Farm Mechanisation & Conservation Agriculture for sustainable Production (FACASI)

1. **PROTOCOL FOR ON STATION TESTING (MOTHER TRIAL) FOR 2 WHEEL TRACTOR MOUNTED DIRECT SEEDERS FOR MAIZE AND PIGEONPEAS IN MAIZE-LEGUME BASED FARMING SYSTEMS.**

Introduction:

Seeding in un-disturbed land has been a challenge to the farmers practicing conservation agriculture (CA) in the ACIAR SIMLESA project. This obstacle has led to a slow rate of adoption of CA especially the practice of zero till. To relieve farmers from this difficulty the FACASI project has recommended testing small direct planters/seeders that are powered by a two wheel tractor. The aim is to evaluate them and assess their comparative performance of 8 models of the seeders and compare them to current practice. These comparisons will enable site-specific recommendations for Small-scale motorized CA mechanization technologies suitable for Eastern & Southern Africa, that are economically and environmentally competitive with animal and human powered technologies.

8 different direct mult-crop planters will be evaluated:

1. Gongli ARC
2. National Agro
3. Danyang 2BFG-100
4. JEM CA seeder
5. Fitarelli single row
6. Fitarelli two row
7. VMP
8. Gongli Africa

The evaluation will be done in a replicated trial design (researcher managed/Mother trial) and a non replicated farmer managed trial (on-farm/Baby trial) in two districts, in Kenya and Tanzania.

In tanzania in Mbulu and Arumeru districts

In Kenya in . Laikipia and Bungoma districts

Farmers, equipment suppliers and service providers will be involved from the beginning of the experiment, researcher managed and of farm, to; familiarize themselves with and to assess the performance of each machine,.

Treatments:

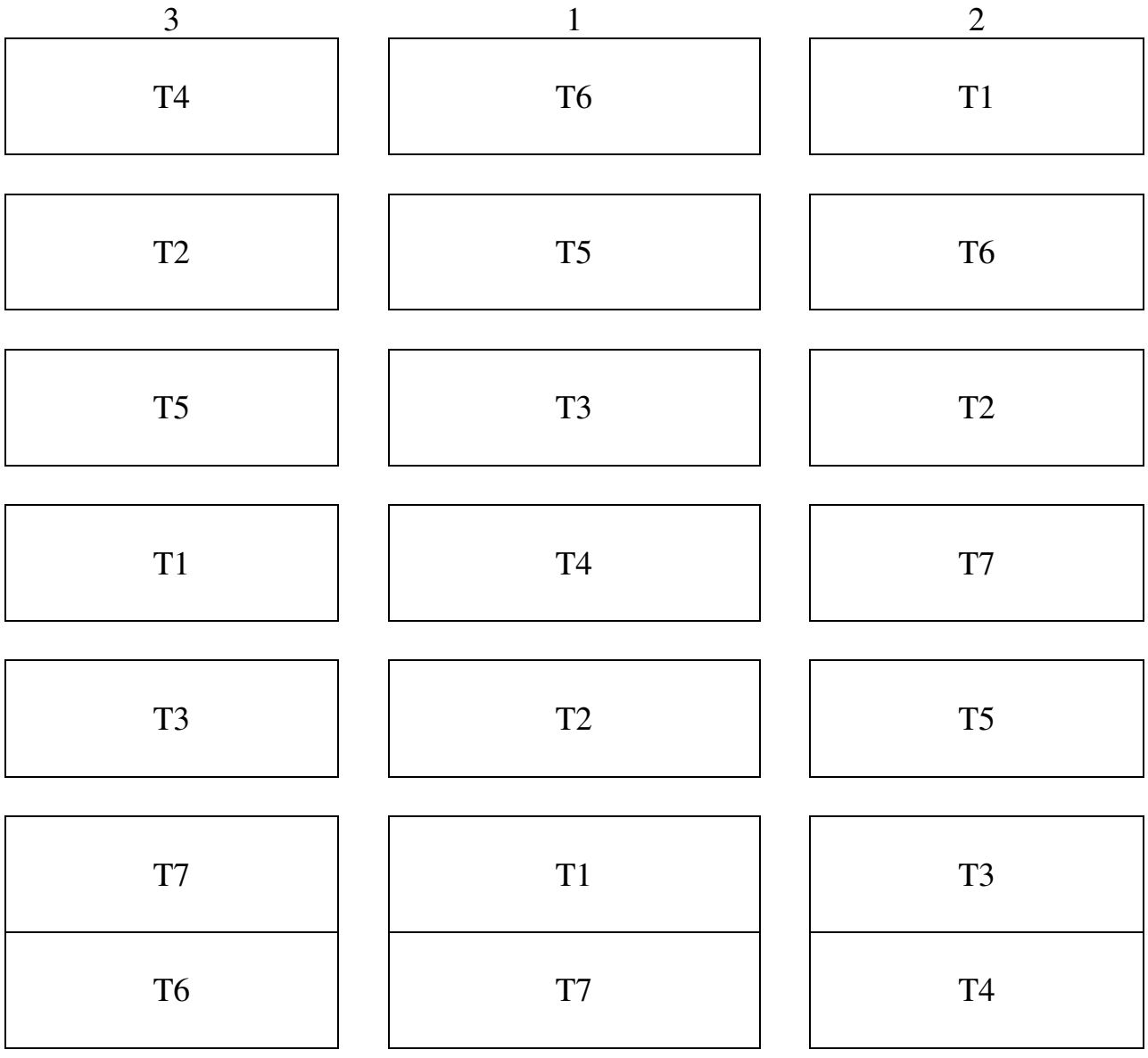
The trial will have six treatments in short rains season (currently underway) and eight treatments in the long rains (March-May 2014). The eight treatments are necessitated by the addition of VMP and Gongli Africa which are yet to be received but are expected to be available for the coming season.

