CRS Farmer to Farmer Report on Nchiru Children's Village: Meru, Kenya

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Assignment Length: 30 January 2015-21 February 2015

Overview of the village:

Nchiru Children's Village is a beautiful oasis of life and hard-working students with smiles beaming on their faces. Located in Meru, Kenya, and run by Father Riwa, the center serves as a boarding school for street-children, orphans, and abused children. The village offers a loving community and the chance of a better life.

The mission of this Farmer-to-Farmer assignment focused on increasing the productivity and thus profits of the baron farm, Ndekero, run by Father Riwa in hopes of raising revenue to aid in the mission of making the center self-sufficient. In addition, the assignment included trainings and education of the students in greenhouse practices.

Goals of Assignment:

- Situation analysis on best management practices including: sanitation practices, crop monitoring practices, pest management decisions
- Develop best management practices guide for NCV
- Set forth plan to increase productivity and marketability of crops produced at Ndekero farm
- Motivate children, especially young women in their agricultural endeavors
- Increase agricultural knowledge of children

- Identify gaps and recommend future F2F volunteer training to ensure food sustainability of NCV for high value crops under greenhouse and field conditions

Ndekero

Ndekero is located approximately 30 minutes from NCV. The farm is supplied with irrigation water from two nearby streams that is piped up to water tanks for use. The soil is very fertile, being of a sandy-loam variety. There are three large greenhouses on the property which, at time of assessment, were not producing, along with the rest of the farm. There is much hope of medium-scale production at Ndekero in the near future.

Current Blockages to Success

- Unable to gain reasonable profit margin from local market
- Entire farm is bare, along with the three large greenhouses
- Must develop and implement entire farm management plan
- Lack of cold storage for harvested crops
- Records of farm management decisions and IMP have not been kept

Goals set forth

- By June 2015, have entire farm producing crops, whether for market or NCV
- Decision on what to be planted in the three large greenhouses
- Planning of crop rotation
- Identify stable markets in which to sell produce

Proposed Course of Action:

Implementation of a stable rotation of crops in all fields at Ndekero will be achieved prior to December 2015, and continued thereafter. There is no reason to have empty fields!

*Refer to Fig. 1 at back of report for proposed layout of farm

It is suggested that the fields are rotated with such crops as green capsicum, french bean, amaranth, maize, beets, and garlic throughout the seasons. The lower fields on either side of the property, near the streams, will be planted with amaranth and maize. Passion fruit will be grown both in and outside of the greenhouse, but not rotated since the plant produces for 4-7 years. Passion fruit, along with the crops suggested above, have great market value. It is believed that passion fruit will have good economic yields, which make it worth keeping in the greenhouse. Greenhouse A will be grow passion fruit, greenhouse B will grow beets or French beans, and greenhouse C will grow tomatoes, as desired by host, to start.

Rotation of crops in differing families is highly beneficial to the recovery of the soil after each crop because each crop/family gives and takes away certain essential nutrients from the soil during the growing cycle. Example: Legumes and peas are a great source of nitrogen. Vegetable families have their own requirements as far as nutrients and growth habits go; thus, knowing the families that differing crops are members of can assist in a healthy crop rotation cycle. Differing families of crops also tend to attract differing pests and diseases (example: bacterial wilt affects the

Solanaceae family). By utilizing crop rotation, the build-up of populations of pests and disease can be prevented.

*Refer to Fig. 2 at back of report for chart of plant families

There will be three full time workers hired to care for the farm, each worker with an area of land to himself. It is imperative that the workers must visit/monitor their land every day, multiple times to ensure that irrigation is functioning properly as well as everything running smoothly. The farm manager or extension specialists should do training and re-training of workers on proper irrigation techniques and duties periodically, as necessary.

The workers in charge of their land must anticipate and prepare for future market expansion. The stable supply of crops coming from the farm throughout the year should provide for extensive market entry opportunities. It is the responsibility of the farm manager and workers to research these options and choose the most sustainable and profitable option. The farm plan is dependent upon success of the marketability of the crops. The farm exists to raise funds for NCV, thus, location of stable markets is key to ensure its success. Example: Find markets willing to directly purchase crops from farm on contract; consider export businesses as an option. French beans, passion fruits, and possibly capsicum could be worth looking into for exportation.

Greenhouse Recommendations

The following recommendations are to be implemented at all NCV greenhouses (St. Clare, St. Francis, and Ndekero).

Best Management Practices (BMP)

- Sanitation
  - Proper irrigation is important
  - Must maintain greenhouse
  - Repair tears, holes in house immediately
  - Prevent insects, bugs, disease from entering
  - Do NOT leave door open. Always close door when entering and leaving house
  - Weed
- Nutrient management
  - Safe application of fertilizers, herbicides, and pesticides as needed
    - Proper storage of chemicals and fertilizers
  - Addition of organic material as needed and between plantings if possible
- Irrigation
  - Choose correct irrigation technique for the given area
    - Drip irrigation, overhead/sprinkler system, hand-watering
  - Water in the early morning, not in the evening
  - Water at base of plant, not top to aid in disease prevention

- Greenhouse construction
    - Upkeep of greenhouses is essential to healthy plants and ensuring greenhouse production for years to come

Integrated Pest Management (IPM)

A pest is anything that injures the crop or structure, competes with crop for food/water or spreads disease. The use of integrated pest management is a globally accepted approach system to combat greenhouse pest and disease prevalence. Correctly following the procedures should result in eradication of the problem; IPM should be utilized in all greenhouse operations.

