters' work ethic, was undertaken when the garden was first formed beginning 50 years ago in 1967. The land available for a kitchen garden was steep and rocky, and so the Sisters undertook the immense task of collecting the rocks from the land and piling them into walls to build planting terraces. Whereas much of the land around them is eroded, the Sisters' garden displays a legacy of hard work in land management that has stood the test of time.

I would prescribe a little more land-leveling to continue the great legacy on the Southwestern portion of the land. There is a clump of bananas that is holding back some of the potential erosion, and I would add to that clump of bananas to hold the soil on the upper areas of the farm.

Soil tests showed N and K depletion but high P enrichment. This suggests significant leaching of N. Also, while the soils on the farm were in relatively good condition, they appeared low in organic matter content (not measured). We recommend applications of compost for plant nutrition as well as soil building. A compost pile on the farm could be made much more active by mixing periodically and keeping it moist. This could probably be handled relatively well with pitch forks and wheelbarrows if necessary. Some high-N fertilizer could improve crop growth in the short term.

Manure is available in abundance from the animal pens and we urge for none of this to go to waste. Ideally, it should be used in compost where it would help ensure the efficient composting of plant wastes.

In summary: this is a fantastic kitchen garden and a real heart-warmer. Keep up the great work!

### **Machaka Farm**

The farm at Machaka is co-located with an orphanage which cares for a significant number of children, ages birth – five, and part of the role of the farm is to provide fresh, healthy food to the orphanage as well as the hospital at Kiirua. A range of livestock are held in reasonably well-built pens (and a new barn is under construction) on approximately half an acre. Crop production is on one rectangular field of approximately two acres and two smaller fields beside the livestock pens comprising another half acre.

We have a range of observations:

1. The land available to cropping is approximately 2.5 acres.
2. The land is relatively flat, but does have some slope along the long-orientation (N/S not known).
3. Soils were depleted of N and K, and appeared to be limited in organic matter, but appeared capable of significant productivity.

4. The water table on the land is oddly high. There was lots of moisture in the soil even during the dry season. We never thought to ask how boggy the site gets in the wet season.
5. For the acreage available there seemed to be very few people dedicated to the task of management.
6. For the acreage available there seemed to be very few tools available.

Providing suggestions for Machaka farm is little more difficult than for the Kiirua kitchen garden. It would appear that the Machaka farm has the potential to be an extremely productive small farm. The development of the farm could be improved a little by very modest investments in time and reorganization and could be improved drastically with investments in scale-appropriate (small-farm) equipment.

Assuming a modest/nil investment in equipment and salaries:

1. Design a long-term crop rotation that will improve soil fertility and organic matter. Include legumes in the rotation and a non-harvested soil-building cover crop in the rotation.
2. Add some buffer strips of native vegetation or erosion-stopping berms (e.g. Napier grass) or small fruit trees (guava?) or N-fixing bushes (Leucaena?) to hold soils, harbor beneficial insects, help soil building, and increase fruit production.
3. Ensure that all the manure from the livestock operation finds its way onto the farm. Ideally, the manure should be used to activate large compost piles that also contain large volumes of plant material. Compost will be much more valuable than manure alone.

Various investments would enable the farm to produce much more food:

1. Some form of mechanical land preparation.
  2. Some form of transportation of manure/compost.
  3. Some way to mix compost and apply to land.
- 1-3 could be achieved with a small (~30HP) tractor with a loader (front) and some simple implements (back). A fancy one, brand new, in the US with implements, would go for ~\$15,000.

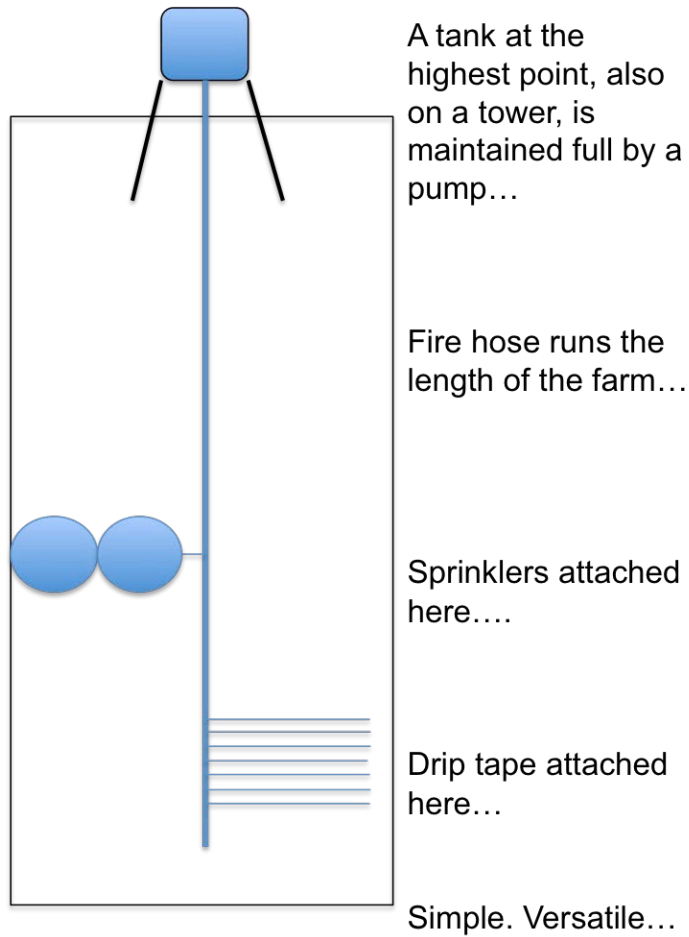
Here is a picture of a Farmall-31 which would be perfect. There are cheaper brands, of course.



