Conservation Agriculture Training of Trainers Course for Researchers, Farmers and Extension Officers

National Agricultural Research Organization- Uganda

16th – 21st November 2015

Training Report

Prepared by:
Eng Saidi Mkomwa, Peter Kuria & Achora J C
The African Conservation Tillage Network
KARLO - NARL, Waiyaki Way
Nairobi- Kenya.
Email: info@act-africa.org
www.act-africa.org
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**List of Acronyms**

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<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEATREC</td>
<td>Agricultural Engineering and Appropriate Technology Research Centre</td>
</tr>
<tr>
<td>ACT</td>
<td>African Conservation Tillage Network</td>
</tr>
<tr>
<td>CA</td>
<td>Conservation Agriculture</td>
</tr>
<tr>
<td>CIMMYT</td>
<td>International Maize and Wheat Improvement Center</td>
</tr>
<tr>
<td>FFS</td>
<td>Farmer Field Schools</td>
</tr>
<tr>
<td>MUARIK</td>
<td>Makerere University Agricultural Research institute, Kabanyolo</td>
</tr>
<tr>
<td>NARL</td>
<td>National Agricultural Research Laboratories</td>
</tr>
<tr>
<td>NARS</td>
<td>National Agricultural research system</td>
</tr>
<tr>
<td>REDs</td>
<td>Rural Enterprises Development services</td>
</tr>
<tr>
<td>SIMLESA</td>
<td>Sustainable Intensification of Maize and Legumes in East and South Africa</td>
</tr>
<tr>
<td>TSUs</td>
<td>Technical Service Units</td>
</tr>
</tbody>
</table>
Executive Summary

The five day Conservation Agriculture training course for farmers, researchers and extension officers was conducted for the CA project of NARO supported by CIMMYT-SIMLESA in Uganda. The training was conducted by the African Conservation Tillage Network, a regional Pan-African not-for-profit membership organization whose mandate is to “enhance agricultural productivity, sustainable land management and environmental conservation through the promotion of conservation agriculture principles and practices in Africa.” Conservation agriculture has been defined as a farming approach that fosters natural ecological processes to increase agricultural yields and sustainability by minimizing soil disturbance; maintaining permanent soil cover; and diversifying through crop rotations and/or associations. This reduces land and water pollution and soil erosion, reduces long-term dependency on external inputs, enhances environmental management, improves water quality and water use efficiency, and reduces emissions of greenhouse gases through lessened use of fossil fuel.

One of the setbacks to adoption of conservation agriculture among small holder farming communities in Africa has been the lack of standardized Conservation Agriculture training programs, service provision and implements. Cognizant of this challenge, the National Agricultural Research Organization (NARO), which is the umbrella organization for the SIMLESA project in Uganda requested the African Conservation Tillage Network provide training its project beneficiaries who include farmers, researchers and extension staff on conservation agriculture with a focus on CA service provision. The course facilitators from ACT were Peter Kuria as the lead trainer, Janet Cox Achora, Stanley Muruki, CA service provider and Edward Gitta from the Rural Enterprises Development services. The participants were twenty-five in total, nineteen male and six female. Of these twelve were farmers, four extension officers, four district agricultural officers and five researchers/graduate assistants from the districts of Lira and Nakasongola and the National Agricultural Research institutes of Kawanda and Ngetta.

The training methodology consisted of power point presentations, group presentations, plenary discussions and skits performed by participants on their knowledge and understanding of conservation agriculture, field trips and practicals. The focus of the training was on Conservation agriculture technology and practices. The different topics covered included: What is CA and why CA (Background, historical perspectives, rationale, benefits, challenges), Conventional farming (what has gone wrong), CA Concepts and principles (Minimum Soil Disturbance - Manual; animal traction & tractor based systems; Soil cover and Crop rotations and Associations), Soil Health (Soil characteristics & properties, erosion and water infiltration), conservation farming and Agriculture Equipment (demonstration of use, equipment manufacturing and hire-service provision), Weed, pest & disease management and control in CA systems (timeliness, manual and chemical options, strategic control) and Crop-tree-livestock integration in conservation farming systems. Field based practicals included: CA techniques in manual systems (jab planting), CA in animal traction systems (harnessing animals for ripping and direct seeding, CA equipment assembling).

The objectives of the training were:

1. To enhance understanding of the principles of Conservation Agriculture as the new way of farming.
2. To provide practical knowledge and skills in the application of CA practices for different socioeconomic and agro-ecological environments so as to enable participants to respond competently to farmers’ needs.
3. To provide the participants with approaches and methodologies for enhanced documentation and wide scale adoption of profitable CA.
4. To strengthen the competency of the participants to facilitate learning of CA by CA support staff and farmers

The expected outputs were;
1. Participants would be able to explain and demonstrate to other members of their farming communities the concept and principles of CA and applications.
2. They would be able to guide farmers and other stakeholders in analyzing and determining solutions to problems in sustainable use of soil and water in farming.
3. The participants would plan and facilitate farmer-based trials and demonstrations for development/or adaptation of CA technologies.
4. Develop learning facilitation materials and work plans for implementation of identified field activities.
5. The facilitators would provide participants with relevant CA materials and Monitoring and Evaluation tools.

This training took place from the 16 – 21st November, 2015 at the Agricultural Engineering and Appropriate Technology Research Centre (AEATREC) where generation, adaptation and dissemination of appropriate agricultural engineering technologies to meet farmer and market demands are developed and tested.

The course evaluation undertaken by the participants at the end of the training provided the following insight for follow up actions:

Cover crop and seeds
- Participants suggested that the issue of cover crops be addressed and seeds from Kenya brought so that they can be multiplied by the Ugandan farmers.
- They also requested for linkages to cover crop seed suppliers in Kenya.
- The farmers asked that provision of improved seeds to them should at least be given to them by the first season.

Visits and tours
- Participants requested that study tours are conducted both in and outside the country.
- They requested that the next training is organized in Kenya, Tanzania or Zimbabwe and preferably on a farm.

Training in animal traction
- Farmer groups and technical staff should be trained in animal traction if good CA results are to be realized.
- The lack of preparedness of the animals at the University farm was a lesson to the farmers that animals should be kept very busy all the time so that they are ready to work anytime.
- They requested for further trainings on selection and training of oxen.

Linkage to service provision
- Farmers and any intended CA practitioners should be facilitated by enabling linkages to CA equipment dealers like suppliers of Jab- planters.
Livestock/ CA integration
- The participants requested that the issue of integration of livestock feeds (fodder training) should be handled very seriously as this would attract more farmers to CA.
- More trainings should be organized on how to integrate CA with livestock in dry areas.

Practical training
- A request was made that next time more time should be allocated for the practical trainings, for instance the assembling and disassembling of machines.
- Calibration of sprayers should be handled by farmers/service providers at the next training as opposed to trainers.
1.0 Background and Introduction

The Sustainable Intensification of Maize and Legumes in East and South Africa (SIMLESA) is a CIMMYT regional project implemented in five core countries of Kenya, Ethiopia, Tanzania, Malawi and Mozambique and in three spillover countries of Uganda, Botswana and Rwanda. The project’s focus is the improvement of maize and legume production systems with the aim of improving food security, farmers’ incomes and sustainable environmental management through promotion of Conservation Agriculture (CA).