There are four main steps in IPM:

1. Monitoring and assessing
    - Daily monitoring of all crops
    - Assess what effect the pest/disease is having upon the crop
2. Identification of pest problems
    - Insects, diseases, environmental conditions, weeds, nematodes
3. Control methods
    - Biological (beneficial insects and plants)
        - Ladybugs, praying mantis, etc.
        - Turnips

- Resistant plant varieties
    - Hybrid varieties (not good for saving seed…)
    - Grafting
- Bio-pesticides
    - Insect soaps
- Cultural and mechanical controls
    - Hand-picking out of insects
    - Practice of good greenhouse sanitation and precautions against spread of disease

4. Evaluation
    - Keep records
        - Of all outbreaks
        - Of all chemical applications
        - Any treatment utilized for control of pest/disease with dated entries and staff names

The use of IPM is a globally accepted approach system to combat greenhouse pest and disease prevalence. Correctly following the procedures should result in eradication of the problem.

Monitoring and assessing the problem is the first step in IPM. Daily monitoring of all crops should be done in order that when pests or disease does strike, action may be immediately taken, thus lessening damage. When an outbreak does take place, assessment must be done. Assessing the crops includes observing how the crops have been damaged, and the overall effect the pest/disease is having upon the crop.

Identification of the existing pests or disease enables workers to correctly treat the outbreak. Without identification of the pest/disease and research into the best possible methods of eradication, effective treatment may not happen in the most timely manner, as well as have an increased chance of reoccurring. Research is important when identifying the problem, and should be done. Utilize the Internet if possible and run some searches on what the problem may be.

Control: It is vital that any notices of pest and disease outbreaks are controlled at first appearance. There are multiple methods of dealing with an outbreak, and creativity is always welcome in the process. Handpicking off of pests can be tedious, but still highly effective if the pest outbreak is in its beginning stages. Beneficial insects such as ladybugs and praying mantis' may be let into greenhouses to control pests. There are also many disease resistant varieties of seed available which should be a consideration when sourcing seeds for the greenhouse as well as fields. Grafting of plants for optimum resistance and other desirable traits can be highly effective. Intercropping of plants with certain others such as turnips can result in natural pest repellant; turnips repel aphids. Such practices are worth looking into. Improvements in cultural methods include anything that workers are able to change in their day-to-day practices in order to improve the practice of good sanitation in the workplace to lessen

the chance of spreading pests and disease. This means sanitizing all tools used, wash clothing, and shoes when handling diseased plants and facilitating the eradication of pests. Bio-pesticides may be applied if necessary, and turned to before the use of chemical pesticides. The last option (and still most frequent), is to apply pesticide to eradicate pests and/or control disease. It is important to turn to pesticides lastly because pests can become resistant to pesticides over time.

Evaluation consists of keeping details up-to-date records of all steps taken each time pests appear. This is helpful for future pest outbreaks because there are records of what steps have previously been taken; thus, the records may serve as guidelines on what actions to take. Also, having accurate records available with information such as what control methods, especially in the case of chemical pesticides, were used so that it is possible to know if the methods were successful.

Bacterial Wilt:

Bacterial wilt is common in areas of high temperature and humidity. It attacks crops in the Solanaceae family, which includes tomato, potato, capsicum, eggplant, cosmos and sunflower. The wilt causes the plant to wilt and die quickly and without much warning. Most other wilt diseases have symptoms such as spotting and yellowing. Bacterial wilt; however, attacks by bacteria coming up through the roots or stem of the plant. The bacteria proceed to block the water-conducting tissue in the stem so that water and nutrients are unable to reach the leaves and top of the plant. Because of this, the plant dies. It is spread through soil, contaminated irrigation water,

equipment, and humans. It may also be spread by transplantation of infected plants and propagative materials.

Symptoms of bacterial wilt include:

- Wilting of youngest leaves during hottest part of day
- Leaves stay green, but in time, entire plant wilts and dies
- Foliage wilts quickly, but stays green
- When split, stem interior is dark and water-soaked
- Stem may be hollow as disease progresses
- Occurs in hot weather (over 85 degrees F)
- Occurs in areas of high humidity
- Occurs more prevalently in soils with high pH

Diagnosis may be done by cutting the stem of a plant at the base and suspending it in a glass of water; if the plant is infected, a white, slimy substance will ooze into the water within a few minutes. It is also important to look for discolored tissue in the stem. This test is fairly accurate.

