African Cassava Agronomy Initiative (ACAI)

First Annual Review and Planning Workshop, held December 5 – 7 2016 at the IITA Headquarters, Ibadan, Nigeria

Workshop Report

December 2016

Acronyms

ACAI	African Cassava Agronomy Initiative
AfSIS	Africa Soil Information Service
ASH-C	African Soil Health Consortium
ARI	Agricultural Research Institute
CABI	Centre for Agriculture and Biosciences International
CAVA	Cassava Value Adding for Africa
DSSAT	Decision Support System for Agrotechnology Transfer
DST	Decision Support Tool
EA	Extension Agent
FUNAAB	Federal University of Agriculture in Abeokuta
IPNI	International Plant Nutrition Institute
NARS	National Agricultural Research System
NRCRI	National Root Crops Research Institute
ODK	Open data Kit
PAC	Project Advisory Committee
PMT	Project Management Team
QUEFTS	Quantitative Evaluation of the Fertility of Tropical Soils

About ACAI

ACAI is a 5 year Bill & Melinda Gates Foundation funded project in 5 countries in Africa (Nigeria, Tanzania, Democratic Republic of Congo, Ghana and Uganda) aiming to increase the availability of appropriate and affordable technologies to sustainably improve cassava productivity in the short and long-term. The project is composed of six Work Streams (i) Research on cassava growth dynamics, nutrient and water requirements, and responsiveness to inputs, (ii) Development of a geo-spatial cassava agronomy information base, (iii) Production and validation of demand-driven decision support tools for cassava agronomy, (iv) Facilitation of the use of decision support tools to farmers, extension services and other development initiatives, (v) Capacity development of national institutions to engage in transformative cassava agronomy R4D and (vi) Project governance, management, coordination, and ME&L. Within 5 years, building on effective partnerships and engaging national system scientists, ACAI will improve cassava root quality and yields, cassava supply to the processing sector as well as fertilizer sales. During this process ACAI will engage over 150,000 households including at least 30% women farmers in the target countries and lead to the creation of a value of at least US$ 40 million.

Contents

1. Introduction

The first annual review and planning workshop of the African Cassava Agronomy Initiative (ACAI) took place from December 5 to 7 2016 at the International Institute of Tropical Agriculture headquarters in Ibadan Nigeria. The objectives of the meeting were to:

1. Provide an update on progress in project implementation and field activities during 2016
2. Present and discuss plans and strategy for the development of the first version (V1) of the intended application tool for the identified use cases
3. Formulate and discuss feedback and recommendations by Project Advisory Committee (PAC) and
4. Plan field activities for year 2 (2017)

The meeting was attended by a total of 64 participants covering a cross section of key stakeholders of the project. These included development partners, private sector including cassava producers, processors and input dealers as well as researchers and policy makers. Presentations were made by a cross section of these stakeholders particularly the researchers of the National Agricultural Research System (NARS) of the initial two countries where the project is being implemented – Nigeria and Tanzania.

The meeting comprised of four key sessions. The first session covered an overview of the project, and achievements with regards to milestones as well as cluster activities. The second session involved presentations of field trials associated with the various use cases while the third session which was mainly a group working session, involved planning of activities for the 2017 field and associated activities. The fourth session which was the closing session focused on the presentation of feedback from the Projects Advisory Committee (PAC). There was also a field visit to enable the PAC members have a better grip of situation on ground.

Opening Ceremony

The official opening ceremony was chaired by Dr Robert Asiedu, IITA Director for West Africa. Statements were made by Dr Bernard Vanlauwe, Director for Central Africa and Principal Investigator of the project; Lawrence Kent of the Bill & Melinda Gates Foundation; and Dr Ken Dashiell, IITA Director of Partnerships, representing the Director General of IITA.

Bernard recalled the dire need for reducing the cassava yield gap as the key motivation for developing the proposal and expressed optimism towards a positive impact of the project on cassava production in the continent. Lawrence expressed satisfaction on the great strides the project has made since its inception and noted his anxiety for data and results that will impact farmers yields on the continent. Ken welcomed all participants on behalf of the IITA DG and thanked the Foundation through Lawrence for the increasing confidence the Foundation has in IITA, which is clearly expressed by the growing number of project being funded by the Foundation. He pledged IITA administration's support to all project teams so that the desired results could be achieved. He then declared the workshop officially open.

Overview of ACAI

An overview of ACAI was given by the Project Coordinator, Abdulai Jalloh. The objective of this presentation according to him was to introduce the project to new comers attending the workshop as well as to refresh the memories of participating stakeholders who may be at different levels of understanding and appreciation of the project. He pointed out the persistent issue of yield gap that continues to undermine cassava roots supply to the industry. In this regard, he emphasised the project's philosophy of addressing constraints through use cases identified by stakeholders. He also stressed the projects emphasis on partnerships to ensure sustainability. The project is currently being implemented in strategic locations in Nigeria, and Tanzania (Fig. 1)

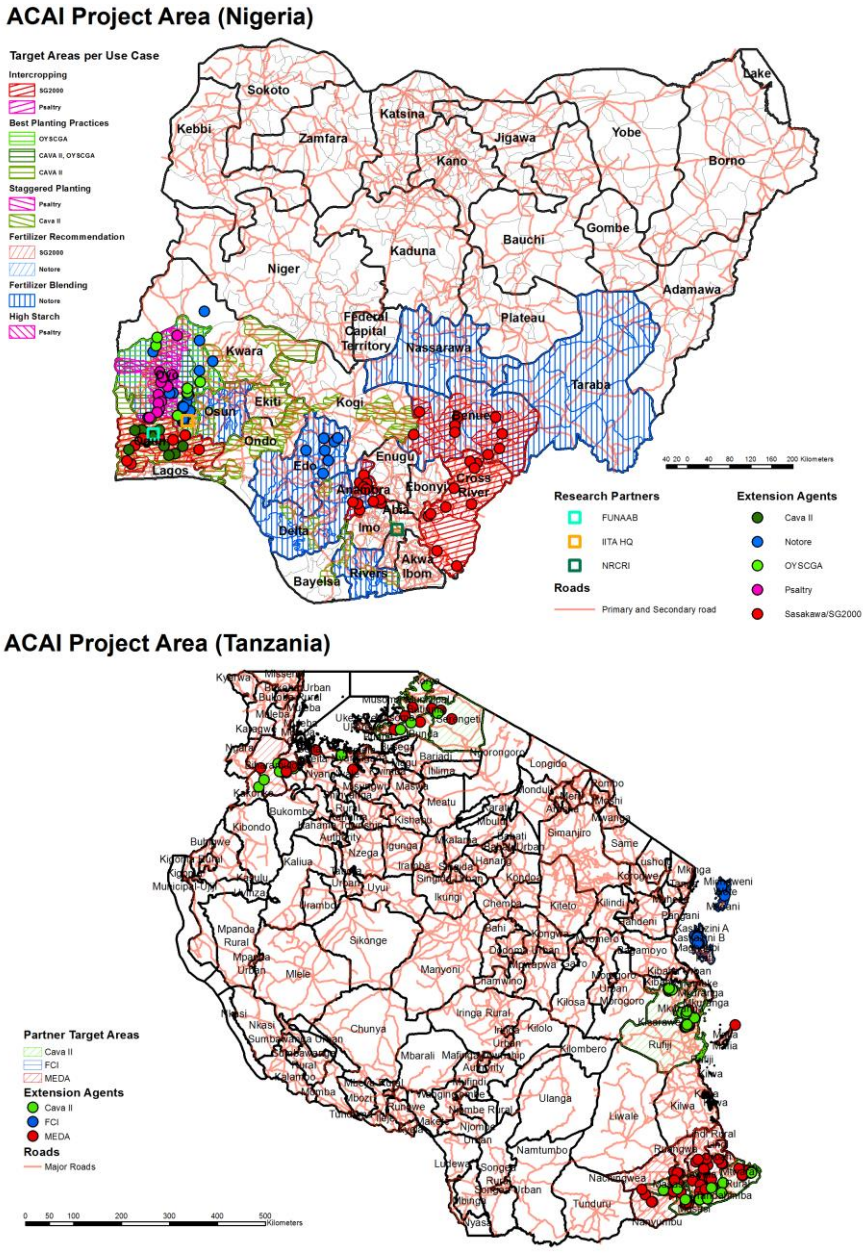


Fig. 1 Map of Nigeria and Tanzania showing project and trial sites

2. Review of progress in project implementation during 2016

2.1 Overall project achievements

In her presentation, the project's Monitoring, Evaluation and Learning Officer informed participants that all the key milestones of the project for 2016 were met. These included recruiting of key staff; establishing the Project's Advisory Committee (PAC), and Project's Management Team (PMT); developing and signing memorandum of understanding (MoU) and agreements with a variety of partners both in Nigeria, and Tanzania; developing geospatial layers, establishing over 500 field trials associated with the various use cases; as well as building capacity including postgraduate, and on-the-job training of the National Agricultural Research System (NARS) in the two countries (Figs. 2 & 3).

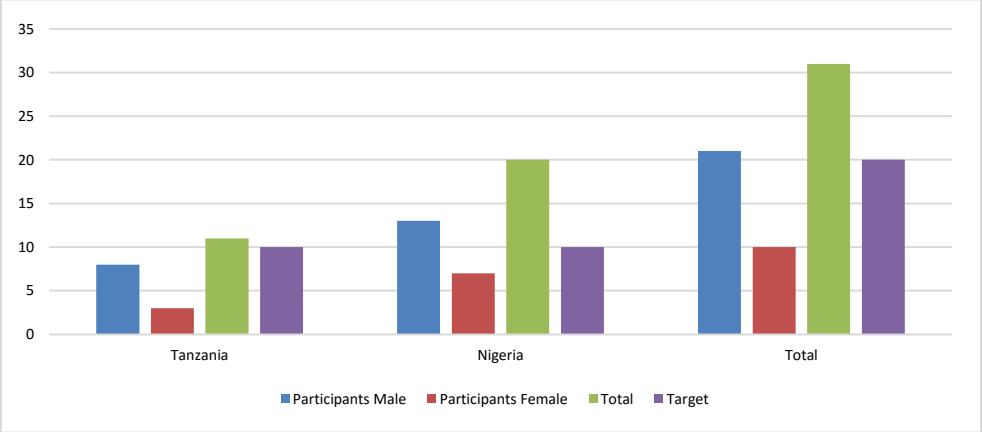


Fig. 2 Modelling, non-destructive sampling and Data management Training

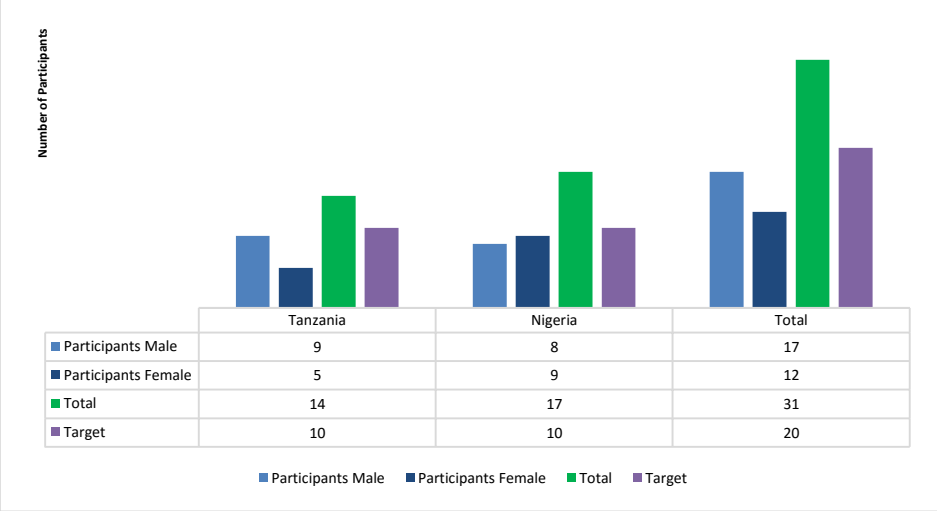


Fig. 3 Project Management Training

There was a general appreciation of the progress made in project implementation. It was recommended that the project uses existing proven ME&L tools for quantifying progress made against set milestones.

2.2 Progress in field trials associated with use cases

2.2.1 Fertilizer recommendation and blending

The leader of the Fertilizer Recommendation and Blending use case, Guillaume Ezui of the International Plant Nutrition Institute (IPNI), gave an overview of the use case and implementation framework. He pointed out that the initiative involved a participatory development of a decision support tool to derive site-specific nutrient management recommendations for cassava production. He further outlined how fertilizer requirements for a crop is determined using the QUEFTs approach.

Participants were informed that a total of 143 Nutrient Omission Trials (NOT) were established in Nigeria (85 South East and 58 South West) while 117 NOT were established in Tanzania (85 Lake zone, 4 Southern, and 28 Eastern zone). The IITA variety TME419 was used in Nigeria, while variety Mkombozi was used in the Lake Zone and Kiroba in both Southern and Eastern zones in Tanzania. Fertilization was at NPK: 150 – 40 – 180 kg/ha including a control and a plot with half the rate as shown below. NPK+S+Ca+Mg+Zn+B at 16.6-10-10-5-5 kg/ha. Treatment layout is presented in Figure 4.