In Uganda the SIMLESA project started in 2012, with the introduction of Conservation Agriculture practice in two selected districts of Lira and Nakasongola both located in high and low potential agricultural zones. Within the two districts, two sub counties were selected from each (in Lira district – Lira and Aromo sub counties and Nakasongola district - Kalongo & Wabiyonyo sub counties.). A baseline survey was conducted before the commencement of the project and the following challenges were identified along the production chains. Some of the challenges included,

<table>
<thead>
<tr>
<th>Challenge identified</th>
<th>Solution being provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td></td>
</tr>
<tr>
<td>- Late opening of land</td>
<td>- Provided quality seeds (maize &amp; beans)</td>
</tr>
<tr>
<td>- Quality of seed</td>
<td>- Use of fertilizers</td>
</tr>
<tr>
<td>- Declining soil fertility</td>
<td>- Use of herbicides</td>
</tr>
<tr>
<td>- Weed management</td>
<td>- Provision of cribs</td>
</tr>
<tr>
<td>Post-harvest</td>
<td></td>
</tr>
<tr>
<td>- Poor storage</td>
<td></td>
</tr>
<tr>
<td>- Lack of markets</td>
<td></td>
</tr>
</tbody>
</table>

Why the training?

One of the setbacks to adoption of conservation agriculture among smallholder farming communities is the lack of Conservation Agriculture service provision and implements. This training is one of the approaches, the National Agriculture Research organization will use to scale up the conservation agriculture practice among the farming communities. By building a critical mass of service providers who are themselves farmers, these service providers will be able to train other farmers while at the same time providing service. It is expected that the trainees from this TOT will commence provision of subsidized conservation agriculture services to their communities under Technical service units over seen by the local district authorities.
1.1 Course objectives were;
- To enhance understanding of the principles of Conservation Agriculture as the new way of farming.
- To provide practical knowledge and skills in the application of CA practices for different socioeconomic and agro-ecological environments so as to enable participants to respond competently to farmers’ needs.
- To provide the participants with approaches and methodologies for enhanced documentation and wide scale adoption of profitable CA.
- To strengthen the competency of the participants to facilitate learning of CA by CA support staff and farmers

Course outputs
At the end of the course the participants would be able to:
- Explain and demonstrate to other members of their farming communities the concept and principles of CA and applications.
- Guide farmers and other stakeholders in analyzing and determining solutions to problems in sustainable use of soil and water in farming
- Plan and facilitate farmer-based trials and demonstrations for development/or adaptation of CA technologies
- Develop learning facilitation materials and work plans for implementation of identified field activities
- Provide participants with relevant CA materials and Monitoring and Evaluation tools.
1.2 Official opening by the AEATREC Deputy centre Director, Engineer Charles Mutumba

In his opening remarks, the Deputy Centre Director, Engineer Charles Mutumba, talked about the changing environment and how it was an opportune time to embrace Conservation agriculture. He said the AEATREC centre was one of the research units under the National Research organization and carried out four main functions.

- Generation, adaptation and dissemination of appropriate agricultural engineering technologies to meet farmer and market demands.
- Training of farmers, agro-processors and other users.
- Training of and provision of back-up services to rural artisans, technicians and private fabricators.
- Advisory and consultancy services in agricultural and rural engineering

The objective of the centre was to improve labour productivity, ensure timeliness in farm operations and expand production and productivity for households and markets.

Dr Drake Mubiru in the opening session gave a background to the SIMLESA project in Uganda and why the training was taking place at this time. He said the project started in 2012 and during that year, they were tasked to select beneficiaries' sites, where they conducted a baseline study. The two selected two sites, Nakasongola and Lira districts were drylands and located in the cattle corridor. This training was being looked at as an approach to scaling up conservation agriculture through the training of trainers, creation and equipping of Technical Service Units. (TSUs). The TSUs would be expected to offer subsidized CA services to the communities.
1.3 **Workshop expectations**

The expectations were as captured below.

2.0 **Situation Analysis**

The session on situation analysis set the pace for the context under which conservation agriculture is practiced in the two districts. Analyzing the situation in the two different districts, working groups discussed the central factors and issues in the life of a typical household and community within their respective areas, highlighting:

- The physical situation (geographical location, roads, rivers, other physical landmarks)
- The climate (rainfall patterns/duration/character, temperature)
- The People (settlement, size, culture-traditions, occupations including pass-time, etc…)
- Agriculture production (crops, livestock, fields, implements, farming patterns; etc…)
- external inputs/interventions (development programmes, extension/research programmes; agricultural inputs, labour; interaction with urban center/s; markets)
- survival strategies
### 2.1 Group presentations on the situational analysis