Failing a tractor, then a walk-behind tractor would be really useful for land prep. See picture of a BCS. Again, BCS is top of the line (Italian). There are much cheaper ones as well.



4. Better irrigation? Not sure what is needed here, but a water tank on a tower (~15ft) could supply flexible fireman's hose (or permanent pipe) to which either sprinklers or drip tape (or even furrows, but not preferred) could be fitted as needed by each bed.



5. Planting technology. The farm does not appear to have a seeder of any kind. Even a super-simple seeder such as an Earthway would make planting beans, maize and other large-seeded crops more reliable and tidy.



6. Transplanting. Transplants are currently raised in nursery beds. I would love to see a more advanced system for the raising of high quality seedlings to give the crops a better start, but this requires a number of things to be put in place:
  - a) High quality potting soil – I think the only way to do this is to learn how to make high quality compost on site.
  - b) Seedling trays. Either bought (plastic) or made (not too easy, but can be done out of newspaper and other materials).
  - c) A place to keep the seeded trays out of the wind and rain. A makeshift greenhouse can be put together cheaply.
7. Better drainage? I'm not sure what happens when it rains – could drainage channels be cut and planting beds raised to avoid waterlogging? Impossible to say without being there when it's wet.

Overall, the Machaka farm seems to be doing quite well but there are a range of simple approaches that could increase productivity and sustainability, and, with investment, this could be a really impressive and productive farm.

### **Ntumburi Farm**

The farm at Ntumburi is the largest owned by the Little Sisters of St. Therese in Meru County. It is about 30 mins drive from the Kiirua convent in the direction of Isiolo to the Northeast. Although close to Kiirua, Ntumburi is further from Mount Kenya, at lower altitude, and sits in a much drier location. In March, when we visited, in the dry season, the ground was parched and unable to support grass.

The development of the Ntumburi farm is a much more complex challenge than either Kiirua or Machaka. The biggest asset to the Ntumburi farm is its manager, Veronica Muthoni who is knowledgeable and competent.

From our extremely brief visit to the site, here is our assessment:

#### **WATER:**

- The dry location presents significant challenges to crop production.
- Water is available from a piped irrigation systems bringing water (incredibly!) from Mount Kenya. Ntumburi is far from the source however, and is vulnerable to interruptions in supply. The farm should be careful not to be too over-reliant on piped water.
- Water pipes coming onto the farm are only 1-inch diameter. Flows will be limited.
- Pipe connections on the farm are limited. Too much time must be wasted moving hoses around and sprinklers.
- We recommend further calculation, study and analysis of irrigation needs, risks, and opportunities.

- A very quick survey would suggest the erection of further water storage towers that could hold water and maintain pressure to irrigation systems. We would suggest using trickle-feed to maintain full tanks and irrigate from the tanks to maintain even pressure. It would also suggest the location of additional buried pipes for quick access to irrigation areas chosen for horticultural production (more on that below).

## SOIL MANAGEMENT:

### **Water Erosion:**

There are some soil management issues to deal with at Ntumburi. When we saw the soil in the dry season it was very dry and friable. We suspect erosion could be a serious concern. We recommend the erection of barriers (some Napier grass strips already exist – expanding on those might be the way to go) and the careful use of cultivation. Soil building through cover crops and carefully designed rotations should protect and build soils. Fertility was not assessed but may be quite high.

### **Wind Erosion:**

Veronica and Sister Naomi (who has been involved in the development of the Ntumburi site for some time) explained that serious winds blow through this area. We suggest tree-plantings to break the flow of the wind, especially the dry-season winds that blow off the plains in the direction of Mount Kenya. Some of these trees should be tough, native, savannah species.

## FARM DESIGN:

The Ntumburi farm is located in a rather marginal area and we caution against attempts to over-produce on this land. The history of the land is clearly as a marginal grassland savannah, historically grazed by large herbivores, probably at very low densities. Forcing a marginal grassland to become productive cropland could lead to serious problems.