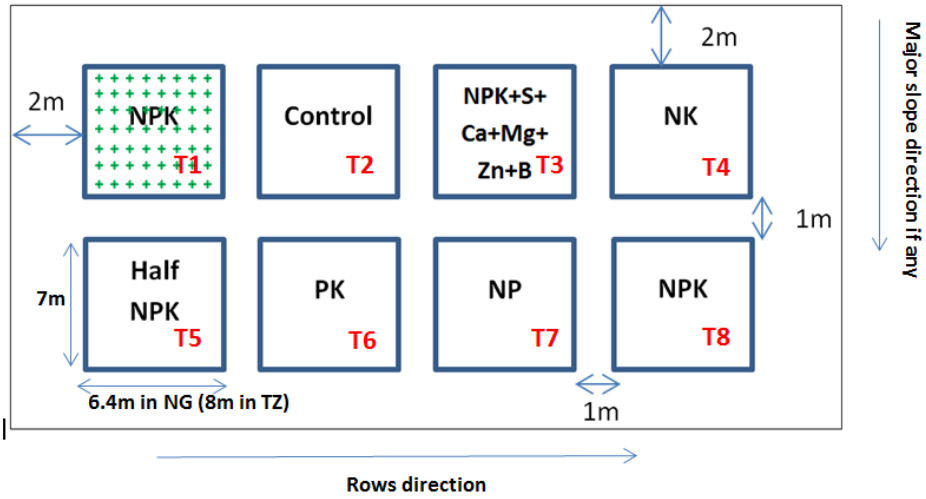


Fig. 4 Layout of treatments for the Nutrient Omission Trials

Peter Mlay of ARI and Adeyemi Olojede of NRCRI made presentations on the preliminary results for Tanzania and Nigeria, respectively. In Tanzania, different responses of the main stem length to treatments appear between districts (Fig. 5a). There was no fertilizer effect at Bunda while there was in Mara but no clear distinction of most limiting nutrient. Nitrogen seems to be most limiting at Sengerema. In general, differences in responses appeared between districts, but

nutrient limiting effects were not very distinct at 4MAP (effect of the 3rd split application of N and K not inclusive), except for root yield in Mara (Fig 5b).

Similar to Tanzania, plant height (Fig. 6a) as well as fresh root yield (Figure 4b) appeared to vary among locations in Nigeria.

Fig. 5a Main stem length

Fig. 5b Storage roots weight

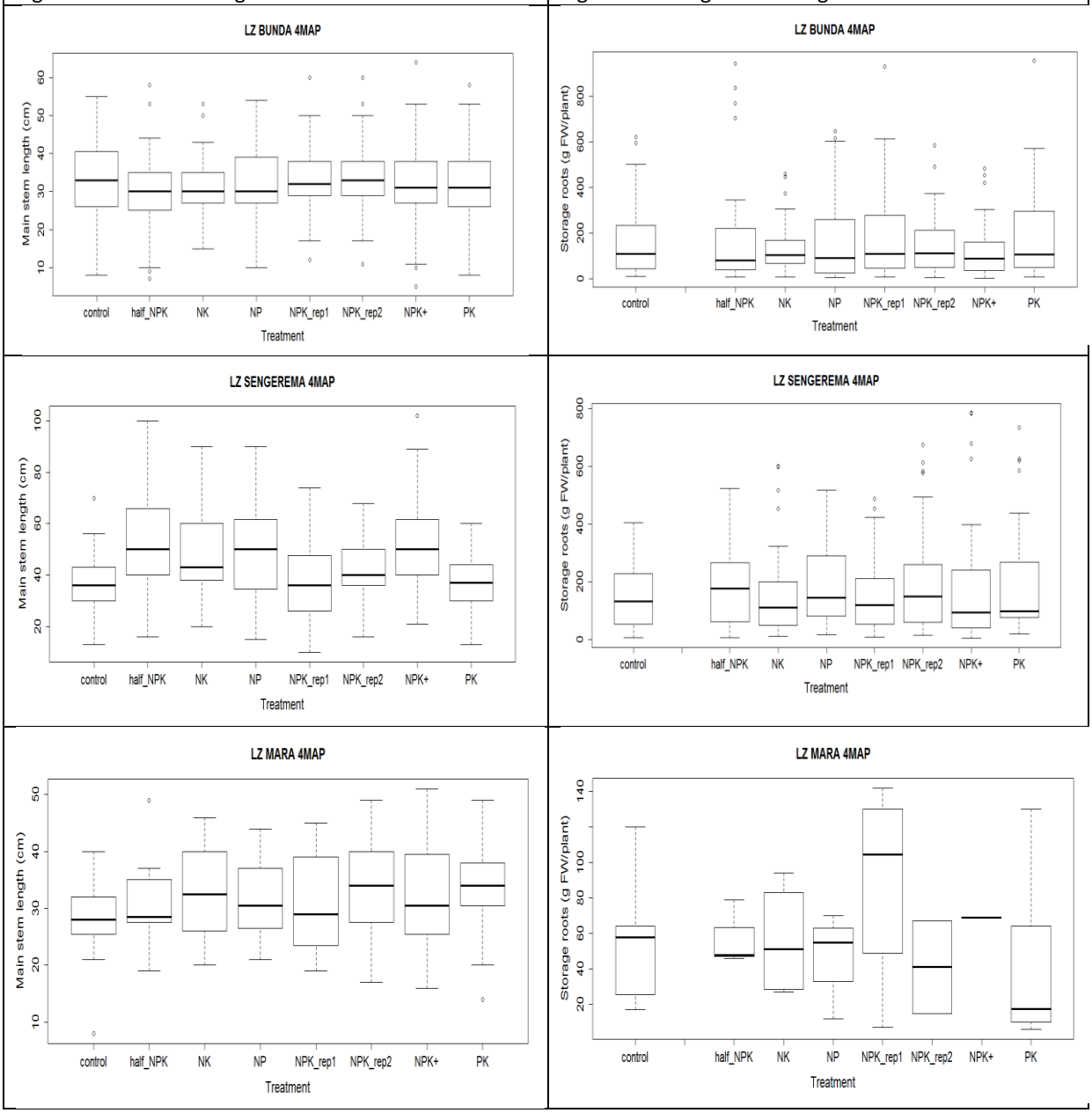


Fig. 5 Stem length and storage root yield at 4 MAP in Tanzania

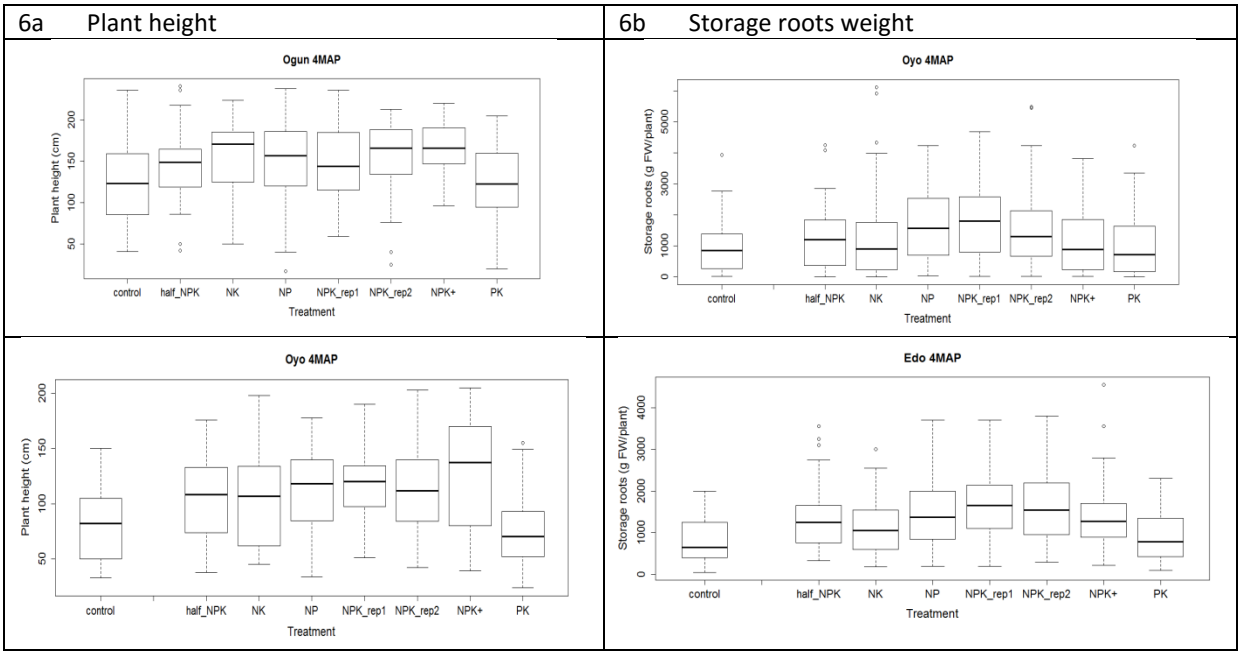


Fig. 6 Plant height and storage root weight at 4 MAP in Nigeria

In general, results from different states/districts in both countries are expected to provide a general picture of most limiting nutrients, indigenous nutrient supply by soils and cassava response to fertilizers in the pilot areas. This will guide the parameterisation of QUEFTS model for the assessment of site specific nutrient requirements of cassava

Comments, Questions and recommendations

Discussions on this session focused on the need for clear demonstration of the effect of soil fertility on cassava production, and consequently the profitable use of fertilizer in cassava production. The use of organic manure came up during the discussions but the general conclusion was that the limitation due to the bulkiness of organic manures vis-a-vis the expected high yields to meet the growing demand for cassava continues to be a deterrent. It was generally agreed that inorganic fertilization appeared to be a more viable option for the expected high yields to meet growing cassava demand. The session noted that the results were preliminary and not comprehensive due to earlier challenges with data collection using the Open Data Kit. There was, however an indication for the project team to clearly indicate what had been achieved and what was yet to be implemented in order to guide appropriate observations. Participants noted that the lack of data on soil analysis hampered conclusions on fertilizer effects.

With regards to project implementation, the issue of establishing validation trials in Tanzania before considering yield data was raised. It was noted that the ideal case was to have a comprehensive overview of the results of the first year experiments. It was, however, argued that a considerable number of non destructive data had been considered together with a review of relevant literature to determine key trends and associated treatments that could be considered for validation.

This approach provides the opportunity to fast-track the required validation with farmers as well as establish the required number of field trials across key locations.

The session made the following recommendations for consideration by the research teams:

1. *Data from CWMP, SARD-SC and Harvest Plus should be incorporated into the V0 for Nigeria and Tanzania.*
2. *Characterization of soils should be prioritized.*
3. *Soil analysis should be carried out before the establishment of any trial*
4. *Farmer-managed trials and Researcher-managed trials should not move concurrently.*

2.2.2 Intercropping

The intercropping use case was introduced by Veronica Uzokwe for Tanzania (cassava/sweet potato), and Christine Kreye for Nigeria (Cassava/maize).

Treatments for Tanzania involving cassava and sweet potato were as follows:

a) **Intercropping**

- Time of planting (4): 0 week, 2 weeks, 5 weeks and 8 weeks after planting cassava
- Planting density for sweet potato (3): 10,000, 20,000, and 30,000 plants/ha
- Fertilizer (2): control (without fertilizer), and fertilizer applied at half of the rates applied in the nutrient omission trials, that is: N, P and K application as urea, TSP and MOP at 75 kg N, 20 kg P and 90 kg K per hectare

b) **Monocrops**

- Cassava monocrop (1)
- Sweet potato monocrop (1) at planting density of 30,000 plants/ha, planted simultaneously with cassava
- Fertilizer (2): control (without fertilizer) and fertilizer applied at half of the rates applied in the nutrient omission trials, that is: N, P and K application as urea, TSP and MOP at 75 kg N, 20 kg P and 90 kg K per hectare

Factors and Levels in the Farmer-managed trials (FMTs)

- Farmers' practice: that is, the normal way farmers plant their sweet potato intercrop with cassava without any management intervention; they may use organic manure if this is their common practice, but not inorganic fertilizer (All decision taken by farmer)
- Sweet potato at low density (10,000 plants/ha) without fertilizer
- Sweet potato at high density (20,000 plants/ha) without fertilizer
- Sweet potato at high density (20,000 plants/ha) with fertilizer applied at half of the rates applied in the nutrient omission trials, that is: N, P and K application as urea, TSP and MOP at 75 kg N, 20 kg P and 90 kg K per hectare

Factors/Treatments for Nigeria were as follows:
Cassava variety (farmers' choice): Erect (TME 419) and branching (TMS 30572, TMS 0581)
Maize variety: Sammaz 35 or 27 (yellow or white)

Fertilizer F1: N/P/K: 90/20/37 kg/ha and Basal NPK + 2 splits of urea
Fertilizer F2: N/P/K: 75/20/90 kg/ha; 3 WAP NPK + 6WAP urea + 10 WAP urea/MoP +16 WAP MoP
Ridged or flat: farmer's choice; no mounds

Preliminary results for Nigeria were presented by Innocent Onyekwere of NRCRI. It was noted at many locations birds caused serious damage to the maize. Data sets for maize plant height showed taller plants for fertilized than unfertilized plants (Figure 7) in Cross River State while that was not the case in Ogun. The number of maize cobs per plant seemed to be lowest in Ogun. Fertilization seems to produce more maize cobs (Figure 8)