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factors</strong></td>
<td><strong>Situation</strong></td>
</tr>
</tbody>
</table>
| **Geographical location** | Good | Geographical location | - Cattle collide  
- Characterized by prolonged droughts.  
- Hard past (hard soils)  
- High temperature |
| **Roads** | Connecting farmers are poor | **Roads** | Roads are there but not in a good condition. |
| **Rivers** | Sezibwa in Kalongo, Nakasongola and Okolo in Lira | **Rivers** | Lira: Have and used for insects.  
Nakasongola: Lake Kyoga and rivers dry up in droughts. |
| **Physical landmarks** | Nakasongola - we have some nearby hills.  
Lira - we also have some nearby hills e.g. Akia, Ngetta | **Soils** | Nakasongola: Sandy soils.  
Lira: Loam soils |
| **Climate** | Rainfall patterns: Two rainfall seasons (3 months in Lira 3-3) and two (2)-(3) months in Nakasongola.) | **Climate** | A lot of changes now in season and amounts.  
Nakasongola: First season now short yet was major.  
Lira: First season is long and still major. |
| **People (settlement)** | Both districts have scattered settlement. | **People** | Nakasongola: Absentee landlords. Farming areas densely populated. 85% farmers mixed tribes.  
Lira: Public land. Lira is densely populated.  
50% farmers mixed tribes. |
| **Size** | Both districts 7-15 members. | **Agriculture** | Nakasongola: Still average and livestock (for sell and food). Used oxen, monocropping. |
| **Culture and tradition** | Both districts are different in culture and tradition. | **Interventions** | Ngo’s (world vision, kulika, caritas, same children, maristopes)  
Mukwano (simsim, soya, sunflower) |
| **Occupation** | Both are farmers. | **Livestock** | Both have the same types of livestock |
| **Crops** | Both grow the same crops. | **Field** | Not the same. |
| **Livestock** | Both have the same types of livestock | **Farming pattern** | The same (mixed, intercropping, monocropping) |
| **Field** | Not the same. | **External inputs** | Both the same  
Interventions: Both are the same. |
| **Implements** | Not the same. | **Development Programs** | Both are the same. |
| **Farming pattern** | The same (mixed, intercropping, monocropping) | **Interventions strategies** | Youth- Bodaboda, technical, business.  
Women- Small animals.  
Men- Pig animal, trade, etc. |
| **External inputs** | Both the same | **Interventions strategies** | Youth- Bodaboda, technical, business.  
Women- Small animals.  
Men- Pig animal, trade, etc. |
| **Development Programs** | Both are the same. | **Survival strategies** | Youth- Bodaboda, technical, business.  
Women- Small animals.  
Men- Pig animal, trade, etc. |
| **Survival strategies** | In Lira dry spell do not cause much effect onto animal compared to Nakasongola.  
Chipping of sweet potatoes and Cassava is both not different.  
Granary utilization is both done in Lira and Nakasongola. | **Survival strategies** | Youth- Bodaboda, technical, business.  
Women- Small animals.  
Men- Pig animal, trade, etc. |
<table>
<thead>
<tr>
<th>Factors</th>
<th>Lira</th>
<th>Nakasongola</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>North</td>
<td>Central</td>
</tr>
<tr>
<td><strong>Roads</strong></td>
<td>Tarmac roads good condition.</td>
<td>Tarmac road good condition in (town).</td>
</tr>
<tr>
<td></td>
<td>Many footpath and roads in poor conditions.</td>
<td>Many footpath and roads in poor condition.</td>
</tr>
<tr>
<td><strong>Rivers</strong></td>
<td>Swamps (Okole)</td>
<td>Sezibwa river</td>
</tr>
<tr>
<td></td>
<td>Onek, munu and Ayap swamp</td>
<td>Kambu swamp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mukote swamp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wakalembo swamp</td>
</tr>
<tr>
<td><strong>Others physical land marks</strong></td>
<td>Ngetta hill</td>
<td>Lake Kyoga</td>
</tr>
<tr>
<td></td>
<td>Akia hill</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ongura hill</td>
<td>Kagera</td>
</tr>
<tr>
<td><strong>Climate</strong></td>
<td>Two rainy seasons (March to May and July to November)</td>
<td>Two rainy seasons (March to May and August to November)</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>86 degrees F</td>
<td>High temperatures</td>
</tr>
<tr>
<td><strong>People</strong></td>
<td>Urban centers densely populated.</td>
<td>Urban densely populated</td>
</tr>
<tr>
<td></td>
<td>Rural sparsely.</td>
<td>Rural sparsely populated</td>
</tr>
<tr>
<td></td>
<td>Family size 6-10</td>
<td>Family size 8-15</td>
</tr>
<tr>
<td><strong>Culture</strong></td>
<td>Chiefs</td>
<td>Kings</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td>Agriculture</td>
<td>Farming</td>
</tr>
<tr>
<td></td>
<td>Business</td>
<td>Fishing</td>
</tr>
<tr>
<td></td>
<td>Local brew (malwa)</td>
<td>Business</td>
</tr>
<tr>
<td></td>
<td>Sports</td>
<td>Local brew</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sports (mweso)</td>
</tr>
<tr>
<td><strong>Agriculture</strong></td>
<td>Crops - cassava, simsim, maize, groundnuts, soya, bananas, fruit trees, beans, millet, sunflower, cotton, peas.</td>
<td>Crops - cassava, potatoes, millet, maize, simsim, groundnuts, beans, peas.</td>
</tr>
<tr>
<td></td>
<td>Livestock - cows, goats, chicken, pigs.</td>
<td>Livestock - cows, goats, poultry, pigs, sheep.</td>
</tr>
<tr>
<td></td>
<td>Implements - hand hoes, oxen on ploughs, pangas.</td>
<td>Implements - hand hoes, oxen on ploughs, pangas.</td>
</tr>
<tr>
<td></td>
<td>Farming patterns - First season majorly food crops (Second season- other crops of commercial use)</td>
<td>Farming patterns - first season- maize and groundnuts. (second season- simsim, cotton and millet)</td>
</tr>
<tr>
<td><strong>External inputs</strong></td>
<td>- C.A</td>
<td>- C.A</td>
</tr>
<tr>
<td></td>
<td>- Energy efficiency</td>
<td>- Pest harvest</td>
</tr>
<tr>
<td></td>
<td>- Pest harvest handling</td>
<td>Extension- single spine</td>
</tr>
<tr>
<td></td>
<td>- Extension- single spine</td>
<td>Research- ZARDI (Ngetta)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Research- NARO (Kawanda)</td>
</tr>
<tr>
<td><strong>Survival strategies</strong></td>
<td>- Casual labour</td>
<td>- Casual labour</td>
</tr>
<tr>
<td></td>
<td>- Petty businesses</td>
<td>- Petty businesses</td>
</tr>
<tr>
<td></td>
<td>- Comfort zones (men)</td>
<td></td>
</tr>
</tbody>
</table>

### 2.2 Problem Analysis

Based on the situation analysis conducted of the two districts, the three groups generated problem trees based on the following parameters (i) what had not changed, (ii) what had changed and (iii) what had increased. The root causes of the situations and the effects were also discussed. Below is a sample of how the problem analysis was captured.
### Table: Changes in Farming Practices

<table>
<thead>
<tr>
<th>Seed Quality</th>
<th>Has not changed</th>
<th>Has declined</th>
<th>Has increased</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-30 years</td>
<td>Varieties not many.</td>
<td>Seeds used to last long.</td>
<td>Plant saved seeds.</td>
</tr>
<tr>
<td>Today</td>
<td>Take a short period. (Have to buy every season).</td>
<td>Storage is a challenge.</td>
<td>Many crop varieties.</td>
</tr>
<tr>
<td>Farming Skills</td>
<td>Organic and inorganic walk to manage soil fertility, pests and diseases.</td>
<td>-Indigenous/local knowledge.</td>
<td>A lot of modern information in areas of production and harvest.</td>
</tr>
<tr>
<td>20-30 Years</td>
<td>Was safe in granaries, googa.</td>
<td>By laws to observe quality products drying.</td>
<td>Appropriate tools. (Ox planters, clippers, etc.)</td>
</tr>
<tr>
<td>Today</td>
<td>Many players in the market offer any price for any product.</td>
<td>Very risky in granaries because of thieves.</td>
<td>Very risky in granaries because of thieves.</td>
</tr>
<tr>
<td>Climate</td>
<td>-Very favorable and reliable.</td>
<td>-Because of poor quality, people fetch low prices.</td>
<td>-Changing people’s occupations to charcoal making.</td>
</tr>
<tr>
<td>20-30 Years</td>
<td>Could support crop growth.</td>
<td>Predictable seasons and rains.</td>
<td></td>
</tr>
<tr>
<td>Today</td>
<td>Making agriculture very risky venture.</td>
<td>Very unreliable.</td>
<td></td>
</tr>
</tbody>
</table>

---

### 3.0 Introduction to Conservation agriculture

In this session, participants were introduced to the concept, principles and practices of conservation agriculture. A brainstorming session was held in which participants were asked to explain what they understood by conservation agriculture. Africa’s food security challenges and why Africa had failed to feed itself including the steps being taken to rectify this situation.