We recommend a careful stepwise development (we note that this has begun) that brings the acreage of the farm into production in a staged way, in small zones. An additional zone should only be initiated once the management of existing zones is secured. If this is not done the farm may find itself constantly building and rebuilding. Additionally, further development should perhaps pause until irrigation systems are more developed and some equipment has been purchased (see below).

**Zone 1:** An orchard planted at the North side of the buildings has established well. We suggest expanding this orchard and protecting it with windbreaks. The spacing of trees and their diversity seems appropriate.

**Zone 2:** The walled kitchen garden on the South side of the house has some potential, but may need to be rebuilt a bit. We suggest cleaning this area up, ridding it of stones, and fixing the planting beds to be more ordered. Compost should be generated to build the soil in this area.

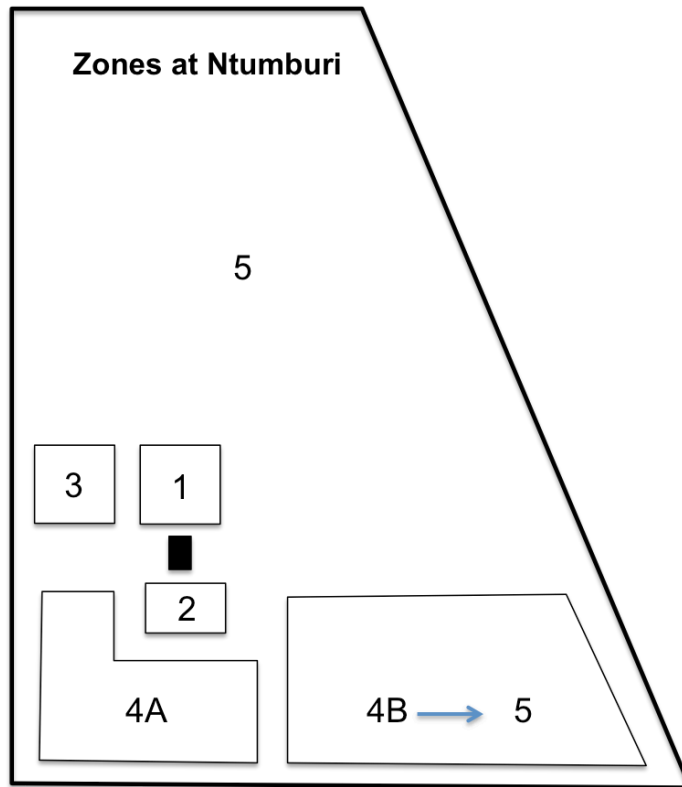


Zone 3: The area of tomato production where greenhouses were built was damaged by wind. If greenhouses are to be located here again (and it's not a bad idea) it would be wise to erect a windbreak of trees first. Also, knowing that the wind is powerful in the area, greenhouses with high quality fastenings and with close-aligned posts should be selected. The quality of the sweet potato crop in this area looked good: we suggest pursuing the development of this zone with a high quality horticultural crop production area. Erosion should be managed with some barriers (Napier grass or stones collected from across the site).

Zone 4: Cultivation of maize, beans, onions, Sukuma wiki and other crops has been attempted on the southern portion of the land (approx. 5-6 acres) with mixed results.

- A) A recent onion harvest appeared to be pretty good, a standing onion crop looked to be in good shape, and a standing pepper crop looked a little stunted, but producing some fruit. These crops all came from an area of about 1.5 acres that was close to the house and small enough to be irrigated reasonably effectively. We suggest developing this area further. A significant portion should be set aside for soil building with cover crops. Irrigation should be arranged more efficiently. However, close attention needs to be paid to the market for these crops. Currently, onions are sitting in storage waiting for the price to rise again and timing could be an issue if ready cash is needed for other farm inputs. Diversified, high-value crops can help to minimize this risk.
- B) Further from the building where it seemed it was difficult to get sufficient irrigation water, standing crops of beans and maize were struggling. For the meantime, until Zones 1, 2, 3, and 4A are developed and productive, we suggest consigning zone 4B to zone 5.

Zone 5: We caution against the overexploitation of the Ntumburi farm. The major part of the farm could be used for grazing, but livestock specialists should be consulted and over-stocking carefully avoided.



#### EQUIPMENT:

It would appear that relatively little progress can be made at Ntumburi without at least some degree of mechanization. The same recommendations made for Machaka apply here and are even more urgently needed. Most of the equipment could be shared among the two sites.

#### **C. Building a Farm Extension Community Among the Sisters.**

The Sisters gathered for our short course were extremely energetic and keen to increase their knowledge to their various farms and others. Any and all efforts to support them in this regard should be made. The group seemed like a group capable of being powerful agents of change.