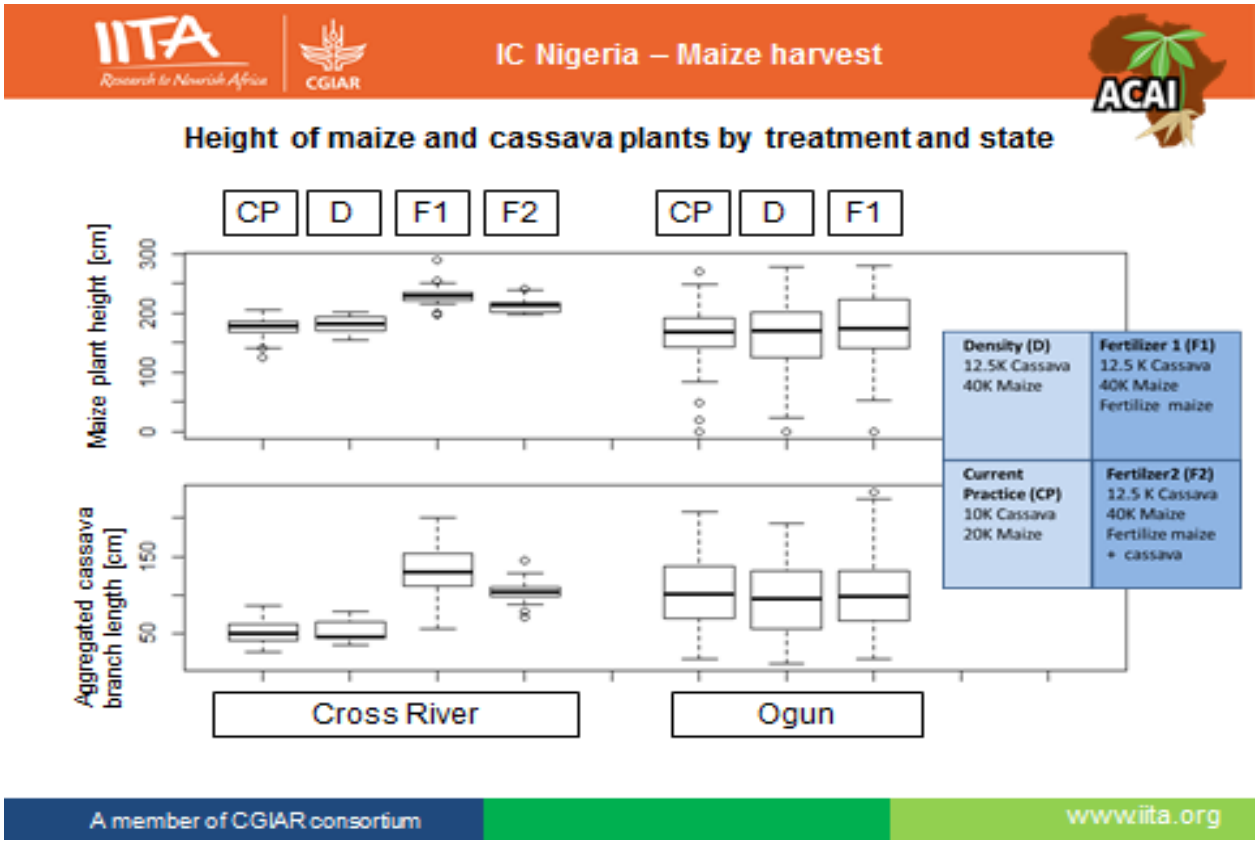


Fig. 7 Maize and cassava plant heights in Cross River and Ogun States in Nigeria

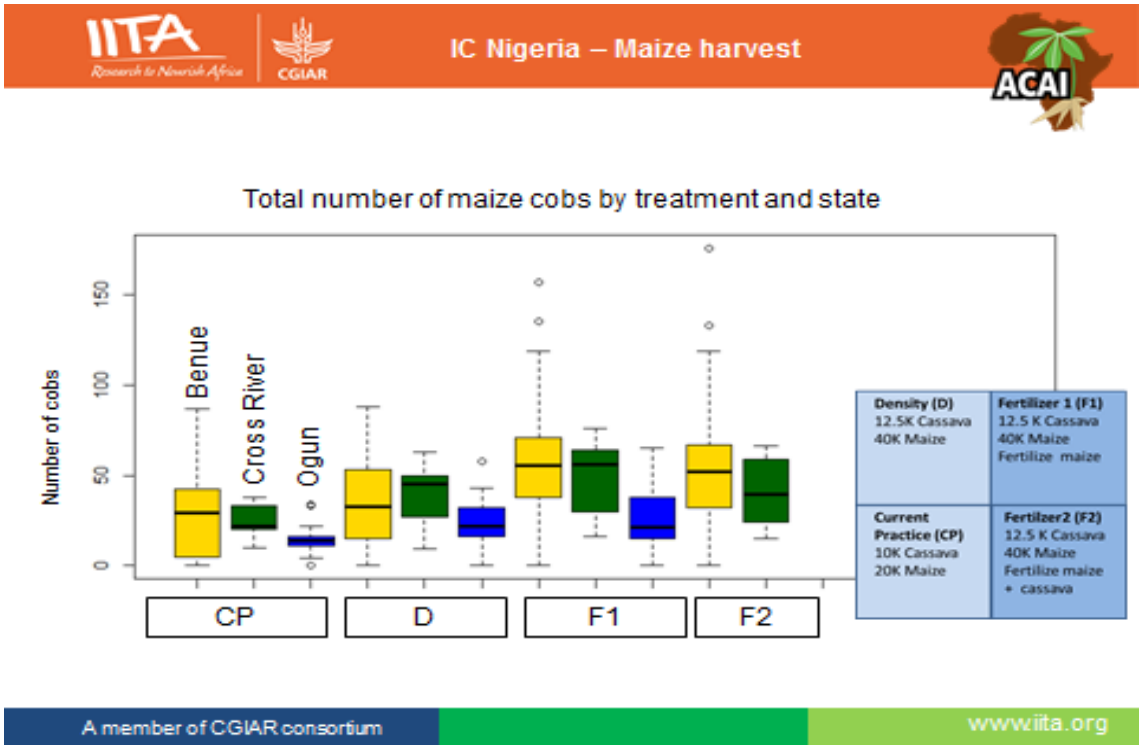


Fig. 8 Total number of maize cobs in Ogun, Cross River, and Benue States in Nigeria

Comments, Questions and Recommendations.

Discussions revolved around the predominant maize- cassava intercropping in Nigeria, and the need to optimize intercrop yields particularly with fertilization. On the other hand, the issue of intercropping two root crops (cassava and sweet potato), which attracted attention was clarified on the basis of being the predominant cropping system in Zanzibar, and that the use case was suggested by partners for possible improvement. Participants welcomed the rapid survey on the cassava-maize intercropping system in Nigeria but cautioned that the apparent positive response of farmers to the treatments should be verified before conclusions are made.

Recommendations

1. *Develop a protocol for determining maize grain yield from fresh cobs*
2. *Follow up on farmers to ensure adoption of some of the treatments.*

2.2.3 Scheduled planting and high starch content

A total of 20 trials (13 in Tanzania and 7 in Nigeria) were established in 2016. The scheduled planting trials involved planting 2 varieties at 4 different times during the year (April, June, August, October), and harvesting at 3 different plant ages (9, 11, 13 months after planting). The first two plantings were not done in Nigeria due to the initial delays in selecting sites, and challenges in finding farmers who could accommodate the treatments on their farms; while in Tanzania, the abrupt cessation of rains disrupted later plantings.

Comments, Questions and Recommendations

Participants had very useful discussions around the issues related to schedule planting particularly the supply of roots and ease of harvesting. It was noted that planting time largely depends on rainfall and this is now being influenced by climate change. The issue of synchronising the availability of planting materials (harvesting), and planting was also raised. Participants were informed that Tanzania Agricultural Research Institute (ARI) is partnering with MEDA and the Tanzania Seed Certification Institute (TOSCI) who are quality declared seed producers to produce planting materials in Lake zone, Eastern zone, Southern zone and Zanzibar.

Recommendations

1. *Efforts should be made to link producers of planting materials with farmers*
2. *There is need for the promotion of varieties with high starch content*

2.2.4 Best Planting Practices

The Best Planting Practices (BPP) use case was introduced by Stefan Hauser. Unlike the other use cases, BPP focuses on cost and labour reduction in cassava production. Trials comprise 4 factors to identify least cost intensive production approaches without compromising the root yield. The use case is implemented in Ogun and Oyo state of Nigeria.

The first factor is primary tillage with 3 treatments: zero, single, and double ploughing; the second factor is secondary tillage: with and without ridges; the third factor is the cassava planting density at the current standard of 10000 plants/ha, planted at 1 by 1 m distance and an increased density of 12500 plants/ha, planted at 1 by 0.8m; the fourth factor is fertilizer application with a nil control versus the rates listed in Table 1.

Table 1 Fertilizer application treatment for Best Planting Practices

Time of application	Type of	Fertilizer	Applied amounts (kg/ha)		
WAP	fertilizer	rate (kg/ha)	N	P	K
4	NPK 15:15:15	150	22.5	9.81	18.675
8	NPK 15:15:15	150	22.5	9.81	18.675
12	urea	65.22	30		
16	MOP	52.62			26.31
20	MOP	52.62			26.31
	total		**75**	**19.62**	**89.97**

The analysed data from Oyo and Ogun were presented by Prof. Felix Salako of FUNAAB. There were no differences in cassava plant height at 8 WAP in Oyo State, between single and double plough irrespectively of secondary tillage, i.e. whether ridged or on flat soil (Fig. 9). There was no difference between ploughed and zero plough when the soil was ridged. Only in zero plough

without ridging plants were shorter than in all other tillage situations. In all tillage and density treatments a clear advantage of fertilizer application is visible.

The number of leaves at 8 WAP Oyo State (Fig. 10): leaf number per plant followed a similar pattern as the plant height. However, the advantage of fertilizer application did not show in the ridged treatments and was less pronounced in the flat soil treatments.

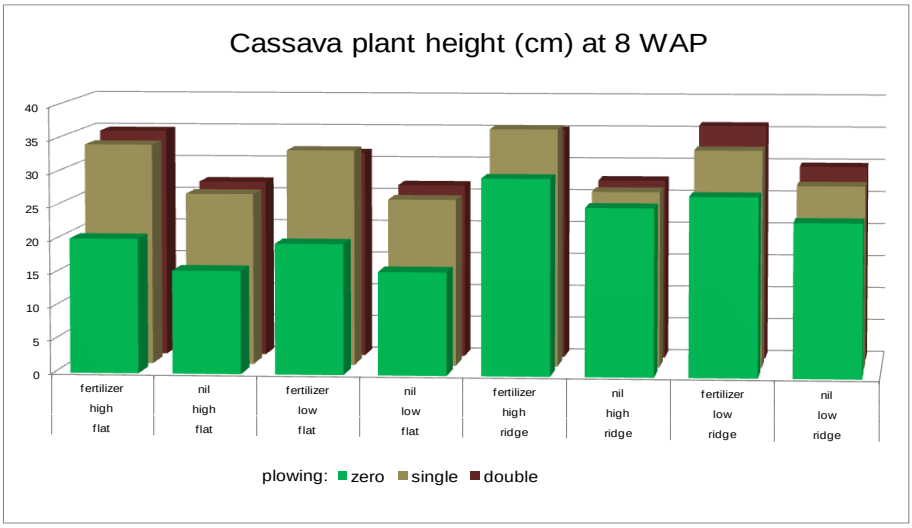


Fig. 9 Cassava plant heights (cm) at 8 WAP

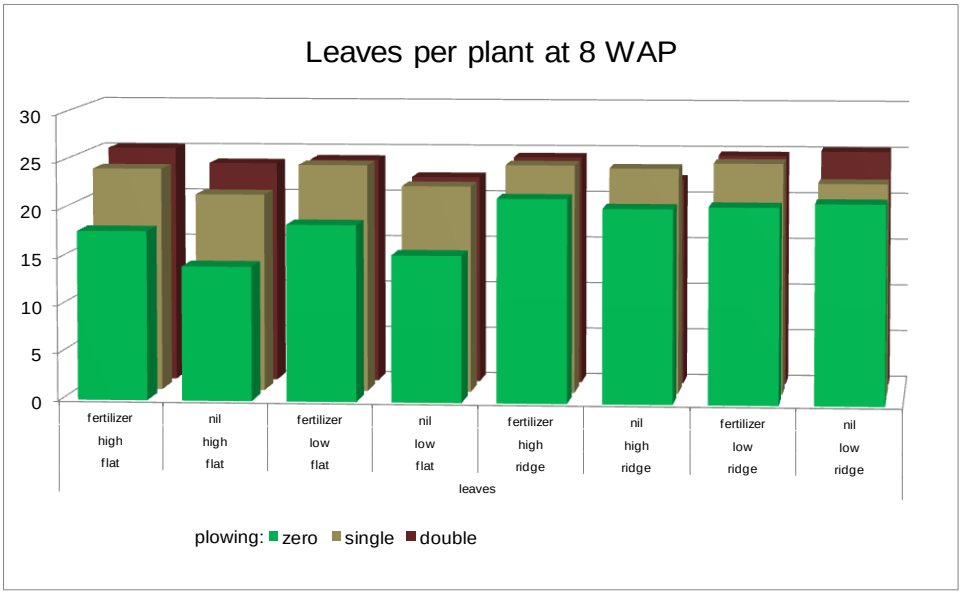


Fig. 10 Number of leaves per plant at 8 WAP

Plant height at 8 WAP Ogun State: The pattern in Ogun was similar to that in Oyo. Single plough produced the tallest plants, followed by double plough and shortest plants were found in zero plough (Figure 11a). The number of main stems was lower in the zero plough treatment than in the ploughed treatments (Figure 11 b). Light transmission measured by a ceptometer (at 16

WAP in Ogun) revealed that the single plough treatment intercepted more light than the double and zero plough treatments (Figure 11 c). Fertilizer application contributed significantly to a higher light interception (lower transmission) (Figure 11 d). This could be interpreted as a positive fertilizer effect producing more leaf area.