### 3.1 What is Conservation Agriculture?

Conservation agriculture technology was explained as a farming concept that promotes efficient input use and increases long term productivity of land and water resources.
CA is achieved through a combination of good agronomic practices and application of the three principles;

i) **Minimum soil disturbance** which involves reducing the number of tillage operations in the farm.

ii) **Permanent soil cover** which involves establishing either live or dead organic cover to protects soil from erosion, extreme temperatures and fluctuations. This also improves soil moisture retention by reduced evaporation. Source of organic matter and suppresses weeds by blocking sunlight.

iii) **crop rotation and associations** which emphasizes crop diversification to avoid build up pest and diseases, total crop failure and improves soil fertility through nitrogen fixation by legumes and microbes as well as extraction of nutrients from different soil depths by achieving biological tillage by roots and enhances water infiltration and percolation.

### 3.2 Why Conservation Agriculture?

Course participants were taken through why practice Conservation agriculture, through a discussion on the lessons drawn from SASAKAWA GLOBAL 2000 and the Asian Green revolution (details in the presentations)

Some of the examples shown included increased water runoff taking most of the top soil and the need to loosen the soils due to the hardpan created by the conventional agricultural practices.

Therefore, there was need for **Good agronomic practices,**

Use of improved external inputs, Agro-forestry and Mechanization
Day Two Proceedings

4.0 CA Concepts and Principles

During this session, the three principles of CA, Minimal mechanical soil disturbance, Soil cover and Crop rotations and associations were discussed and illustrated as a working best when applied in combination.

4.1 Managing Soil fertility in CA systems

This session covered effects of tillage on soil properties and enhanced soil fertility. The effects of CA on various physical, chemical and biologicals properties were elaborated and the facilitator gave practical examples of what was happening in the field. The three principles of CA were once again revisited and how their application influences soil fertility. Examples of Organic and Inorganic Fertilizers like Compost / Manure, DAP, Urea, NPK, Live mulch and cover crops were discussed including their applications. To elaborate on effect of good soil management, the facilitator shared the examples below on data that had been gathered over four seasons

<table>
<thead>
<tr>
<th>Practices Applied</th>
<th>Tons Per Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012A</td>
</tr>
<tr>
<td>Traditional Farmer Practice – Conventional Tillage</td>
<td>1.72</td>
</tr>
<tr>
<td>Conservation Farming = Basins + Herbicide Use</td>
<td>2.73</td>
</tr>
<tr>
<td>Conservation Farming = Basins + Fertilizers + Herbicide Use + Crop Residue Retention</td>
<td>4.00</td>
</tr>
</tbody>
</table>
Mechanised CF Ripping Vs. Conventional Ploughing 1 acre Differentials at GOU Ibuga Prison Farm

<table>
<thead>
<tr>
<th>Input</th>
<th>CF Mechanised Ripping</th>
<th>Conventional Plough</th>
<th>Savings/Gains Realized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel (Diesel)*</td>
<td>3 litres</td>
<td>10 Litres</td>
<td>7 litres/UGX23,100</td>
</tr>
<tr>
<td>Time</td>
<td>30 minutes</td>
<td>45-60 minutes</td>
<td>15-30 minutes</td>
</tr>
<tr>
<td>Seed rates**</td>
<td>8 kg</td>
<td>13 kg</td>
<td>5 kg/UGX25,000</td>
</tr>
<tr>
<td>Yield‡</td>
<td>3.2 tons</td>
<td>2.2 tons</td>
<td>+1 ton</td>
</tr>
</tbody>
</table>

*Based on current diesel costs of UGX 3,300 per litre
**Seeding rates are higher in ploughed fields due to extra seed required to compensate for uneven seeding depths that can significantly decrease or increase germination and crop stand along planting rows. Seed costs are based on the maize seed variety Longe 10H at a cost of UGX 5,000 per kilogram.
‡Yields are based upon prior historical end yields for conventional mechanized ploughing in normal rainfall seasons versus CF mechanized ripping yields.

4.2 Soil loss and run off demonstration

The session on soil and run off demonstration was further used to validate the earlier session on managing soil loss. The objective of this session was to

- To understand the function of soil cover.
- To visualize the effect of rainfall on bare soil and covered soil.
- To measure/observe the difference in water loss through runoff and water infiltration.
- To understand the effect of soil cover on water infiltration and erosion.

The facilitator explained that inappropriate management practices were important factors in causing soil erosion. Such inappropriate management practices included overgrazing, ploughing, burning crop residues and bare soil. He further emphasized that soil erosion removes the topsoil, which is the most fertile layer that provides food for soil organisms. Soil loss and water runoff could be avoided by covering the soil with crops and crop residues.

The following questions were used for discussions

1. What process took place on the bare soil?
2. How was this avoided in the covered plot?
3. What does this mean for growing a crop on the two plots, in relation to water efficiency?
4. Can you think of other measures to avoid soil erosion and water loss?
4.3 Theoretical presentation on CA Equipment

This presentation was an introductory session preceding day three, when participants would be exposed to CA equipment, have an opportunity to see, assemble and have hands-on experiences on the use of some of the tools and equipment.

The tools discussed included

- Ripping equipment
- Planting equipment
- Weeding equipment &
- Spraying equipment
5.0 Practical training at MUARIK

The practicals took place at the Makerere University Agricultural Research institute, Kabanyolo (MUARIK), the arm of the university that interfaces with the National Agricultural research system (NARS). It is located 21 Km north of Kampala along Gayaza road. MUARIK farm was established in 1953, and upgraded to a fully-fledged research institute in 1992 under the College of Agricultural and Environmental Sciences’ School of Agricultural Sciences, Makerere University. Here trainees were exposed to CA in animal traction systems, CA techniques in manual systems and how to assemble and use the Pedestal herbicide sprayer.

Below is a cross-section of the practical training in pictorial

5.1 CA in animal traction systems. Trainees taken through the animal traction systems
5.2  CA in manual systems
Trainees learnt about the Jab planter

5.3  Assembling CA equipment
Trainees are taken through on how to assemble and use the pedestal herbicide sprayer

Day Four Proceedings
6.0  Plenary discussion after the field visit
The discussions focused on the following issues below

Animal traction – In Nakasongola, we foreseen a challenge. From the field practicals, CA equipment can only be used in dry seasons. But during that time, the animals are hungry. How do we ensure that we prepare the land using the CA equipment before the season?
**Yokes** - Our animals are used to short yokes, in the field we saw long yokes being used on the draught animals, how shall we use the long yokes?

- How do we prepare the animals to use multiple yokes?
- Some farmers under the SIMLESA project had been given yokes, they were asked to share with other trainees their experiences in using the yoke

**Fodder preservation** - Can you take us through on how to preserve fodder and what type of storage facility we need? We need to have a ratio of 50:50 livestock and what is to be left on the fields.

