**The FRN Diagnosis and designing/planning Exercise**

**1.0 Introduction**

The diagnosis and designing exercise is done in order to facilitate a deeper understanding of the local context and then define the research problem. The farmer researchers and technocrats (research scientists and extension workers) identify options (solutions) for testing in the experimental plots. These options include innovations from formal research organisations (science), farmer practices (indigenous knowledge) or a fusion of both science and indigenous knowledge. Finally the actors engage in a dialogue which results into a farmer-led experiment but with principles of experimentation upheld.

**Time:** 2 hours

**Participants:** FRN research groups (15 farmers), extensions workers, university/research scientists

**Materials:** Flip charts, pental markers, masking tape

**2.0 Understanding the local context: status of soil health (20 minutes)**

**Objectives**

* To help farmers reflect on their soil health status
* To identify a research problem

**Guiding questions (plenary discussions)**

1. What is the status of the soils in your farms (soil health)?
2. What indicators do you use to determine the status of your soils?
3. What options do you know that can improve the soil health in your farms
4. What options do you practice in order to improve the soil health in your farms?
   1. What is good about the options?
   2. What is not good/convincing about the options?

**3.0 Designing the experiment (60 minutes)**

**Objectives**

* To state the research question (one key question)
* To identify options to be tested (treatments)
* To agree on type of data to collect (variables)

**Guiding questions (group discussions)**

1. What should be done to existing options, to make them work better?
2. Are there other options which you think or have heard that they may help improve soil health? (local knowledge)

**Guiding questions (plenary discussions)**

*Selecting treatments and plot layout*

1. What options would you like to test?
2. Are there any changes you would like to make to the selected options, so they suit your area? (adaptations)
3. Which option are you going to compare the test option with? (comparison)

* *Researchers add to the list of options identified by farmers, the scientific or research tested options e.g., double up legume technology.*
* *Farmers agree on the options to test as a group (these options will be tested by each farmer)*
* *Each farmer is allowed to select one option of their own choice (may not be tested by other farmers in the group)*
* *Total number of options tested by one farmer should range from 3 to any number manageable by farmers*

***See appendix 2 for an example on the combination of options***

*Data collection and recording*

1. What will be measured or observed in each plot?
2. How will it be recorded?
3. When will the measurements and observations be made
   * Critical stages during the season when data can be collected
     + E.g., Planting, germination, vegetative, harvesting

**3.0 Managing the experimentations (30 minutes)**

**Objectives**

* To agree on the crop husbandry to be followed in the experimental plots
* To identify the crop management data to be recorded from the plots

**Guiding questions (plenary discussions)**

1. Where should the experimental plot be? *(site is farmers’ choice)*
2. What should the total size of the plot be? (10m x 10m per plot)
3. How should the crops in the plot be planted? E.g., plant spacing, ridge spacing
4. How should the crops in the plot be managed? E.g., weeding, soil nutrients application
5. What problems in the plots should be observed which can affect the performance of the options? E.g., pests and diseases, dry spells, run off

***See appendix 3 for an example on the possible problems faced in the plots***

**4.0 End of sessions, thank farmers for participating (10 minutes)**

***Appendix 1: Experimental principles to remember***

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| 1. *The aim of an experiment or trial is to compare options*     1. *Minimum number of options to compare in one experiment is 2. There is no maximum.*    2. *New options need to be compared with something that acts as a baseline (Usually a current practice known to farmers).* 2. *Experiments and demonstrations have different aims so have different requirements*    1. *Demonstration shows how something is done so others can learn*    2. *Experiments are needed when something is not known* 3. *Allocate options to plots randomly*    1. *Avoid any possible bias due to putting a favoured treatment on the best plot* 4. *Repeat comparisons to be sure differences between options are consistent.*    1. *Repeat same options on same farm or same options with different farmers* 5. *Manage the alternatives in the same way (e.g., weeding, pest and disease control)* 6. *Keep good records of what you do and what you see* 7. *Learn by comparing experiences from several farmers doing the same trial.* |

***Appendix 2: Example of experimental design***

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| **Year 1 (legumes)** | |
| **Plot 1: Option 1***(science- group treatment)*  *(Double up legume technology from research e.g., soya plus pigeon peas)* | **Plot 2: Option 2** *(comparison plot with science or local-group treatment)*  *(maize plus basal and top dressing fertilizer in continuous cropping)* |
| **Plot 3: Option 3** *(indigenous-group treatment)*  *(Maize plot treated with organic manure as basal fertilizer and then Urea (inorganic) as top dressing fertilizer- an option combining local and research knowledge (all farmers agree to add this option in their plots)* | **Plot 4: Option 4** *(indigenous- individual treatment)*  *(Maize plot treated with urine (basal and top dressing)- local knowledge tested by an individual farmer (in this plot, farmer has can include an option of their personal choice*) |
| **Year 2 (maize response to treatments in year 1)** | |
| **Plot 1: Option 1**  *(Maize response to double-up legume technology)* | **Plot 2: Option 2**  *(Maize response to continuous cropping in basal and top dressing fertilizer)* |
| **Plot 3: Option 3**  *(Maize response to continuous cropping and continuous organic and inorganic treatment)* | **Plot 4: Option 4 (response trial-maize)**  *(Maize response to continuous cropping and continuous urine treatment)* |

***Appendix 3: Examples of the problems faced in the plots (sources of variations)***

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| **Problems/issues** | **Present**  **0=No, 1=Yes** |
| Pests |  |
| Diseases |  |
| Witch weeds |  |
| Other weeds |  |
| Shading from trees |  |
| Run off due to steep slope or heavy rains |  |
| Water logging due to site (dambo) or heavy rains |  |
| Moisture stress due to dry spells |  |
| Termites attacking crops |  |
| Livestock damaging the crops |  |
| Other problems |  |