Across Oyo and Ogun State, the preliminary data indicate that double ploughing has no advantage over single ploughing. Considering the cost of two plough passages, there is a potential cost reduction by recommending single ploughing. Ridging on un-ploughed soil produced growth data that were similar to single ploughed treatment. Although the final harvest is still underway, there appears sufficient options to modify the tillage regime to reduce costs.

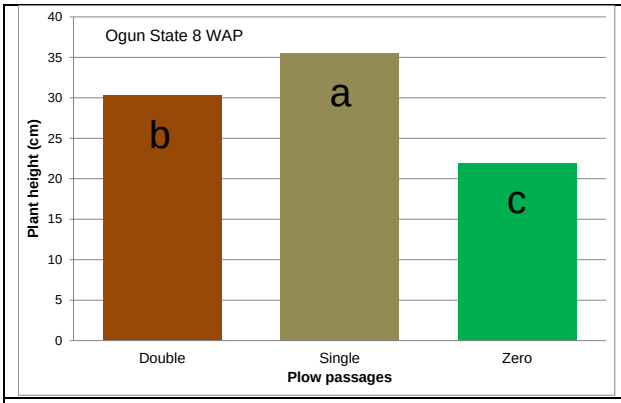


Fig. 11a Plant height

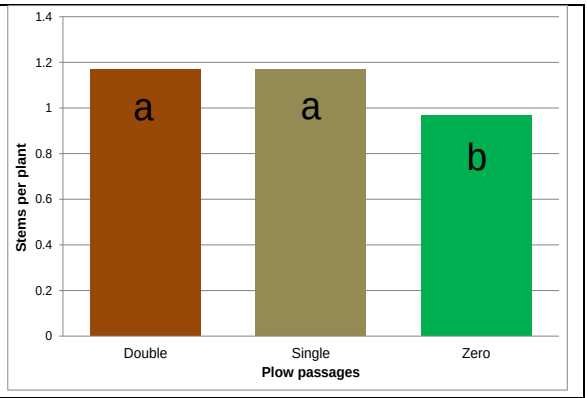


Fig. 11b Stem girth

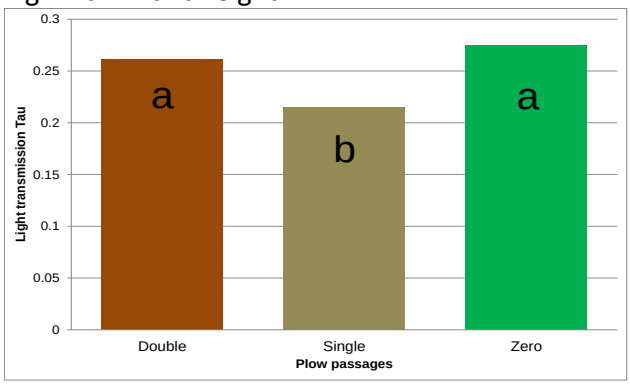


Fig. 11c Light transmission as affected by ploughing

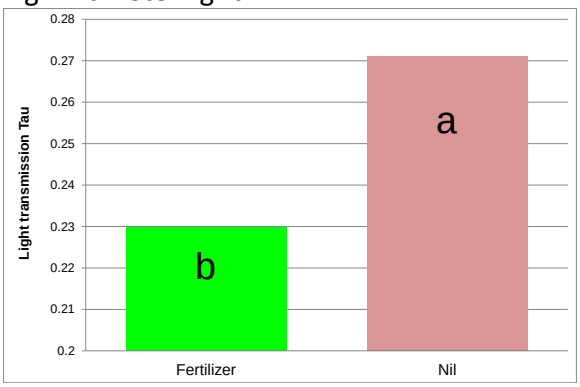


Fig. 11 d Light transmission as affected by fertilization

Comments, questions and recommendations

A major challenge noted was the lack of cooperation of farmers to weed in time and properly. The relative disadvantage of the un-ploughed treatment is most likely caused by the early and intensive weed infestation which led to farmers preferably weeding the less infested plots and thus introducing variation not related to the tillage, fertilizer, and planting density treatments imposed. Cow damage was noted very frequent in some areas, in others it was marginal but it

remains a problem everywhere. The issue of gender considerations particularly with regards to amelioration of drudgery was raised. It was generally perceived that appropriate recommendations for tillage will go a long way in addressing drudgery as well as profitability in cassava production.

Recommendations

1. *Consider gender issues in designing treatments with regards to reducing drudgery*
2. *Consider costs associated with the various treatments*
3. *Consider ways of effectively controlling weeds*

2.3 Rapid Characterization of cassava based farming systems in Nigeria and Tanzania.

Dr Mark Tokula of NRCRI made the presentation for both Nigeria and Tanzania. A total of 2016 households (987 in Nigeria and 1,029 in Tanzania) were interviewed. This exercise was mainly to gain an insight into the cassava cropping and value chain in the two countries ahead of the baseline survey. Some of the key findings included the prominence of cassava both as food (Table 2) and cash crop (Table 3) in the two countries, varied planting for monocrop (Table 4) and intercrop (Table 5); harvesting times (Table 6) for cassava as well as the glaring non or very low fertilization of cassava in Tanzania as well as in South Eastern Nigeria (Table 7).

Table 2 Main food crops grown in Nigeria and Tanzania

	location.project.zone					
mainFoodCrop	Lake zone	Eastern zone	Southern zone	Zanzibar	SE Nigeria	SW Nigeria
bambara	0.0	1.2	2.0	0.0	0.3	0.0
banana_(cooking)	0.3	0.6	0.1	17.7	0.0	0.0
banana_(sweet)	0.3	0.3	0.8	8.9	0.1	0.0
cashew	0.0	0.6	0.4	0.0	0.0	0.1
cassava	32.7	34.4	31.5	33.6	33.1	35.1
coconut	0.0	1.0	0.0	0.3	0.2	0.0
cocoyam	0.0	0.0	0.0	0.1	1.3	0.7
coffee	0.0	0.1	0.0	0.0	0.0	0.0
common_beans	3.4	0.0	0.0	0.0	0.9	0.9
cowpea	0.0	9.9	2.1	0.0	0.6	0.5
groundnut	0.8	0.0	1.9	0.1	0.3	0.6
maize	32.9	29.4	32.6	1.1	22.8	32.0
millet	0.3	1.1	0.3	0.0	0.1	0.1
NA	0.0	0.0	0.0	0.0	0.0	0.1
other	2.2	1.0	2.0	2.6	0.5	0.4
other_vegetables	0.0	0.0	0.0	0.4	0.1	2.4
peas	0.1	1.9	0.0	0.0	0.0	0.0
pigeon_pea	0.0	2.8	6.0	0.0	0.0	0.0
pineapple	0.0	0.1	0.0	1.4	0.0	0.0
plantain	0.0	0.0	0.0	0.0	0.3	0.1
potato	0.0	0.0	0.0	0.0	1.1	0.1
rice	14.1	10.8	8.6	26.6	5.8	0.8
sesame	0.1	2.4	0.1	0.0	0.0	0.0
sorghum	5.9	0.1	10.6	0.0	1.8	0.2
soybean	0.0	0.0	0.1	0.0	0.9	1.8
sugarcane	0.0	0.0	0.1	0.0	0.0	0.6
sweet_potato	6.7	1.9	0.8	5.6	2.1	1.9
tomato	0.0	0.0	0.0	0.0	0.5	5.3
watermelon	0.0	0.1	0.0	0.0	0.1	0.8
wheat	0.1	0.0	0.0	0.3	0.0	0.0
yam	0.0	0.1	0.0	1.1	27.2	15.9

Table 3 Main cash crops grown in Nigeria and Tanzania

location.project.zone mainCashCrop	Lake zone	Eastern zone	Southern zone	Zanzibar	SE Nigeria	SW Nigeria
bambara	0.2	0.8	4.2	0.0	3.1	0.0
banana_(cooking)	1.0	0.6	0.0	18.3	0.2	2.4
banana_(sweet)	0.5	0.5	0.6	7.6	0.4	3.7
cabbage	0.5	0.0	0.0	0.0	0.0	0.0
cashew	0.0	10.2	28.0	0.0	2.0	17.6
cassava	24.9	35.3	5.5	34.4	16.1	18.4
coconut	0.0	6.4	0.8	4.0	0.5	0.3
cocoyam	0.0	0.0	0.0	0.2	0.8	0.5
coffee	0.0	0.0	0.0	0.0	0.0	0.3
common_beans	3.5	0.0	0.0	0.0	1.6	0.0
cowpea	0.9	3.3	2.4	0.0	1.3	0.5
groundnut	4.2	0.3	11.3	0.2	7.6	0.6
maize	20.7	11.8	2.4	1.3	20.0	6.1
millet	0.5	0.3	0.3	0.0	0.6	0.3
NA	0.2	0.0	0.0	0.0	0.0	0.2
onions	0.5	0.0	0.0	0.0	0.2	0.0
other	13.7	3.0	11.7	14.2	5.6	21.9
other_vegetables	0.5	0.0	0.3	1.3	2.2	1.0
peas	0.0	2.4	0.0	0.0	0.0	0.0
pigeon_pea	0.5	1.9	18.5	0.0	0.5	0.0
pineapple	0.0	2.1	0.4	5.1	0.1	1.3
plantain	0.0	1.3	0.0	0.0	3.6	15.2
potato	0.0	0.0	0.0	0.0	0.7	0.0
rice	19.5	5.6	0.8	2.5	16.0	0.6
sesame	0.2	11.6	11.0	0.0	1.0	0.0
sorghum	2.8	0.0	0.6	0.0	2.3	0.0
soybean	0.0	0.0	0.0	0.0	6.1	0.5
sugarcane	0.2	0.0	0.0	1.5	0.1	2.3
sweet_potato	3.8	2.2	0.8	5.9	0.0	0.8
tomato	1.0	0.2	0.4	0.4	1.4	0.8
watermelon	0.2	0.2	0.0	0.4	0.2	0.5
wheat	0.0	0.0	0.0	0.2	0.0	0.2
yam	0.0	0.2	0.0	2.3	5.6	4.0

Table 4 Planting time for monocrop cassava in Nigeria and Tanzania

	Lake zone	Eastern zone	Southern zone	Zanzibar	SE Nigeria	SW Nigeria
January	1.0	0.0	13.2	2.9	0.2	1.3
February	5.7	9.5	0.0	0.8	0.0	5.0
March	3.8	19.0	1.5	20.9	2.5	12.8
April	16.2	0.0	0.0	23.8	41.2	25.3
May	3.8	0.0	0.0	14.2	33.9	13.3
June	1.9	0.0	0.0	7.1	15.1	11.2
July	0.0	0.0	0.0	5.4	3.4	7.3
August	0.0	0.0	2.9	4.2	1.0	8.1
September	13.3	4.8	5.9	7.9	0.6	7.6
October	25.7	61.9	5.9	10.5	0.7	3.1
November	18.1	4.8	44.1	0.8	1.3	3.4
December	10.5	0.0	26.5	1.3	0.0	1.6

Table 5 Planting time for intercropped cassava in Nigeria and Tanzania

	Lake zone	Eastern zone	Southern zone	Zanzibar	SE Nigeria	SW Nigeria
January	2.2	0.6	10.8	0.6	1.8	0.9
February	1.1	1.2	3.6	1.9	0.3	4.3
March	3.7	2.1	1.8	18.2	4.9	13.5
April	8.9	2.1	0.7	26.6	28.8	21.8
May	4.4	0.3	1.4	18.8	26.7	14.6
June	0.0	0.0	0.0	4.5	19.2	12.9
July	0.0	0.0	0.7	4.5	9.4	9.7
August	0.4	0.3	0.0	1.9	2.6	11.9
September	20.0	1.5	9.4	10.4	0.8	5.5
October	33.7	65.2	9.7	9.7	1.0	2.7
November	19.3	17.7	26.7	1.9	4.6	1.6
December	6.3	9.0	35.0	0.6	0.0	0.7

Table 6 Harvesting time for intercropped cassava in Nigeria and Tanzania

Lake zone	Eastern zone	Southern zone	Zanzibar	SE Nigeria	SW Nigeria
January	0.7	0.3	1.4	5.2	2.8	1.7
February	2.6	1.8	0.0	8.4	4.5	3.4
March	1.9	1.5	1.1	22.1	6.3	9.9
April	3.7	0.3	2.5	13.0	14.9	13.6
May	9.7	0.3	2.5	13.0	15.9	15.5
June	6.7	63.5	6.9	20.8	10.5	11.1
July	11.6	20.1	36.8	3.9	7.2	12.5
August	10.5	8.4	26.4	3.2	3.7	10.9
September	6.4	1.5	14.1	1.3	4.0	8.6
October	20.2	1.5	5.8	3.2	5.4	4.6
November	9.4	0.6	0.7	0.6	12.5	4.1
December	16.5	0.3	1.8	5.2	12.4	4.0

Table 7 Use of fertilizer in Nigeria and Tanzania

Lake zone	Eastern zone	Southern zone	Zanzibar	SE Nigeria	SW Nigeria
Urea MC	0.0	0.0	0.0	0.0	30.5	0.0
Urea IC	0.0	0.0	0.0	3.0	24.1	0.9
NPK MC	0.0	0.0	0.0	0.0	62.1	5.2
NPK IC	0.0	0.0	0.0	2.0	83.5	3.8
DAP MC	0.0	0.0	0.0	0.0	0.0	0.0
DAP IC	0.0	0.0	0.0	0.0	0.0	0.0
MOP MC	0.0	0.0	0.0	0.0	0.0	0.5
MOP IC	0.0	0.0	0.0	0.0	0.0	0.3
Other MC	0.0	0.0	0.0	0.0	2.6	0.5
Other IC	0.0	0.0	0.0	0.0	5.7	0.0

Comments, questions and recommendations

The presentation generated discussions around current farming practices and the need for increased production to meet the growing demand for cassava. It was noted that fertilizer utilization in cassava production is still low. The need for clear demonstration of the effective use of fertilization to boost cassava production was expressed.