- Connected to this were questions on silage/hay making and the feed preservation.

**Care for the animals** - Trainees were advised to talk to the animals instead of beating them. In the field practicals it was observed that animals were being beaten. They were also advised to give the animals “snacks” at 10:00 am if they started work early.

**Jab Planter** – the jab planter does shallow planting, how do we adjust the planter to do deep planting?

*Overall participants observed that the animals during the practicals had not been prepared well and therefore could not efficiently use the CA equipment.* Plenary discussions were held on all possible issues to consider when preparing/training the animals by the service provider.

6.1 **CA Service provision and Equipment- sharing of practical experiences by CA service provider**

6.1.1 **Economics of Conservation Agriculture service provision**

The facilitator a seasoned service provider for both conventional farming and CA shared with the trainees his experiences. Below is a snap shot of the services provided
6.1.2 **Marketing strategies Shared with the participants included**

- Market survey before the start of the investment
- Knowledge of the market
- Knowledge of competitors
- Assessment of own potential
- Knowledge of areas to invest in
- To understand the demand
- Record keeping

The marketing channels included

- Field days, demonstrations, workshops
- Churches
- Chiefs barazas/meetings
- Local media – radio, TV,
- Internet
- Collaborations in other exhibitions
- Workshops
- Places of workshop
- Barazas
- Local media that have local content
- Other farmers

NB: draft animals and equipment call for better services: Quick service & Working by objectives
Demographic/Classes of farmers was also very essential to understand so that one was able to approach and treat them carefully and sustain them.

6.1.3 **Draught animals- care and feeding**
- Shelter and resting place
- Hoof cleaning/trimming
- 6-7 years peak performance, animals should be culled, then sold and a performing one got
- Select animals 2-2.5 years old is the best time to start training at the start of the season
- Keep the animals busy after the season, you can use them for transport
- Best time for working is early hours for about 5 hours and rest the animals to feed

6.1.4 **Questions**
1. What is your experience when you interact with the farmers especially on payments?
2. CA services seen to be expensive, how can you convince farmers yet the conventional service is cheaper?
3. How do you do the weeding with potatoes using animal traction?- weed using a ridger
4. What do you use to plant the potatoes in a straight line- can do ridges with a plough
5. Between a sub-soiler and ripper- I do not see any big difference between a sub-soiler and ripping. Do we have to sub-soil and rip all the time?- No depends on depth of hard pan
6. Do farmers prefer conventional or CA? 80% prefer Conventional agriculture, 20% prefer conservation agriculture. Now people are coming for CA services because of decline in labour due to the flower farms in Laikipia County.

6.2 **Weed management in CA**

The facilitator started by explaining what would happen if weeds were not controlled. He explained that weeds reduce crop yields and could lead to total crop failures if not controlled on time. The longer they were left in the field, the harder they became to control.

**Discussion questions**

a) In which farming practice, Conventional and CA is the weed more of a challenge?
b) When it comes to weeding, which are the correct agronomic practices?
c) In dry planting, what germinates first, the weed or the crop?
d) In the absence of weed scraper, can I use a hoe?

e) When is the right time to spray, is it before or after planting?

f) Farmers are being advised to wait for the weed to grow abit (4 weeks) so that it acts as a green mature, what is your advice on that?

g) How do you deal with borehole water?

(Harvest the water and leave it to stabilize for 2-3 days in a water pan, the salt levels will have gone down. The chemicals should not be in water when using chemical weed control. Can use Moringa oleifera - as a water purifier)

h) Measure the PH of the water- request advise from the water personnel in your county.

**Rules under CA for weed management**

1. Do not allow weeds to produce seeds
2. Do timely weeding
3. Combine several weed control methods
4. Observe the right agronomic practices

Even under Conservation Agriculture, the advice is to still use the weed control methods under conventional. Under CA we avoid only one method of weed control - ploughing.

The discussion on traditional weed control focused on

- Ploughing/ harrowing
- Stubble grazing
- Burning of crop residues (before ploughing)
- Hand weeding - Manual weed control is labour intensive and thus limits the production area.

In CA, weed was a big problem if the weeds were allowed to grow seeds and drop on the ground, they germinate and grow faster since they are already on the ground. Since in CA the soil is not turned.

Therefore there **two major approaches** for weed control

1. **Preventive weed control**
   - clean crop seeds free of weed seeds
   - preventing the entry of machinery from heavily infested fields into low infested ones
   - reduction of the weed seed bank in the soil by preventing weeds to set seeds
2. Control techniques pre and post crop planting

- Cultural methods
- Physical control (mechanical and manual weeding).
- Chemical control through the use of herbicides

Usually a combination of two or more control strategies to increase effectiveness to economic levels.

How was CA controlling weeds?

- It disturbs the soil less, so brings fewer buried weed seeds to the surface where they can germinate.
- The cover on the soil (intercrops, cover crops or mulch) smothers weeds and prevents them from growing.
- Rotating crops prevents certain types of weeds from multiplying.

6.2.1 Chemical weed control

The facilitator explained that chemical weed control could also be used by smallholder farmers especially in the first years of changing from conventional to CA. Increasing labour shortage and cost of labour had made chemical weed control an attractive alternative for small farmers e.g. Zamwipe, pedestrian sprayer, Knapsack.

Before you use chemicals

- You have to know the weed that you are controlling
- Know the chemical that the weed controls
- Chemicals are specific to crops
- Get advice from the extension officer which chemical to use when crops are there and which one to use when crops are not there

Rules

- Do spraying when the weed is actively growing.
- Do not spray when the weed is harden by weather.
- **Plant and spray:** If you are spraying at planting time, you can plant today and then spray within 2-3 days after planting. (depends on how long your plants germinates- eg beans plant and spray next day)
- **Spray and plant**: Another method, spray then you plant after 2-3 days (*because of health reasons*)
- Ensure you use clean water

### 6.3 Climate Change: Mitigation and adaptation

**The session on climate change focused on:**

In climate change there is mitigation and adaptation. Mitigation—actions you take to prevent, adaptation is the actions taken to adapt. Climate change is the long-term change in the distribution of the weather patterns over a period of time. Participants were taken through the causes of climate change, effects on Agriculture and what needs to be done.

### 6.4 Farmer Field School approach

The session on Farmer Field schools (FFS) was discussed by a farmer field trainer, who defined FFS as a group of farmers usually 20-25 who come together to solve a problem under the guidance of a facilitator, who in most cases is a farmer or extension officer. The participants were taken through the objectives, principles and concepts of FFS. They were also enlightened on the major activities in FFS which include Community entry (situational and problem analysis), Registration of members, election of office bearers and registration at government level, Enterprise selection and Criteria for selection as well as other activities like record keeping, Field day at the end of the season and Daily/weekly activities and finally on the evaluation of last sessions using evaluation wheel tool.