Table 1: SAS output showing randomized blocks and treatments

Obs	Block	Treatment
1	3	T4
2	3	T2
3	3	T5
4	3	T1
5	3	T3
6	3	T7
7	3	T6
8	1	T6
9	1	T5
10	1	T3
11	1	T4
12	1	T2
13	1	T1
14	3	T7
15	2	T1
16	2	T6
17	2	T2
18	2	T7
19	2	T5
20	2	T3
21	3	T4

T1- Gongli ARC; **T2** - National Agro; **T3** - Danyang 2BFG-100; **T4** - JEM CA seeder; **T5** - Fitarelli single row; **T6** - Fitarelli two row **T7**Traditional method

Figure 1: Field layout showing treatments



Plot size.

Each plot will measure 10x30M with adequate space (5M) between blocks to allow for turning. The space between treatments will be 2Metres.

Test crop:

Maize (same variety in all trials) as a mono crop will be planted at a plant population of approximately 40 thousand plants per hectare. The seeders will be calibrated and adjusted to give the above plant population. Row spacing may vary depending on what is possible with individual seeders but the plant population will be maintained.

DAP fertilizer will be applied during planting at a rate of 50kg/ha. The crop will be top-dressed with urea at the rate of 100kg/ha when crop has grown to knee height (approximately 4 weeks after plant emergency).

NB: In the long rains season (March-May 2014) a legume (possibly beans) will be introduced to complete a maize-legume regime.

Weed control

All plots to be sprayed with Glyphosate (roundup) for weed control before planting, and thereafter shallow weeding undertaken at intervals and frequency determined by weed intensity.

Sampling:

From each plot an area measuring 5Mx2M will be selected randomly and demarcated from which all necessary data will be taken.

Harvesting:

Manual harvesting at maturity, making sure to retain at least 50 percent of the maize stalks in the field.

Economic evaluations of each treatment

All treatments will be evaluated for economic performance

DATA TO BE COLLECTED:

Name of site:

General description of the site:

Soil type

Field condition at sowing (slope, soil moisture)

soil cover/weeds/mulch (average of three 1m square cuts)

Sowing:

Crop type and variety

Sowing date

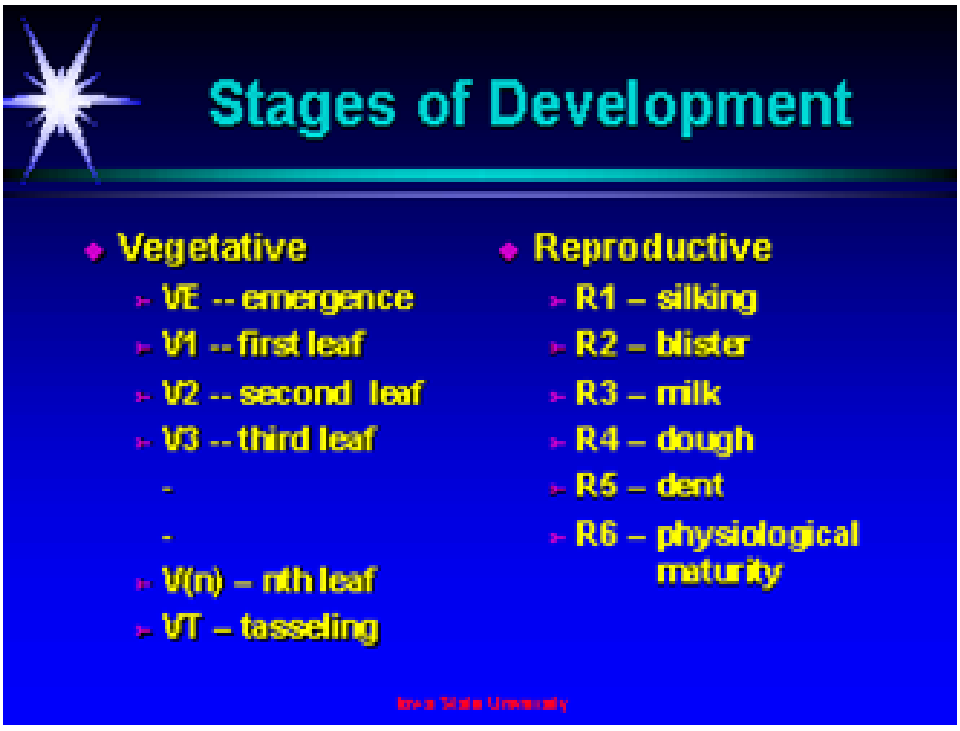
Spacing or machine calibrated plant population