The selection of Extension Agents as well as their distribution was discussed. The project team was urged to use the mainstream extension system of the governments so as to ensure sustainability. Similarly, the project team was encouraged to take into consideration women involvement and specific consideration of the youth in agriculture.

Recommendations

1. *Gender differences in the adoption of these technologies should be considered, their impact at household levels as well as issues of norms and values.*
2. *ACAI should establish links with the government extension system to ensure sustainability.*

2.4 Geographic Information Systems

Alex Verlinden of AfSIS gave an overview of how collaboration between ACAI and AfSIS is providing support for appropriate out scaling of technologies. This is mainly being achieved through the identification and delineation of trial sites to ensure that they are representative for potential extrapolation and out scaling. In addition, AfSIS is developing relevant geospatial layers crucial for extrapolation of results.

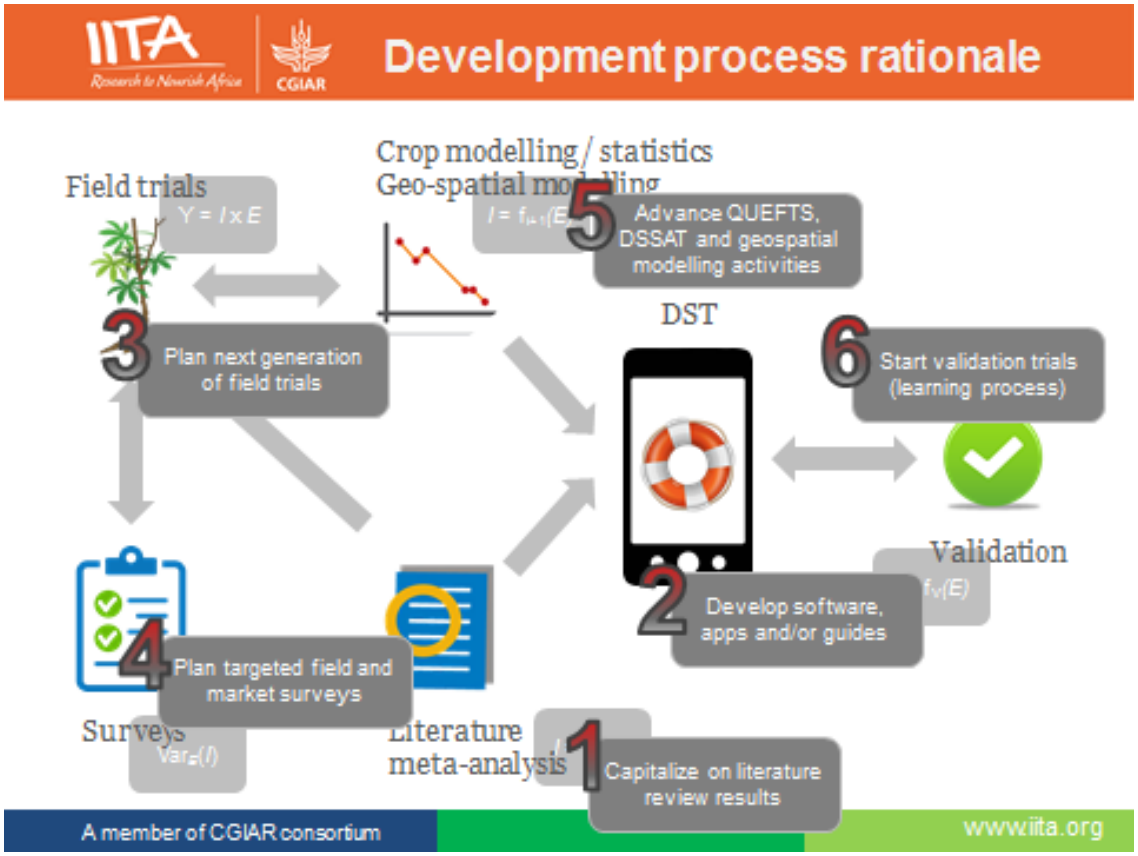
General comments and recommendations

1. *AfSIS' support should be more closely related to ACAI coverage areas and its use cases rather than general coverage of the countries even where ACAI is not operating.*
2. *Every effort should be made to use agro ecological zones rather than administrative boundaries in designating ACAI operational areas.*

2.5 Literature and development of V0 and V1 of the decision support tool

These presentations were made by Guillaume and Abdulai on behalf of Pieter Pypers. The two presentations outlined how existing knowledge (literature) will be relied on to guide the identification of gaps in the current ACAI initiatives which will in turn inform relevant investigations to find appropriate solutions for cassava farmers. The systematic use of experimental data coupled with modelling to inform the development of the tools was elaborated on. The steps involved were outlined as:

- Literature gathered, reviewed, and extracted
- Decision tree models developed
- First generation trials ongoing (mostly RM)
- Rapid characterization study conducted
- GIS-assisted sampling frames implemented
- Representativeness analyses conducted
- Harvest planned in February – May 2017. These results will inform the development of V1



Key issues and recommendations

Participants were impressed by the logical use of experimental data to develop versions of the respective tools for the use cases. However, there appeared to be some concern among some participants on the emphasis on electronically based tools.

Recommendations

1. *The project should consider diverse tools and including paper tools like fact sheets etc.*
2. *Capacity strengthening in data base management should be mainstreamed in the project*

2.6 Establishing cassava clusters

Mr James Watiti of CABI made a presentation on behalf of the African Soil Health Consortium (ASH-C). James informed participants that in collaboration with the ACAI coordinating team, scoping of cassava value chain actors was done in Tanzania and Nigeria. The forum was attended by various value chain actors including fertilizer producers, cassava planting material dealers, agrochemical dealers, cassava producers (farmers and farmer groups), cassava processors – starch, bread, other products, extension service providers – both government, private companies and NGOs, agricultural information service providers, and credit institutions. The forum achieved the following key outputs: Identified critical gaps in knowledge products and information; Identified appropriate dissemination pathways and key dissemination

partners; Defined project clusters and operation modalities; and identified and agreed on key elements of effective campaigns

Key issues and recommendations

Discussions revolved around the definition of a cluster and what actually constitutes a cluster. The issue of ACAI focusing on production while keeping in view the entire cassava value chain was raised. There was an indication that a geographical connotation with value chain actors would more appropriately serve as a cluster. It was also made clear that ACAI focuses on reducing the cassava yield gap but it should be noted that increasing cassava production has implications on the cassava value chain.

Recommendations

1. *There is need for a clear cluster definition within the ACAI/CABI initiative*
2. *ACAI should have in view the cassava value chain in increasing cassava production.*

3. Implementation framework for 2017 cropping season: Work plans for use cases

This section covers plans for the implementation of project activities during the 2017 cropping season. Participants were divided into groups based on the use cases. Each group was led by the use case leader, and provided with an implementation framework based on year one results obtained as at December. Each group was requested to identify and discuss key activities related to the use case to inform implementation and budgeting for 2017. Roles and responsibilities of partners were also to be identified as well as time frame for implementation.

3.1 Fertilizer recommendation and blending

General implementation framework

1) Nutrient omission trials to quantify **nutrient limitations**
2) Fertilizer response trials to establish **response curves**
   [integrated into the nutrient omission trials – see Tanzania planning meeting]
3) Surveys including leaf sampling to assess deficiencies in farmers' fields based on comparison with **nutrient norms**
4) Predict soil nutrient stocks and potential yield, and extrapolate across target intervention area using **geospatial modelling** techniques
5) Advance **QUEFTS modelling** and integrate into V1 Decision Support Tool (DST)
6) Conduct **validation trials** on V0 and consider fertilizer response assessments in fields established by farmers [mainly as a learning exercise for year 3 activities]

Fertilizer Recommendation/Blending

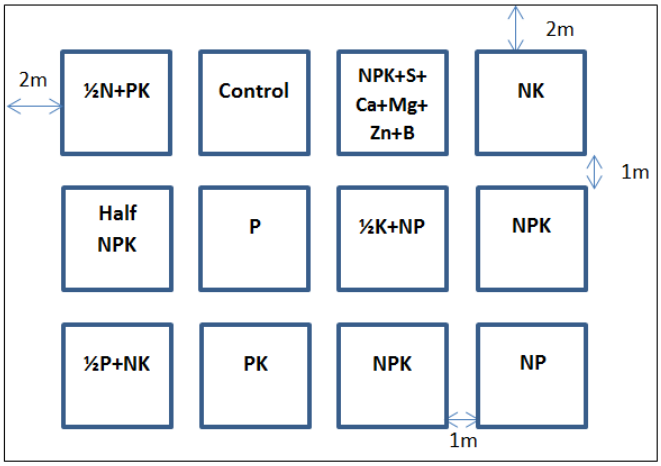
Trial	Country	Number of sites	Observation/Remarks
NOT	Nigeria	300 (180 SE, 120 SW)	50% Classic (8 plots), 50% Upgraded (12 plots)
	Tanzania	300 (120 LZ, 100 SZ, 80 EZ)	50% Classic (8 plots), 50% Upgraded (12 plots)
Validation	Nigeria	300 (180 SE, 120 SW)	30% on fertilizer response assessments in fields established by farmers
	Tanzania	300 (120 LZ, 100 SZ, 80 EZ)	

Activities needed for fertilizer blending (FB)

1) Nutrient omission trials to quantify nutrient limitations [overlapping activity with FR use case]

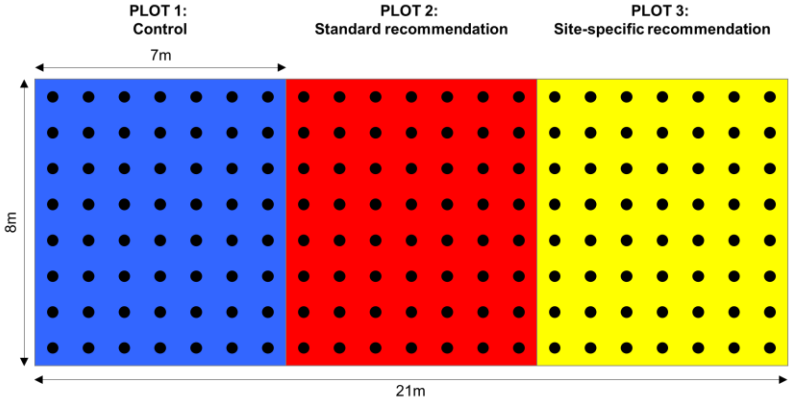
2) Surveys including leaf sampling to assess deficiencies in farmers' fields based on comparison with nutrient norms [overlapping with FR use case]
3) Geospatial analyses to map nutrient limitations (based on trial data, soil maps and surveys with leaf sampling and comparison with nutrient norms)
4) Current availability and prices of fertilizer by type (market survey)
5) Compile results for the private sector partner (format?) to develop prototype best blends that are competitive (for the farmer and the blender), to allow starting validation activities in year 3 [led by the private sector partner] and explore potential for new partnerships to generate demand for fertilizer

Upgraded Nutrient Omission Trials (Lead: ARI in TZ, NRCRI and FUNAAB in NG)



- Data collection as in year 1
- Researcher managed on-farm

Validation" Trials (Lead: ARI in TZ, NRCRI and FUNAAB in NG)



- Management by farmer with EA support
- Input provided by the project
- Minimum data collection (site description, management operation records, final yield data)