### 6.5 Socio-economic aspects of CA

The facilitator took the participants through the socio-economic aspects of CA and said it was important to undertake analysis on the:

- Labour demands
- Crop yields
- Returns on investment and profitability
- Sustainability of various CA technologies
- Broad socio-economic aspects of each technology/practice
- And the external factors that affect adoption of CA

The Basic tools and concepts to use included the Partial Budget, its features and estimation of Gross benefits. An example of the partial budget is tabulated below
Example of a partial budget: Hand Weeding Vs Herbicide Use

<table>
<thead>
<tr>
<th></th>
<th>Hand Weeding</th>
<th>Herbicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average yield (kg/ha)</td>
<td>2,000</td>
<td>2,400</td>
</tr>
<tr>
<td>Gross Benefits (Yield X Price@$0.2/kg)</td>
<td>400</td>
<td>480</td>
</tr>
<tr>
<td>Cost of herbicide ($/ha)</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Cost of labor to apply herb/ha</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Cost of labor for hand weeding</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Total costs that vary ($/ha)</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>Net benefits ($/ha)</td>
<td>400-10</td>
<td>480-27</td>
</tr>
</tbody>
</table>

6.6  **Crop – tree livestock integration in CA systems**

The discussions on the Crop – tree livestock integration focused on the importance, opportunities and benefits. Diversification to livestock and other income generating activities. The facilitator gave examples and said successful integration of crop and livestock enterprises resulted into many synergies which included enterprise diversification, Recycling of nutrients, Soil enhancing rotation crops, power and transportation, and biological "savings accounts" for farmers.

He also discussed the place of livestock in the CA value chain and shown that livestock and crops should complement each other under CA

6.7  **Monitoring and Evaluation of CA programs**

**Monitoring** was referred to as the assessment of both the functioning of the project activities in the context of implementation schedule and the use of project inputs by target population as to the designed expectations and the frequent checking of progress, with analysis about implications for the project.

**Evaluation** was explained as the means, assessment of the relevancy, performance, efficiency and impact of the project in the context of its stated objectives.
Importance of M&E was emphasized as important for Accountability to donors, partners, and beneficiaries, guiding project Implementation and Improving project design

**Important indicators to consider to see of CA works.**
- Increased crop yields
- Increase in land area under Conservation Agriculture
- Number of beneficiaries practicing Conservation Agriculture
- Number of CA equipment distributed and being used.
- Savings in production costs
- Savings in labour and drudgery
- Improvement in soil fertility
- Increase in biodiversity
- Soil organic matter
- Diversification in enterprises due to Conservation Agriculture

**Examples of tools to use in M & E**
- Monitoring and Evaluation matrix

<table>
<thead>
<tr>
<th>Project logical framework</th>
<th>Indicator</th>
<th>Information to collect</th>
<th>Baseline Information</th>
<th>Targets</th>
<th>How often &amp; when</th>
<th>Data source</th>
<th>Who collects, analyses reports</th>
<th>Tools for data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Outputs</td>
<td>1.</td>
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<td></td>
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<tr>
<td></td>
<td>2.</td>
<td></td>
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<td></td>
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<tr>
<td>Process</td>
<td>1.</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td>2.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
- Evaluation wheels

Other participatory include

- And group discussions and song and drama.

6.8 Action Planning

Guidelines for the participants to draw an action plan on how they would proceed after the training.

Below are the guidelines

Guidelines used

Considering the knowledge and skills you have acquired from this course and in line with the SIMLESA target programmes and your regions’ experiences, develop an action plan for implementation in your area for 2015/2016.

1. Brain storm, identify and list the CA technology options that you think would be feasible in your area giving due consideration to power sources and weed control options and give some points to justify your reasoning:

2. Which of these options are you going to implement with farmers in your area taking into consideration the programme activities?

3. With whom (other partners, collaborators) and when (time schedule) will you implement these activities?

4. What resources (inputs) will be required to implement these activities and when will you source these resources?

5. What further technical back-up would you require to achieve these activities?

6. Summarize the above issues as suggested in the table below.

7. Draw up an action plan for CA implementation - indicate (at least) the following
List of CA technology options

<table>
<thead>
<tr>
<th>Feasible CA options</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Action plan for CA implementation

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Activities</th>
<th>Lead organization</th>
<th>With Who (partners/players)</th>
<th>When? (time schedule)</th>
<th>With What? (resources required)</th>
<th>Technical back-up</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Some of the key activities and kind of information to be collected (December – June 2016)

1. Information on the Leave sample
2. Yield data- when should extension come- do not mix the plots
3. Plan for the next season
4. Service providers – what are the things you should do for service provision, what are your needs- especially in the part of training
5. Participatory monitoring and evaluation
6. Multi-stakeholder innovation platform- the project start piloting with the Nakasongola group- identify key constraints- *For lira will not start immediately*
Day Five Proceedings

7.0 Presentation of Action Plans

The action plans were done and presented according to the two districts. Below is the Lira district action plan.

These plans will be implemented by the farmers and TSUs with support from the district agricultural officials and researchers.

7.1 Group presentations on conceptualization of the CA concept

To evaluate the trainees conceptualization of the five days trainings, each of the five groups formed at the beginning of the training were asked to make presentations. Each of the different groups had its own unique presentation in the form of skits, poetry, plays and pictorial displays.
7.2 Presentation of Certificates and awards

Certificates of attendance and awards were presented to the trainees by the District and Project officials.
7.3    Presentation of CA Equipment to Technical Service Units

7.4    Field Trip to Mukono District
The field trip was made to Kalagi in Mukono district, where two different sites were visited. A church of Uganda primary school that has set up CA demonstration fields, managed by the pupils and the technology is transferred to their families through the children and the Bandera Farmers group who were practicing various CSA farming practices
7.5 Concluding remarks

1. Cover crops
Participants expressed their concern and need to have access to cover crops seeds and asked ACT and the organizers to assist them in securing sources for cover crop seeds.

2. Conservation Agriculture equipment
Concern was also expressed for the lack of CA equipment in Uganda and organizers were tasked to find strategies together with service providers to fill this gap.

3. Backstopping the Technical Service Units
Since this was the first major training for the TSUs, it was observed that there would be need for more training and study tours to see how other farmers in the region were providing CA services. In addition termite control in CA was expressed as a serious challenge that needed to be addressed.

4. Hay and silage preservation
Advice on feed preservation was given that it was important to harvest the grass at flowering stage, to cut the grass when you see 75% of the field has flowered, cut and let it wilt for three days before baling.

For Silage making using Green maize stovers
- Cut the stovers when the maize at the soft daft stage- when you touch the maize and it produces milk
- Wilt for a day
- Put the stovers in an air tight container and suppress to remove air, compact, continue putting layers and cover it and will be ready for use at one month. Can go up to 5-10 years
- Silage usually preserved itself
- If its a trench, line it with polythene material

**When using dry maize stovers**
- Chop the stovers, mix with urea and molasses using correct mixing ratios. Silage could also be made with napier grass

5. **Networking after the training**

It was suggested that the SIMLESA project management team would create a mailing list for the participants, so that networking continues after the training. For participants who did not use email, and had standard phones, sms would be used and a whatsup group would also be created.