Fertilizer:

Type and application rate at sowing

Type and application rate at top dressing

Dates at which the following growth stages were reached



Field condition at flowering (weeds, soil moisture)

Field condition at harvesting (weeds, soil moisture)

Weeding:

First weeding (method and date)

Second weeding date (method and date)

Third weeding date (method and date)

Additional soil parameters:

Bulk density at beginning of project

Bulk density at the end of the project

Soil texture

OC at beginning and end of project

N, P, K, soil colour

Equipment parameters:

Average depth of seed placement (mm)

Trash handling. (Blockages per run of 30m)

Seed coverage (Good, Average, Bad)

Draft force is this possible Tractor effort? Working hard, comfortable, easy???

Handling and manoeuvrability (good or difficult)

Other relevant observations about the tractors or seeders

DATA SHEET

Plot #	Block	Treat	Trash load Avg three 1 m square plots	Time spent sowing	Fuel consumption Per trial	Plant count at germination	Date at which All Growth stages reached	Plant count at harvest	Soil moisture at sowing	Soil moisture at harvest	# cobs	Grain yields
1	3	4										
2	3	2										
3	3	5										
4	3	1										
5	3	3										
6	3	7										
7	3	6										
8	1	6										
9	1	5										
10	1	3										
11	1	4										
12	1	2										

13	1	1								
14	1	7								
15	2	1								
16	2	6								
17	2	2								
18	2	7								
19	2	3								
20	2	5								
21	2	4								

For any farmers present at the Mother trial, they will be given the opportunity of "driving" all seeders in similar soil conditions to the mother trial block. After this effort they will be asked to fill out the following sheet:

FARMERS' EVALUATION SHEET FOR RESEACHER MANAGED TRIAL (Mother trial)

Community: _____ Site (farmer):_____
Date: _____

Total number of farmers involved in completing this sheet: _____

Number of men: _____ Number of women: _____

Treat	What do you like about		What don't you like about it		Machine handling and operation					
					Easy to operate (Yes/no)		Can't operate		Easy to maneuver (yes/no)	
	F	M	F	M	F	M	F	M	F	M
1										
2										
3										
4										
5										
6										

What other ancillaries would you like to be included and why?

Female farmers
1)……2)……3)……4)……
……

Male farmers
1)……2)……3)…….....4)……
……..

2 PROTOCOL FOR ON FARM TESTING (DAUGHTER/BABY) TRIAL) FOR DIRECT SEEDED MAIZE AND PIGEIONPEAS IN MAIZE-LEGUME BASED FARMING SYSTEMS.

Site selection, Land Demarcation and Preparation for farmer managed trial:

The six participating farmers will be selected to represent a wide range of community field characteristics especially different soil types. An area of 30m x 10m will marked and planted with sole maize. During the sowing exercise, engineers will train the host farmer and his/her neighbors on how to do calibration and other necessary adjustments, and how to operate the machine safely with reference to a safety check list. Plant spacing and fertilizers rate will follow the recommendation in the researcher managed trial. These Daughter/Baby trials will be managed by the farmers themselves; however they will be advised and guided to follow proper agronomic practices (timely weeding, fertilizer application (top dressing), pest control and timely harvesting. Farmers will be assisted with fertilizers and seeds.

Host farmers will be provide with a data sheet in which they will fill different parameters as shown in the table below. **The data sheet will be translated into the local language for a farmer to understand and be encouraged to participate.**

NOTE:

a. Trash (stubble and weeds) load at sowing will be measured by the researchers as in the mother trial and photographs taken
b. Soil parameters, (Moisture at sowing, flowering), bulk density before and after the project, OC, texture, N, P, K, soil color, land gradient will be recorded by researchers.

Daughter/Baby trial (FARMERS) DATA SHEET

Community: _____ Site (farmer)
F/M_____Age……Date: _____

Soil type…….. Slope…….

Presence/absence of stone or stumps……..,

% crop residue cover……..

Date of sowing…….

Date ofTop Dressing……

1st weeding…….. 2nd ……

Date of 50% plant emergence ……..

Date of 50% plant flowering……..

Germination uniformity (Uniform or erratic)…….

Harvesting date……

Plant count at harvest……

Area harvested…….

Treat	What do you like about the planter	What don't you like about the planter	Machine handling and operation			Grain yield (Kg)
			Easy to operate (Yes/no)	Can't operate	Easy to maneuver (yes/no)	