Time frame and responsible parties

ID	Activities for Nutrient Ommission Trials (classic and upgraded) and Validation Trials (including farmers' field fertilizer response assessment)	Country	Jan	Feb	Mar	Apri	May	June	July	Aug	Sep	Oct	Nov	Dec	Leader	Partners
1	**Project sensitization**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
2	**Site selection**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
3	**Collecting and sending Soil Samples**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
4	**Trials establishment**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
5	**Sprout count and gap filling (2 WAP)**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
6	**Weeding**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
7	**Fertilizer application (P at planting, N and K at 4WAP, 10WAP, 16WAP)**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
8	**Non destructive data collection -morphological and disease (4, 10,16, 30, 44WAP)**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
9	**Intermediate harvest (16 WAP)**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
10	**Collecting and sending Leaf Samples (16WAP)**	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
11	**Final Harvest (44WAP)- *For 2016 trials***	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA
12	Baseline Survey	Nigeria													NRCRI, FUNAAB	SG2000, Notore, OyNCGA
		Tanzania													ARI	MEDA, LGA

13	**QUEFTS Modelling to arrive at V1**	Nigeria													IPNI	
		Tanzania														
14	**Predict soil nutrient stocks and potential yield, and extrapolate across target intervention area (Geospacial modelling)**	Nigeria													AfSIS/IITA	IPNI
		Tanzania														
15	**Leaf Sample Analysis**	Nigeria													IPNI	IITA
		Tanzania													IPNI	IITA
16	**Soil Sample Analysis**	Nigeria													IPNI	IITA
		Tanzania													IPNI	IITA

3.2 Intercropping (IC)

General implementation framework

1) **Narrow down IC options** to consider (based on questions recorded in V0 survey and year 1 trial results)
2) Repeat **trials** on few best-bet IC options [Not necessarily an exact repeat of year 1 trials, drop poor performing treatments and introduce new potentially better-performing options. Retain a 'standard current practice']
3) Develop protocol for **fresh grain yield** assessment
4) Consider a **survey** (integrated in baseline and panel surveys) on current intercropping practices?
5) Build **decision tree models** (regression or classification) and consider the need for a geospatial component, as a basis for the V1 DST

Planned activities and timing

	Activity	**Date**
1	Finalize data entry and upload (Site description and non-destructive plant measurements) for 2016 trial	Ending of January
2	GIS Sampling Frame	Ending of January
3	Preparation, circulation of draft sampling / protocol	First Week of February
4	Three days joint workshop on field Implementation and protocol discussion (NRCRI FUNAAB, SG 2000 and 2 Scale) at NRCRI Umudike	20th February
5	Site selection	Ending of February
6	Trial establishment	March (subject to rainfall)
7	2016 trial cassava harvest	March - May
8	Trial (2017) management, data collection/monitoring	March 2017 to Feb 2018

Responsibilities per stakeholder

ACTIVITY	**IITA**	**NRCRI/FUNAAB**	**SG2000/ 2SCALE**
GIS Cluster identification	+		
Protocol and sampling frame draft	+		
Site selection		+	+
Soil sampling		+	
Trial establishment		+	+

Trial management/monitoring		+	+
Data collection (including leaf sampling)		+	+
Training of NARS Scientists in data analysis	+		
Data Analysis	+	+	
Laboratory analysis(soil/plant)	+		
Coordination /Monitoring/backstopping	+		

3.3 Best planting practices

General implementation framework

1) **Narrow down PP options** to consider (based on questions recorded in V0 survey and year 1 trial results)
2) Repeat **trials** on few best performing PP options [Not necessarily an exact repeat of year 1 trials, drop poor performing treatments and those causing high cost without appropriate benefits and introduce new potentially better-performing options + retain a 'standard current practice']
3) Assess **cost** of land preparation operations, including impact on cost of weeding operations
4) **Monitor at Psaltry farm** effects of tillage and ridging operations on cassava yield, consider other possibilities for observational studies (surveys)
5) Build **decision tree models** (regression or classification) and consider the need for a geospatial component, as a basis for the V1 DST

The proposal for 2017 is to remove the double plough treatment. Thus the no-plough and the single-plough treatments will be retained. The two planting densities may not be required. Data from the CWMP indicate that a higher than 10000 plants / ha density is more likely to produce higher yields. The proposal is to plant the trial only with 12500plants/ha. The challenges of insufficient weed control by the participating farmers needs to be tackled and this should be done in a rigorous manner. It is proposed to introduce a herbicide based weed control treatment to be compared with the farmers' weed control approach. Due to dropping the double plough treatment and reducing the planting density to one level, there will be a reduction from 24 to 16 plots per replicate, while introducing the weed control treatment as a full factor. The actual treatment will be determined in collaboration with the CWMP staff. The trial will thus serve in addition as a demo to farmers showing the effects of well chosen and correctly applied herbicides.

1. Reduce cost of land preparation and crop establishment

Keep single and zero plough; (stop double ploughing)
Double ploughing – often done to control weeds and has no advantage over single ploughing.
The disadvantage of zero ploughing can be balanced by ridging.

2. Reduce risk of erosion and other soil physical degradation

Engage the farmers and tractor operators earlier to plough across the slope.

3 Establish optimal planting density

Depending on final harvest results, reduce to 1 density (most likely 12500 ha^{-1})

4. Assess fertilizer response x tillage, as here a synergy may permit further cost reductions.

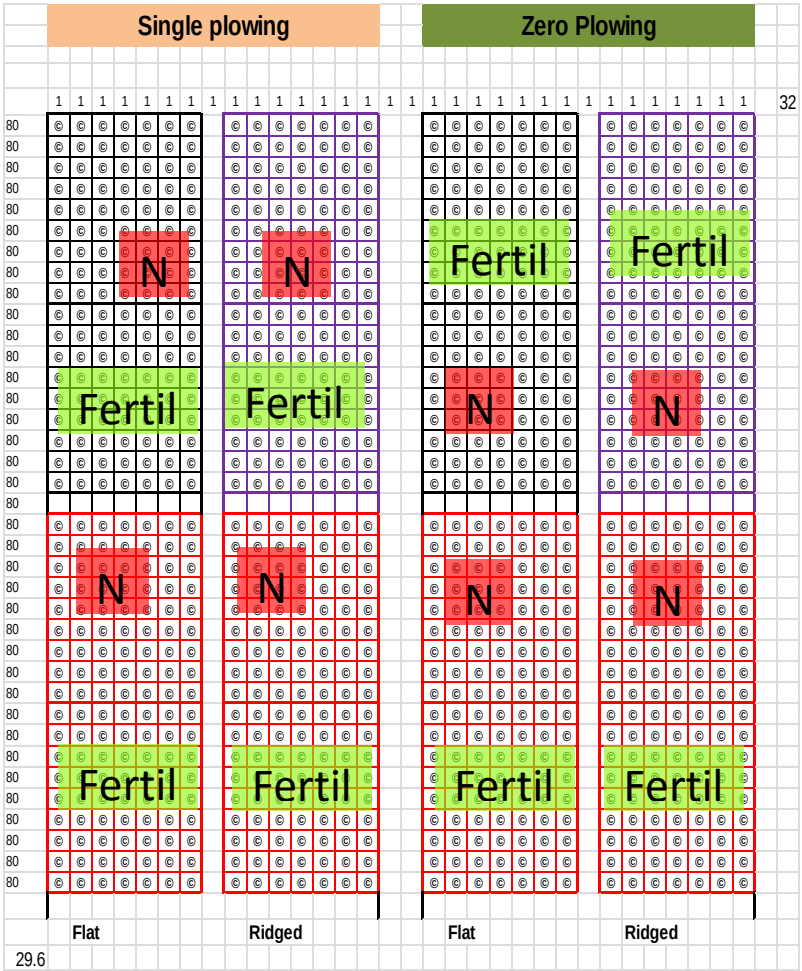
5. Add a weed control component either as a treatment or integrate observations on weed control and weed infestation.
Adjust fertilizer composition and rate according to results of FR and BPP trials.

Factors to be tested -

(1) Ploughing – 2 levels: zero, single
(2) Shaping the soil – 2 levels: flat soil versus ridging
(3) Fertilizer – 2 levels: Nil versus 75:20:90 kg ha^{-1} N, P, K
(4) Weed control

Planting density – fixed: 12500 ha^{-1}

At 2 levels of ploughing, a full treatment set (1 replicate) is 16 plots. With early engagement and plough tillage at the charge (choice) of the farmer we need to convince them to **not plough** a sufficiently large portion of their future cassava field so the Zero plough treatment can be installed



Farmers may choose to have two plough treatments in different sites as long as field history is the same or very similar. Preference will be given to sites where the 2 plough treatments are in immediate neighbourhood.

Ridging has to be done across the slope. Fields will be selected on the basis of permitting erosion control through appropriate tillage operations. Where requested and possible, plots will be larger than in 2016. Space between treatments will remain as small as possible to reduce border effects and weed infestation.

Time lines

January and February
Hold planning meetings with NARS and development partners.
Site selection / drop and select new LGAs and EAs
Identify future cassava sites of all participating farmers
Explain in detail the trials, objectives and responsibilities to farmers
Flag the plough treatments in the future cassava fields
Plan the training of the EAs or other person as Spray operator
March
Peg trials in Sites that were already ploughed.
Assess if pre emergence herbicide is advisable and treat.
Prepare for the final harvest of the 2016 planted trials.
April
Conduct the final harvest – start planting if rains permit
Enter harvest data immediately to get results and do adjustments based on results.
May
Continue planting
Thereafter, evaluations according to calendar

3.4 Scheduled planting

The proposal remains the same but a new trial will be setup with more detailed and frequent measurements for DSSAT calibration (12 plantings, 6 harvesting and 2 varieties).

2017 Use case work plan

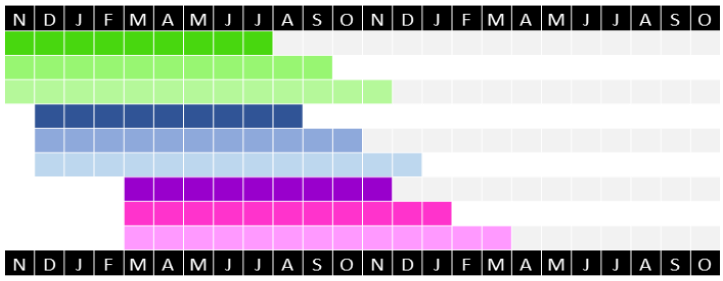
General implementation framework for scheduled planting

1) Continue ongoing trials (at least 4 successful planting events in each site)
2) New trial with more detailed and frequent measurements for DSSAT calibration [propose: 12 plantings x 6 harvesting times for 2 varieties at PSALTRY]
3) Monitor yields around Psaltry (where cassava is planted and harvested throughout the year, and management ± homogeneous)
4) Monitor yields in farmers' fields (survey with ~3 harvest times in same field)
5) Collect rainfall data (weather station at PSALTRY, rain gauges elsewhere)
6) Predict yields based on rainfall regime (DSSAT modelling), extrapolate across target intervention area (geospatial modelling) and integrate into the V1 DST

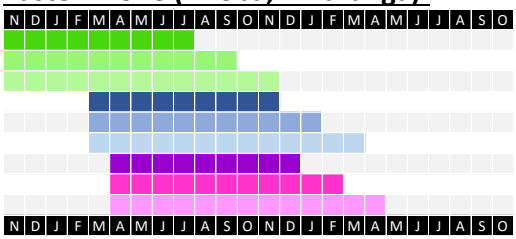
Activities needed for scheduled planting (SP)

1) Continue ongoing trials (at least 4 successful planting events in each site) with 12 trials in Tanzania and 6 trials in Nigeria with 3 planting and harvest dates in Tanzania and 4 planting dates and 3 harvesting dates in Nigeria.
2)

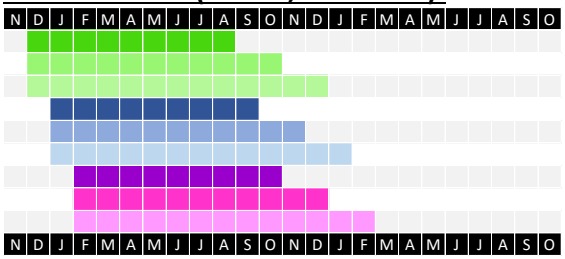
Lake zone (Kiroba, Mkombuzi):



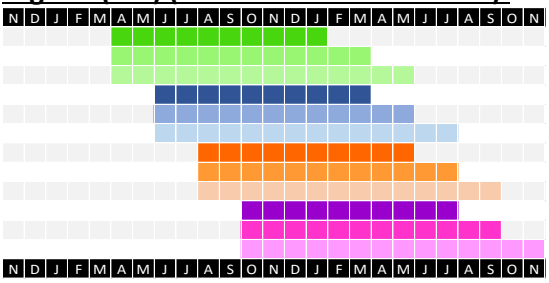
Eastern zone (Kiroba, Mkuranga):



Southern zone (Kiroba, Kizimbani):



Nigeria (SW) (TME 419 and TMS 30572):



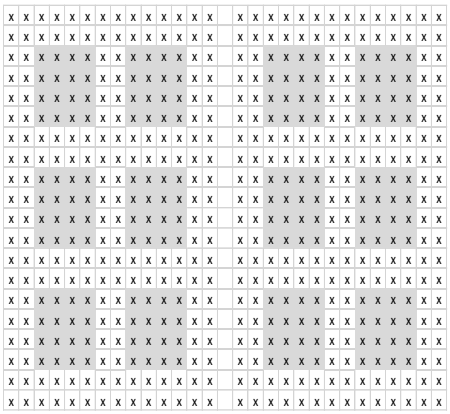
2 New trial with more detailed and frequent measurements for DSSAT calibration [propose: 12 plantings x 6 harvesting times for 2 varieties at PSALTRY]