In his closing remarks, Dr Drake Mubiru, expressed his sincere thanks to ACT. He acknowledged that skills and knowledge had been built. The trainees would now be CA consultants in their respective communities. Knowledge has been extended to both farmers and extension staff. This would make scaling up CA at the district level easier. There was need to however involve other stakeholders like the district councilors. He also acknowledged and thanked AEATREC for the successful hosting of the five day training. The venue had offered a conducive environment for learning. He noted and reminded participants that AEATREC has and develops a number of technologies including maize and groundnut shellers, cassava chippers, bio-gas equipment, water harvesting equipment and irrigation systems. It was therefore in the interest of the participants to come back and equipment themselves with some of these technologies. Finally he thanked the funders of the project, the Global environment facility, NARO, SIMLESA supported by CIMMYT and the Australian Government.
## Annexes

### Annex 1: List of participants

<table>
<thead>
<tr>
<th>SN</th>
<th>Name</th>
<th>Gender</th>
<th>Designation</th>
<th>District</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ayo Alex</td>
<td>Male</td>
<td>Farmer</td>
<td>Lira</td>
</tr>
<tr>
<td>2</td>
<td>Apita Benson Bernard</td>
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<tr>
<td>3</td>
<td>Ocen Jacob</td>
<td>Male</td>
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</tr>
<tr>
<td>4</td>
<td>Agany Jimmy</td>
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<tr>
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<tr>
<td>6</td>
<td>Opio Samuel</td>
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<td>Odong Innocent Polino</td>
<td>Male</td>
<td>Extension worker</td>
<td>Lira</td>
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<tr>
<td>8</td>
<td>Ogwal Francis</td>
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<tr>
<td>9</td>
<td>Kato Daniel</td>
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<td>Farmer</td>
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<tr>
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<td>Sejomba James</td>
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<td>Nsamba Emmanuel</td>
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<td>Nabisaso Mastulah</td>
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<td>Extension worker</td>
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<td>16</td>
<td>Ssemujjuzi Anthony</td>
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<tr>
<td>17</td>
<td>Otim Godfery</td>
<td>Male</td>
<td>Research officer</td>
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<tr>
<td>18</td>
<td>Nakamya Sarah</td>
<td>Female</td>
<td>Principal Agricultural Officer</td>
<td>Nakasongola</td>
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<td>19</td>
<td>Sebwato M. Joshua</td>
<td>Male</td>
<td>Agriculturalist</td>
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<tr>
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<td>Abila Peter</td>
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<td>Nantongo Eva</td>
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<td>Ojuka Godfrey Acuti</td>
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<td><strong>National Agricultural Research Institute</strong></td>
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<td>23</td>
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<td>27</td>
<td>Peter Kuria</td>
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<td>28</td>
<td>Achora Janet</td>
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<td>KIM Manager</td>
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<td>30</td>
<td>Edward Gitta</td>
<td>Male</td>
<td>Program Manager</td>
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Annex 2: Workshop group processes

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<thead>
<tr>
<th>SN</th>
<th>Group Name</th>
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<tbody>
<tr>
<td>1</td>
<td><strong>Group 1:</strong> PUR</td>
<td>“Enkwo”</td>
<td>1. Senyimba Tom - Chair person</td>
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<td></td>
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<td>2. Mukambi Lameck - Secretary</td>
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<td>3. Agany Jimmy - Member</td>
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<td>4. Ssemujjizi Anthony - Member</td>
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<tr>
<td>2</td>
<td><strong>Group 2:</strong> ARANGA KEDE UNGA</td>
<td>“A better future”</td>
<td>1. Ocen Jacob - Chairperson</td>
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<td></td>
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<td>2. Nabisaso Mastulah - Secretary</td>
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<td>3. Apita Benson Benard - Member</td>
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<td>4. Semayaza Ziad - Members</td>
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<td><strong>Group 3:</strong> RIPPER</td>
<td>“Live Soil”</td>
<td>1. Abila Peter - Chair person</td>
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<td>2. Kato Daniel - Secretary</td>
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<td>3. Sarah Nakamya - Member</td>
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<td>4. Ayo Alex - Member</td>
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<td>4</td>
<td><strong>Group 4:</strong> MINIMUM TILLAGE</td>
<td>“Empowerment”</td>
<td>1. Sebwato Joshua - Chair person</td>
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<td></td>
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<td>2. Sejjemba James - Secretary</td>
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<td>3. Opio Samuel - Member</td>
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<td>4. Nsamba Emmanuel - Member</td>
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<tr>
<td>5</td>
<td><strong>Group 5:</strong> Oryem Can</td>
<td>“Yes We can”</td>
<td>1. Opio Tom - Chair person</td>
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<td>2. Odongo Innocent - Secretary</td>
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<td>3. Ogwal Francis - Member</td>
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<td></td>
<td>4. Acuti Godfrey - Member</td>
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<td></td>
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<td>5. Otim Godfrey - Member</td>
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**Course leaders**

**Time Keeper** – Kato Daniel  
**Chairperson** – Rev Agany Jimmy  
**Vice Chair person** – Nakamya Sarah  
**Spiritual Leader** – Abila Peter
## Annex 3: Training Programme