*See figure 3)

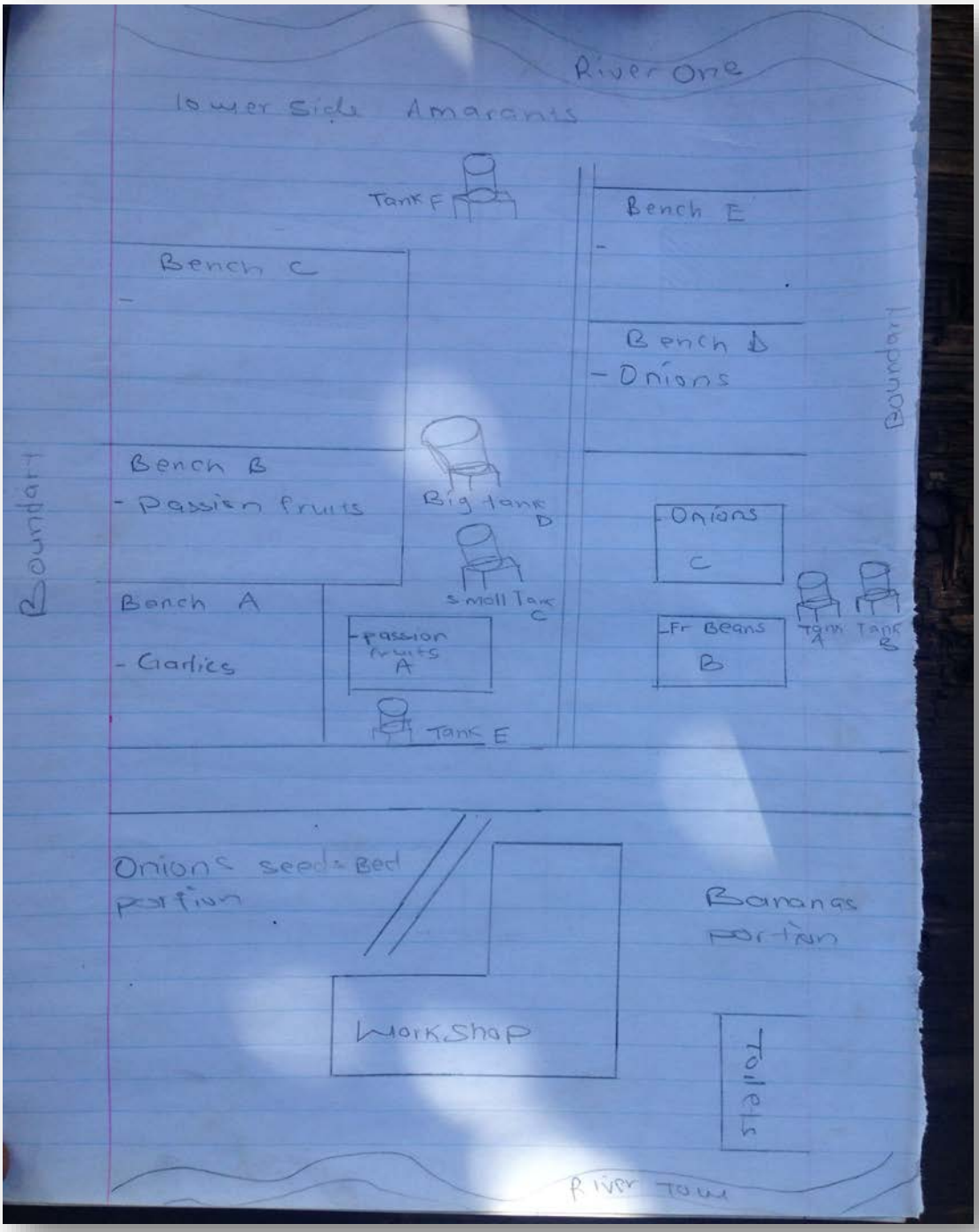
There are no known chemical treatments available to treat bacterial wilt. Most important of all is to act quickly to control the disease. This includes immediately removing infected plants from soil upon death since the pathogen is released into the soil. *The plants should be burned*. Do not compost, and keep them far away from any

other crops and irrigation water, as the infected plants may contaminate the healthy areas.

Control and prevention methods include:

- Implement crop rotation cycle
- Use raised beds
- Improve drainage
- Avoid physical damage to roots and stems when planting and cultivating
- Space plants with enough room for adequate air circulation
- Maintain pH of 6.2-6.8
- Wash hands, tools, and clothing after handling of infected plants
- Choose resistant varieties
- Remove and destroy infected crops

(Fig. 1) Proposed farm layout 2015



(Fig.2) Vegetable families

FAMILY	VEGETABLES in FAMILY
Amaryllidaceae	chives, garlic, leeks, onion
Brassicaceae	horseradish, mustard, broccoli, Brussels sprouts, cabbage, collards, cauliflower, kale, kohlrabi, radish, watercress
Chenopodiaceae	beet, Swiss chard, spinach
Compositae	endive, escarole, cardoon, artichoke, sunflower, lettuce, salsify
Cucurbitaceae	gourd, melon, squash, cucumber, luffa
Gramineae	Corn
Leguminosae	peanuts, peas, beans
Solanaceae	tomato, pepper, eggplant, potato, tomatillo
Umbelliferae	celery, carrot, dill, chervil, cilantro, parsley, fennel, parsnip

(Fig.3) Bacterial wilt diagnosis test

Bibliography

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