Months to harvest

	3	5	7	9	11	13
4	7	9	11	1	3	5
5	8	10	12	2	4	6
6	9	11	1	3	5	7
7	10	12	2	4	6	8
8	11	1	3	5	7	9
9	12	2	4	6	8	10
10	1	3	5	7	9	11
11	2	4	6	8	10	12
12	3	5	7	9	11	1
1	4	6	8	10	12	2
2	5	7	9	11	1	3
3	6	8	10	12	2	4

2017
2018
2019

Two varieties and six harvest times



3 Monitor yields around Psaltry (where cassava is planted and harvested throughout the year, and management ± homogeneous)

4 Monitor yields in farmers' fields (survey with 3 harvest times in same field)
To be defined (by IITA and partners):

Activity	
1)Continue ongoing trials (at least 4 successful planting events in each site)	
Site selection	CAVA-II, FUNAAB, PSALTRY, ARI
Inputs (seeds, fertilizer)	IITA, CAVA-II
Management	
Establishment (land preparation, planting)	farmers, FUNAAB, PSALTRY, ARI
Maintenance (weeding, herbicides application)	farmers, FUNAAB, ARI
Fertilizer application	FUNAAB, ARI
Data collection	
Rainfall	CAVA-II
Non-destructive measurements	FUNAAB, ARI
Harvesting	FUNAAB, PSALTRY, CAVA-II, ARI
2)New trial with more detailed and frequent measurements for DSSAT calibration	
Data collection	FUNAAB, ARI
3)Monitor yields around Psaltry	PSALTRY
4)Monitor yields in farmers' fields	CAVA-II, FUNAAB, ARI

5 Protocol to estimate the yield (including No. plants and area).

6 Collect rainfall data (weather station at PSALTRY, rain gauges elsewhere)

7 Predict yields based on rainfall regime (DSSAT modelling), extrapolate across target intervention area (geospatial modelling) and integrate into the V1 DST

3.5 High Starch content

General implementation framework

1) Measure starch content in **samples from ongoing trials** [proposed: gravimetric in FR-NOT1, IC-RMT1, PP-RMT1 and SP-RMT1, lab analyses in SP-RMT1]
2) Monitor yields and **starch content in fields around Psaltry** (where cassava is planted and harvested throughout the year, and management ± homogeneous) [overlaps with SP activities]
3) Monitor yields and **starch content in farmers' fields** (survey with ~3 harvest times in same field) [overlaps with SP activities]
4) Record **starch content for incoming trucks at Psaltry** along with location from which truck came and approx. planting date
5) Collect **starch samples from produced at Psaltry** (~5-10 samples daily) for assessment of starch quality and $d^{13}C$ signature (drought stress)

4.0 Baseline survey

The projects baseline surevey scheduled for 2017 was presented by Alote representing the project's ME&L officer. The expectation is that any reasonable impact evaluation must have at least two data collections, the baseline and a post intervention data collection. More rounds of data collection are useful as well in determining the trend and keeping in track of the short term outcomes. The baseline should be administered to be able to cover the information on the previous agricultural year that did not have the intervention. The ACAI annual surveys as well as the penultimate post intervention survey will have to be administered two times, one will be in the beginning of the year to check on planting practices and the other after the main season is over to avoid farmers having long recall periods. This also applies to the intervetions that use the staggered tool.

The target group are cassava farmers who are dealing with ACAI local partners (cutoff score). It is assumed the partners already have records of participating farmers and will serve as sample frame for treatment group (confirmed by partners just at the start of baseline). ACAI project will identify control groups from selected non participating communities/regions through the process of listing (identify and generate a list of cassava farmers in the region and close to the region). The listing process will be conducted in conjuction with the local groups, to aid in identification of cassava farmers and their characterization with the aim of matching them with treatment group. With this process the risk of selection bias is eliminated as each farmer has an equal chance of being selected.

Treatment group	**Control group**
• Must be a cassava farmer • Active farmer working with the partner • Must be living in the region that the partner covers	• Must be a casava farmer • Not a member with any partner • Must be living close to the region that the partner is operating

Nigeria Sample (Total 2,880)

Partners in Nigeria	**Regions**	**Treatment type**	**Treatment group sample**	**Control group sample**
SG2000	Cross river , Anambra, Benue	Fertilizer recommendation / Fertilizer blending	180	180
		Intercropping	180	180
Notore*	Oshun, Edo, Oyo	Fertilizer Blending/Fertilizer recommendation	180	180
OYSCGA	Oyo	Intercropping	180	180
		Best Planting Practices	180	180
		Staggered planting	180	180
CAVA-11	Ogun	Best Planting Practices	180	180
Psaltry	Oyo	Staggered planting	180	180

Tanzania Sample (Total sample 1,440)

Partners in Tanzania	Regions	Treatment type	Treatment group sample	Control group sample
CAVA	Pwani, Lindi, Shinyanga, Mara	Staggered planting	180	180
FCI	Unguja	Intercropping	180	180
Minjingu*	Shinyanga, Lindi	Fertilizer blending	180	180
MEDA	Mara, Lindi	Fertilizer Recommendation	180	180

Key issues and recommendations

The key talking point on the baseline was when it should be conducted. The main issue was whether it should be conducted at the initial stages of the project or any other relevant time. There appeared to be a general tendency that the base line could be done at the initial stages, however, in the case of ACAI it was agreed that it should be implemented just before the tools are developed and introduced to the stakeholders.

Recommendations

1. *The baseline should be conducted prior to the intervention that is just before the tools are introduced*
2. *The panel data should be selected properly*

5.0 Feedback from development partners

This session was aimed at having feedback from development partners who are crucial in implementing ACAI project activities in the project countries. The key intention is to inform the Project Management Team on how effectively these partners could be engaged so that the expected results could be achieved.

5.1 Feedback form Tanzanian development partners

This presentation was made by Wiston Mwombeki of Farm Concern International (FCI) in Tanzania

Strengths and opportunities

- ***Project design and approach*:** Unlike other research based projects, ACAI took a difference approach by involving key players (development partners, Extension agents, farmers, Scientists, and government); the involvement of these stakeholders predicts the success and sustainability ACAI work
- ***Demand driven focus*:** ACAI deals with real needs from the grassroots; not hypothetical issues.
- ***Continued involvement of partners*:** This is being done through monthly Project Management Meetings (PMT), Review and planning meetings, and involvement of partners in field activities
- ***ACAI is a learning platform for partners*:** learning is happening in various forms such as meetings, tools development, exposure, data collection, and packaging of information
- ***Avoiding handout syndrome*:** Our people though may be complaining, yet this is a good approach which may bring out anticipated value to the community.
- ***Once the goal of ACAI is attained*;** it will result into; income to SHF, food security solution, business opportunity through value addition, and reliable supply to the industry.
- ***The trained candidates through ACAI*** will bring value to the community once they graduate.

Areas of improvement

- ***Collision of activities*:** Though efforts are being taken to reduce this, yet it happens that sometimes ACAI activities collides with other project's activities.
- ***Conflicting objectives on resource allocation between farmers and ACAI project*:** some farmers would like to be compensated for their land use and time, while ACAI objective is to use available resources for farmers own learning and development.

5.2 Feedback form Nigerian development partners

This presentation was made by Chris E. Okoli of SG 2000 in Nigeria

STRENGTHS:

- Trained human resources –specialists in cassava production.
- Identified areas of comparative advantage for cassava production for the conduct of the trials and demonstration.
- Involvement of development partners in the implementation of the project.
- Formation of ACAI management team and PAC to oversee the activities of the project .

WEAKNESSES:

- High ratio of EA/number of trials.
- Late supply of inputs and materials for the trials.
- Inadequate trainings of the stake holders especially EAs.
- Absence of zonal coordinators in the structure of supervision
- Inadequate local transport allowances for the EAs and absence of the state coordinators from allowances/logistics.

OPPORTUNITIES:

- Development of soil specific nutrient mgt. practices for cassava production.
- Development of cumulative options of intensification in the current Cassava /maize intercropping system
- Increase the yield potential in Nigeria.
- Capacity building of the extension staff and farmers.

Key issues and recommendations

The feedback session was greatly appreciated by participants within the context of transparency. It was a general consensus that the feedback will greatly assist the project team to improve partnership engagement and fine-tune project implementation. Nevertheless, the Project team reiterated the ACAI philosophy of engaging existing partners within their existing areas of operation. It was emphasised that ACAI will continue to support activities of development partners directly related to the ACAI project activities while salaries of extension agents will be covered by the development partners.

6.0 Closing ceremony and recommendations from the Project Advisory Committee

The PAC met during the afternoon of December 6, 2016 to deliberate on the proceedings of the workshop while the other participants were engaged in working groups to plan for activities to be implemented during 2017. The PAC again met in the morning of December 7, 2016 to finalize recommendations to the PMT and other stakeholders as well as plan for subsequent meetings and modalities for effective outcomes of such meetings. The following were the recommendations proposed by the PAC. The recommendations were presented by the Chairperson of the PAC Dr Linley Chiwona-Karltun, of the Swedish University of Agricultural Sciences.

1. **Soil testing and utilization of results**: The PAC notes that soil analysis data is being awaited by research teams to interpret research results. The PAC recommends that in addition to informing interpretation of the results, the soil analysis results should also inform the design of subsequent trials.

2. **Baseline survey**: The PAC notes that the planned timing of the baseline survey of the project for 2017 as well as the framework for its implementation needs refining. There is also need for clarity as to what the baseline will do. The PAC recommends that sampling needs to be well defined to avoid undue bias towards farmers associated with the project. There should be an equal chance of representation by members of the community. Thereafter, the panel surveys can target participants and non-participants. The baseline should be done shortly before commencement of the intervention activities.

3. **Fertilizer as a factor across use case trials**: The PAC notes that while Nutrient Omission Trials (NOT) were designed to appropriate fertilizer recommendation for cassava under the monocrop system, other use cases are also having fertilizer as a factor, but with limited options. The PAC suggests that the other use cases should avoid fertilizer treatments and focus on the key effects they are testing, for example, different tillage methods for Better Planting Practices and crop densities and land use efficiency for the Intercropping use case. Once an appropriate recommendation for cassava is obtained from the fertilizer trials, then this could be considered in the other use cases.

4. **Youth involvement**: The PAC notes the absence of due consideration of youth in the ACAI proposal. In view of the need to engage youth in agriculture in Sub-Saharan Africa, the PAC encourages the project team to consider initiatives that would enhance youth involvement along the various points of the cassava agronomy project as well as benefiting from the results.

5. **Effective linkage with the extension system for sustainability of ACAI gains**: The PAC notes that ACAI is linked to farmers through extension agents of collaborating development partners in both Nigeria and Tanzania. The PAC recommends that ACAI should continue to explore avenues for sustainable continuation of the project goals beyond the lifetime of the project by incorporating community based extension service providers particularly those actively working with and linked to government agricultural systems.

6. **Planting materials:** The PAC notes the issue of unavailability of planting materials from the rapid characterization survey in Nigeria. The PAC also notes the importance of planting material in cassava production. The PAC further notes the existence of the foundation

supported efforts (BASICS in Nigeria and MEDA in Tanzania) in improving seed supply in the cassava sector. The PAC encourages the ACAI team to strengthen linkages with sister foundation project as well as other partners to address the issue of cassava planting materials.

7. **Need to diversify extension decision-making tools**: The PAC notes the emphasis on IT applications as decision support tools. In as much as the PAC welcomes the use of IT, the PAC encourages the team to consider diversification of the decision-making support tools as much as possible.

8. **Streamlining field measurements**: The PAC notes that considerable data is been collected. The PAC suggests consideration of strategic data collection to improve efficiency in field experimentation.

9. **Gender norms and gender relations:** The PAC notes the ACAI project document's consideration of 30% women involvement in project activities. The PAC applauds this consideration and encourages the project team to be aware of the impact that the project may have on gender norms and gender relations while implementing the project. The PAC would like the team to keep in mind how gender relations would be influenced by the technologies that would be developed by the project. In addition, it would be necessary to solicit either through surveys or socio economic studies the potential effect of the technologies on gender norms and relations.

10. **Geospatial analysis**: The PAC notes the importance of geospatial data and information in ACAI. The PAC encourages the project team to continue producing appropriate geospatial maps that will lead to effective decision making and achievement of results

11. **Partnerships:** The PAC notes the already diversified nature of the ACAI partnerships. The PAC encourages the team to continue the existing partnerships and to also explore and include other partnerships beyond sister foundation funded projects particularly other value chain actors. In Nigeria, the agricultural offices in Local Government Area initiatives in extension services should be exploited to strengthen sustainability beyond the project lifespan. Similar efforts should be undertaken in other participating countries.

12. **Integration of weed management in ACAI in Tanzania**: The PAC notes that weed control is an issue with farmers participating in ACAI trials. The PAC also notes the progress already made in the sister Weed Management project in controlling weeds and reducing the burden through mechanisation on women while increasing cassava production. The PAC would encourage the ACAI team to consider incorporating weed management in its field trials particularly in Tanzania where the current weed management project is not under way. ACAI should actively engage with the government of Tanzania to solicit required financial support for technical implementation and staffing and submit a revised budget to the foundation for consideration.