<table>
<thead>
<tr>
<th>Date – Time</th>
<th>08:00-08:30</th>
<th>08:30-10:30</th>
<th>10:30-11:00</th>
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<th>14:00-15:00</th>
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<tbody>
<tr>
<td><strong>Day 0</strong></td>
<td><em>Arrival of Participants and Registration</em></td>
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<tr>
<td><strong>Day 1</strong></td>
<td>* (Monday)</td>
<td>Introductions; logistics; participants’ expectations; <em>(NARO)</em></td>
<td></td>
<td>Situation analysis - Regional Experiences with CA + coping strategies by Participants <em>(Janet Achora)</em></td>
<td>What is CA and why CA? <em>(Peter Kuria)</em></td>
<td></td>
<td></td>
<td>CA Concepts and principles I: Minimum Mechanical Soil Disturbance <em>(CFU – Edward Gitta)</em></td>
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<td></td>
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<td>Course objectives and workshop processes <em>(Peter Kuria)</em></td>
<td></td>
<td>Group exercises</td>
<td>Plenary presentations &amp; discussions</td>
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<td>Plenary presentations, discussions</td>
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<td>Official opening: <em>(Dr. F. Kiyimba)</em></td>
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<td>Group discussions and Plenary presentations</td>
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<tr>
<td><strong>Day 2</strong></td>
<td>* (Tuesday)</td>
<td>Committee reports</td>
<td>CA Concepts and principles II: Soil cover <em>(Peter Kuria)</em></td>
<td>Managing Soil fertility in CA systems <em>(Peter Kuria)</em></td>
<td>CA Concepts and principles III: Crop rotations and Associations <em>(Peter Kuria)</em></td>
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<td>Practical Demonstration of erosion processes and infiltration <em>(CFU- Edward Gitta)</em></td>
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<td>Plenary presentations and discussions</td>
<td><em>(Peter Kuria)</em></td>
<td><em>(Peter Kuria)</em></td>
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<td>Field based practical Exercises</td>
<td>Field Visit Preparations: <em>(Peter Kuria)</em></td>
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<td><strong>Day 3</strong></td>
<td>* (Wednesday)</td>
<td>Committee reports</td>
<td>Field Visit/Practicals: CA in animal traction and Tractor systems <em>(Stanley Muriuki)</em></td>
<td>Field Visit/Practicals: CA techniques in manual systems <em>(Peter Kuria)</em></td>
<td>Field Visit/Practicals: CA techniques in animal traction systems <em>(Stanley Muriuki)</em></td>
<td></td>
<td>CA and Agroforestry CA and Climate Change <em>(Peter Kuria)</em></td>
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<td></td>
<td>Guided exposure to CA equipment, hands-on use and adjustments</td>
<td>Field Practical Exercises</td>
<td>Field Practical Exercises</td>
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<td>Plenary, discussions, exercises</td>
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<tr>
<td>Date – Time</td>
<td>08:00-08:30</td>
<td>08:30-10:30</td>
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<tr>
<td><strong>Day 4</strong> (Thursday)</td>
<td>Committee reports</td>
<td>Weed, pest &amp; disease management and control in CA systems</td>
<td>Practical session on weed control</td>
<td>Social economic aspects of CA</td>
<td>Monitoring and Evaluation of CA programmes</td>
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<td></td>
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<td>(1 hr-Weed Control in CA – Peter Kuria)</td>
<td>Calibration of sprayers</td>
<td>(Peter Kuria, Stanley Muriuki)</td>
<td>(Janet Achora)</td>
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<td>(30 min-NARO–Biological/Strategic)</td>
<td>Practical exercises</td>
<td>Group work and presentations</td>
<td>Guidelines on Preparation of Country Action Plans</td>
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<td>(30 minutes – Chemical control – (TBD))</td>
<td>(2 hours – TBD)</td>
<td>Extension Approaches for CA</td>
<td>(Peter Kuria)</td>
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<td>Plenary presentations, discussions</td>
<td>Course evaluation</td>
<td>Approaches for CA</td>
<td>Plenary presentations, discussions</td>
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<td><strong>Day 5</strong> (Friday)</td>
<td>Committee reports</td>
<td>Action planning</td>
<td>Course evaluation</td>
<td>Field Visit/ CA Practitioners:</td>
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<td>• Feasible CA options</td>
<td>(Janet Achora)</td>
<td>Travelling from AEATREC to Kalagi</td>
<td>Hosted at Bandera Farmer Group, Kalagi, Mukono District</td>
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<td>• Plans for implementation</td>
<td>End of course/Award of Certificates (NARO)</td>
<td>[Bandera Farmer Group]</td>
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<td>Way Forward</td>
<td>Closing remarks (Dr. Mubiru)</td>
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<td><strong>Day 6 (Saturday)</strong></td>
<td><em>Departure of participants</em></td>
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Annex 4: Workshop Evaluation Report

1.0 Introduction
This evaluation report is based on responses from nineteen respondents. Data was collected using a questionnaire that had both closed and open ended questions. The first section of the questionnaire had closed questions using the likert scale ranking with 1 representing the lowest and 5 the highest rank. Using the excel program, responses were coded and graphs generated. The sections on suggestions and recommendations were quoted verbatim.

2.0 Course logistics, facilities and content
The course logistics, facilities and content were very good as indicated in the graph below, with the facilitators’ knowledge ranked as excellent, followed by the food services and venue of the training as very good.

3.0 Major satisfaction/ lessons from the training
The highest level of satisfaction from this training was the session on introduction to CA equipment specifically the jab planter, ox drawn planter, direct seeder and pedestal sprayer. Also related to the CA equipment was the practical session on assembling followed by the session on the three CA principles. These were followed closely by the session on the CA technology, cover crops and the ripping technology.
4.0 Major frustrations and disappointment with the course

The major disappointment with the training was the fact that trainees did not get the chance to see and experience tractor machinery and how it is operated. Many of the trainees expressed their lack of experience with tractors and had expected to learn how to operate one. Other disappointments were the lack of handouts, lack of provision of cover crop seeds. They also expressed the need for the project to provide them with inputs early in March, before the start of the planting season.
5.0 How trainees intend to use acquired knowledge
A high number of the respondents on the use of acquired knowledge, said they would use the acquired knowledge to convince and sensitize fellow farmers to practice CA, others who were already practicing CA, said they would use the acquired knowledge to improve on their farming as well as use the knowledge acquired on CA equipment to train fellow farmers.

6.0 Recommendations for the next course
- Support ToTs to conduct similar trainings at the sub-county level so that more people understand and acquire CA skills
- More exposure be given to trainees with farmer groups practicing CA principles
- More practicals than theory be organized next time.
- Training on oxen handling, yoke making and field visits and practicals in CA should be organized.
- Availability of training tools and handouts at future trainings
- Use of videos to demonstrate CA should be continued.

7.0 Comments and suggestions
Cover crop and seeds
- Participants suggested that the issue of cover crops be addressed and seeds from Kenya brought so that they can be multiplied by the Ugandan farmers.
- They also requested for linkages to cover crop seed suppliers in Kenya.
- The farmers asked that provision of improved seeds to them should at least be given to them by the first season.

**Visits and tours**
- Participants requested that study tours are conducted both in and outside the country.
- They requested that the next training is organized in Kenya, Tanzania or Zimbabwe and preferably on a farm.

**Training in animal traction**
- Farmer groups and technical staff should be trained in animal traction if good CA results are to be realized.
- The lack of preparedness of the animals at the University farm was a lesson to the farmers that animals should be kept very busy all the time so that they are ready to work anytime.
- They requested for further trainings on selection and training of oxen.

**Linkage to service provision**
- Farmers and any intended CA practitioners should be facilitated by enabling linkages to CA equipment dealers like suppliers of Jab-planters.

**Livestock/ CA integration**
- The participants requested that the issue of integration of livestock feeds (fodder training) should be handled very seriously as this would attract more farmers to CA.
- More trainings should be organized on how to integrate CA with livestock in dry areas.

**Practical training**
- A request was made that next time more time should be allocated for the practical trainings, for instance the assembling and disassembling of machines.
- Calibration of sprayers should be handled by farmers/service providers at the next training as opposed to trainers.

**Other suggestions**
- Farmers requested for the need to be trained to understand and interpret the recommendation and instructions given on the herbicide labels.
- Training on waste management is requested

**Project Recommendation**
- Extension staff supporting the project should be supported, in terms of facilitation so that they can do the field visits, data collection, monitoring among other field activities more effectively.

- Better accommodation and evening meals could also be better organized for the next training.