13. **Collaboration with other initiatives to disseminate results beyond current project countries**: The PAC notes the potential of ACAI to impact cassava production in the current countries as well as other countries on the continent. The PAC would recommend that ACAI through IITA explores the possibility of attracting other funding sources such as the Technologies for African Agricultural transformation (TAAT) to extend ACAI results to other countries as well as integration with other regional agricultural programmes.

7.0 Annexes

7.1 Program

DAY 1: December 5, 2016		Responsible person
SESSION I	**OPENING CEREMONY & OVERVIEW OF PROJECT IMPLEMENTATION**	**CHAIR: R. ASIEDU (IITA)**
08.00 – 08.15	Registration	Project Administrator
08.15 – 08.40	Official opening ceremony: Statements by i. Bernard Vanlauwe ii. Lawrence Kent iii. Nteranya Sanginga, DG IITA	
08.40 – 09.00	An overview of ACAI and progress in implementation including partnerships and capacity strengthening	Abdulai Jalloh, Project Coordinator
09.00 – 09.10	Discussion	
09.10 – 09.30	Report on cassava clusters and discussion	ASH-C/CABI
09.30 – 09.50	Monitoring and Evaluation Report	Theresa Ampadu
09.50 – 10.00	Discussion	
10.00 – 10.10	Group Photograph	Godwin Atser
10.10 – 10.30	**BREAK**	
SESSION II	**REPORT & DISCUSSION ON FERTILIZER RECOMMENDATION & BLENDING**	**CHAIR: INNOCENT OKUKU (NOTORE)**
10.30 – 10.50	Introduction to nutrient omission, fertilizer response trials, validation trials and QUEFTS modelling	Guillaume Ezui
10.50 – 11.10	Results from Nigeria (S. West & S. East)	Yemi Olojede
11.10 – 11.20	Discussion	
11.20 – 11.40	Results from Tanzania (Lake zone, South & Eastern zones)	Peter Mlay
11.40 – 12.00	Discussion	
12.00 – 13.00	**LUNCH**	
SESSION III	**REPORT & DISCUSSION ON INTERCROPPING & PLANTING PRACTICES**	**CHAIR: CHRIS OKOLI (SG2000)**
13.00 – 13.15	Introduction of cassava/maize intercropping	Christine Kreye
13.15 – 13.35	Results from Nigeria	Innocent Onyekwere
13.35 – 13.55	Discussion	
13.55 – 14.10	Introduction to cassava/sweet potato intercropping	Veronica Uzokwe
14.10 – 14.30	Results from Tanzania	Haji Saleh
14.30 – 14.45	Discussion	
14.45 – 15.00	Introduction to Best Planting Practices	Stefan Hauser
15.15 – 15.35	Results from Nigeria	Felix Salako
15.35 – 15.45	Discussion	
15.45 – 16.00	**BREAK**	
SESSION IV	**REPORT & DISCUSSION ON SCHEDULED PLANTING & HIGH STARCH**	**CHAIR: LOYCE KAITIRA (CAVA-II)**
16.00 – 16.10	Introduction to Scheduled Planting	Pieter Pypers
16.10 – 16.30	Results from Nigeria	Felix Salako
16.30 – 16.45	Discussion	

16.45 – 17.05	Results from Tanzania	Geoffrey Mkamilo
17.05 – 17.15	Discussion	
17.15 – 17.35	Progress with DSSAT crop modelling	Patricia Moreno
17.35 – 17.45	Discussion	
18.30 – 19.30	**WELCOME COCKTAIL – I-HOUSE TERRACE**	
DAY 2: December 6, 2016:		
SESSION V	**GIS ACTIVITIES, RAPID CHARACTERIZATION & BASELINE SURVEY**	**CHAIR: SANI LATEEF (CAVA-II)**
08.00 – 08.20	GIS sampling frames and geospatial modelling	Alex Verlinden
08.20 – 08.30	Discussion	
08.30 – 09.00	Rapid characterization – Nigeria and Tanzania	Mark Tokula
09.00 – 09.10	Discussion	
09.10 – 09.50	Baseline studies	Theresa Ampadu
09.50 – 10.00	Discussion	
10.00 – 10.30	**BREAK**	
SESSION VI	**Literature review, V0 and V1 development**	**CHAIR: STEPHEN MAGIGE (MEDA)**
10.30 – 11.00	Literature review and V0 development	Pieter Pypers
11.00 – 11.10	Discussion	
11.10 – 11.40	Plans for V1 development	Pieter Pypers
11.40 – 11.50	Discussion	
11.50 – 12.00	Briefing on use case implementation planning working groups	P. Pypers/A. Jalloh
12.00 – 13.00	**LUNCH**	
13.00 – 15.00	Use case implementation (2017) planning working groups	Use case leaders
13.00 – 15.00	PAC members elect chairperson and reflect on proceedings to develop recommendations	PAC chair
15.00 – 15.30	**BREAK**	
SESSION VII	**PRESENTATION OF USE CASE WORK PLANS FOR 2017**	**CHAIR: BERNARD VANLAUWE (IITA)**
15.30 – 15.40	Intercropping (Cassava/sweet potato)	Working group rep
15.40 – 15.50	Intercropping (Cassava/maize)	Working group rep
15.50 – 16.00	Discussion	
16.00 – 16.10	Best planting Practices	Working group rep
16.10 – 16.20	Discussion	
16.20 – 16.30	Fertilizer Recommendations	Working group rep
16.30 – 16.40	Discussion	
16.40 – 16.50	Scheduled planting	Working group rep
16.50 – 17.00	Discussion	
17.00 – 17.20	Strengths, weaknesses, opportunities of ACAI: views by development partners of Tanzania	Elected by development partners Tanzania
17.20 – 17.40	Strengths, weaknesses, opportunities of ACAI: views by development partners of Nigeria	Elected by development

		partners Nigeria
17.40 – 18.00	Open forum and discussion	

DAY 3: December 7, 2016: PROJECT ADVISORY COMMITTEE MEETING AND FEEDBACK		
SESSION VIII	**PAC MEMBERS**	**CHAIR: BERNARD VANLAUWE (IITA)**
08.00 – 09.00	PAC Members formulate recommendations (PAC members only)	PAC
09.00 – 10.45	Discussions PAC – PMT (PAC and project coordination only)	PAC and PC
08.00 – 10.45	Budget discussion and work plan development (Other participants)	Use case leaders
10.45 – 11.00	**BREAK**	
SESSION IX	**CLOSING CEREMONY - Plenary**	**CHAIR: A. JALLOH (IITA)**
11.00 – 11.30	Feedback and recommendations from PAC	PAC representative
11.30 – 12.00	Closing remarks 1. Representative of Development partners 2. Representative of NARS 3. Bernard Vanlauwe 4. PAC Chairperson 5. Lawrence Kent	
11.00 – 11.30	PAC recommendations (Plenary)	PAC chair
12.00 – 13.00	**LUNCH**	
13.00 – 18.00	FIELD VISIT	Ezinne Ibe & Godwin Atser
19.00	**GROUP DINNER – CAPPA BAR**	Ezinne Ibe & Godwin Atser

7.2 List of participants

No.	NAME	ORGANIZATION	EMAIL	GENDER
1	Adesiyan Bashir	Oyo State Cassava Growers Association (OYSGA)	bashiradesiyan@gmail.com	M
2	Aina Olufemi	IITA	f.aina@cgiar.org	M
3	Akpevweoghene Evabor	IITA Youth Agriprenuer	austinevabor@gmail.com	M
4	Ali Mamshie Azara	West Africa Agricultural Productivity Programme, (WAAPP)	aalimamshie@gmail.com	F
5	Alokit Christine	Centre For Agriculture And Biosciences International (CABI)	c.alokit@cabi.org	F
6	Alves Afredo	The Brazilian Agricultural Research Corporation (EMBRAPA)	alfredo.alves@embrapa.br	M
7	Bernard Vanlauwe	IITA	b.vanlauwe@cgiar.org	M
8	Chiwona-Karltun,	Swedish Agricultural University,	Linley.Chiwona.Karltun@sl	F

	Linley	Sweden	u.se	
9	David Obisesan	IITA	d.obisesan@cgiar.org	M
10	Deusdedit, Peter Mlay	Agriculture Research Institute (ARI)	dmlay@yahoo.co.uk	M
11	Dunstan S.C. Spencer	Enterprise Development Services. Sierra Leone	dscspencer@gmail.com	M
12	Ejalonibu Shola	National Root Crops Research Institute (NRCRI)	sholaeja@gmail.com	M
13	Elizabeth Parkes	IITA	e.parkes@cgiar.org	F
14	Enesi Rebecca	IITA	r.enesi@cgiar.org	F
15	Ewinyu Alote	Consultant M&E specialist	aewinyu@yahoo.com	F
16	Ezui Guillaume	International Plant Nutrition Institute (IPNI)	gezui@ipni.net	M
17	Ezumah Humphrey	International Consultant	humphreyezumah@yahoo.com	M
18	Francis Allelumhe	International Fertilizer Development Center (IFDC)	falelumhe@ifdc.org	M
19	Friday Ekeleme	IITA	f.ekeleme@cgiar.org	M
20	Gbenga Akinfenwa	Guardian Newspaper	gbengaherkin@gmail.com	M
21	Godwin Atser	IITA	g.atser@cgiar.org	M
22	Hauser Stefan	IITA	s.hauser@cgiar.org	M
23	Hermant Nitturkar	IITA	h.nitturkar@cgiar.org	M
24	Ibe Ezinne	IITA	e.ibe@cgiar.org	F
25	Iluebbey P. O	IITA	p.iluebbey@cgiar.org	M
26	Iranoye Yemisi	Psaltry Farm	yemisi@psaltryinternational.com	F
27	Jalloh Abdulai	IITA	a.jalloh@cgiar.org	M
28	Jimoh Babatunde	Vanguard Newspaper	babatundejimoh@hotmail.com	M
29	Kabissa Jeremiah	IITA	j.kabissa@cgiar.org	M
30	Kayode Awobajo	IITA	k.awobajo@cgiar.org	M
31	Kent Lawrence	Bill & Melinda Gates Foundation	lawrence.kent@gatesfoundation.org	M
32	Kenton Dashiell	IITA	k.dashiell@cgiar.org	M
33	Kreye Christine	IITA	c.kreye@cgiar.org	F
34	Loyce Kaitira	Cassava: Adding Value For Africa 11	loycekm@gmail.com	F
35	Magige Stephen	Mennonite Economic Development Associates (MEDA)	smagige@meda.org	M
36	Mansoor Hussein	Ministry of Agriculture And Food Security. Tanzania	hussein.mansoor@gmail.com	M
37	Mkamilo Geoffrey	Agriculture Research Institute (ARI, Tanzania)	geoffreymkamilo@yahoo.com	M
38	Moita Nassy	IITA	m.moita-nassy@cgiar.org	F
39	Moreno Patricia	CIAT	lpmorenoc@unal.edu.co	F
40	Mwonbeki	Farm Concern International (FMI)	wiston.mwonbeki@farm	M

	Wiston		concern.org	
41	Odunze Ngozi	Federal Ministry of Agriculture and Rural Development (FMARD)	alfsoyuznik@gmail.com/gozikaz@gmail.com	F
42	Ogunmuditi Funmi	IITA	f.ogunmuditi@cgiar.org	F
43	Okoli Chris	Sasakawa Global 2000 (SG 2000)	chrisokoli62@yahoo.com	M
44	Okuku Innocent	Notore	innocent.okuku@notore.com	M
45	Olaoye Jacob	Federal University of Agriculture Abeokuta (FUNAAB)	olaoyeoj@funaab.edu.ng	M
46	Olojede Adeyemi	National Root Crops Research Institute (NRCRI)	yemiolojede@gmail.com	M
47	Onyekwere Innocent	National Root Crops Research Institute (NRCRI)	innonyeoma@gmail.com	M
48	Onyesom Juliet	Entrepreneur/NGO	ngozionyesom@rocketmail.com	F
50	Richard Ofei	IITA	r.ofei@cgiar.org	M
51	Salako Felix	Federal University of Agriculture Abeokuta (FUNAAB)	salakofk@funaab.edu.ng	M
52	Saleh Haji	Agriculture Research Institute (ARI)	hajisaleh76@yahoo.com	M
53	Sam Ofodile	IITA	s.ofodile@cgiar.org	M
54	Sarafa Hammed	Federal University of Agriculture Abeokuta (FUNAAB)	hammedsarafadeen@gmail.com	M
55	Six Johann	Swiss Federal Institute of Technology In Zurich (ETH, Zurich)	jsix@ethz.ch	M
56	Stephen Olonoade	Cassava: Adding Value For Africa (CAVA)	stephende@gmail.com	M
57	Teri Vandi John	Psaltery Farm	john.terivandi@gmail.com	M
58	Thanni Bolaji	Federal University of Agriculture Abeokuta (FUNAAB)	bolajithanni@yahoo.co.uk	F
59	Thomas Wobill	IITA	t.wobill@cgiar.org	M
60	Tokula Mark	National Root Crops Research Institute (NRCRI)	mhtokula1@yahoo.com	M
61	Tunrayo Alabi	IITA	t.alabi@cgiar.org	M
62	Uzokwe Veronica	IITA	v.uzokwe@cgiar.org	F
63	Verlinden Alex	Africa Soils Information Service, (AfSIS)	verlinden.alex026@gmail.com	M
64	Watiti James	Centre For Agriculture And Bioscience International (CABI)	j.watiti@cabi.org	M