



**African Conservation  
Tillage Network**



Training of Trainers (TOTs) on Conservation Agriculture Technology for Sustainable Food Production and Protection of Environment Held at Emurua Dikirr Transmara East, Narok County in Pachero Hotel on 9<sup>TH</sup> -12<sup>TH</sup> December, 2014

**'Transmara Environment Conservation Movement (TECM) 2030 Project'**



PARTICIPANTS' GROUP PHOTO

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EMBASSY OF DENMARK  
**DANIDA** | INTERNATIONAL DEVELOPMENT COOPERATION

Through



*Conservation Agriculture for improved livelihoods and a better environment*

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## **EXECUTIVE SUMMARY**

Studies' reports and experience shows that decreasing soil productivity, inadequate soil moisture and erratic rainfall, have resulted in rural poverty and lack of food security for many smallholder farmers in Trans Mara East Sub-county.

These problems are prevalent in regions' communities and concern a large part of the population. In order to survive, people tend to overuse natural resources, which form the basis of their livelihoods, these is witnessed by rampant harvest of forest trees for charcoal burning and firewood sale to further regions like Kisii. The encroachment of forest destruction towards outskirts of Maasai Mara Game reserve in Soit regions is wanting and have happened due to lack of food security in the region daunted by occurrence of the Lethal Necrosis maize disease.

Secondly, inappropriate tillage practices applied in the region has resulted in soil fertility decline and increased of soil erosion. Thirdly, due to the negative impacts of climate change, which are quite pronounced in the region, drought periods are occurring more often, last longer and rainy seasons are getting increasingly erratic and weather system is changing. This is evidence currently due to changing trends and periods of long rain expected rain in the month of April and May which has failed but instead drought occurred in this period.

The intervention through the introduction of globally proven environmentally sound and sustainable Conservation Agriculture (CA) technology is purpose to improve food security in the region through improved yield and crop diversification. Conservation agriculture as sustainable land management and resource-saving technology is based on three fundamental principles: (i) minimum soil disturbance (ii) adequate soil cover at critical periods of the growing cycle, and (iii) diversified crop rotations. CA addresses several key constraints that are challenging agriculture in the region: reducing farm labour requirements; sustaining the natural resource base (by reversing land degradation, re-building of soil health through build-up of soil organic matter though minimum soil disturbance and soil cover/cover crops); contributing to mitigating the effects of climate change; and reducing the vulnerability of farm incomes.

The CA and agroforestry research and development communities have now recognized the value of integrating fertilizer trees and shrubs into CA systems to dramatically enhance both fodder production and soil fertility (e.g. FAO 2010; FAO 2011). Practical systems for intercropping fertilizer trees in maize farming have been developed and are being extended to hundreds of thousands of farmers in various part of Sub-Saharan Africa (Garrity et al 2010). The portfolio of options includes intercropping maize with fast-growing N-fixing trees, including *Gliricidia sepium*, *Leuceana Lecocephala*, *Tephrosia candida* or *pigeon peas*, using trees such as *Sesbania sesban* as an improved fallow, or integrating full-canopy fertilizer trees such as *Faidherbia albida* into the CA system (Akinnifesi et al., 2010).

Incorporating trees into crop farming may confer sustainability benefits through ecological intensification. And they may increase the resilience of the farm enterprise to climate change through greater resilience to drought at the crop level and at the household level.

At the crop level there are two key processes in play for drought resilience. First, the presence of the trees increases rainwater capture and storage. This improved rainfall infiltration and soil moisture storage are particularly valuable on farmlands where rainfall runoff is a problem.

In view of the above KUEG CBO under the TECM project funded by DANIDA through CDTF intends to introduce and enhance the adoption conservation agriculture as a new farming system to mitigate imminent constraints facing the farmers in the region daunted by the climate change variability and crops diseases and promote environmental protection.

It is under this background that Africa Conservation Tillage Network (ACT) was engaged to facilitate and train 30 services providers (TOT) on Conservation agriculture technology and agroforestry, who will then train 60 other framers and establish three demonstration farms as learning fields for farmers in the region to learn and experienced the new system within the project site. Based on the prior information and experience, CA has great potential in regions as it can minimum excessive soil erosion, enhance biodiversity regeneration, produce stable yields and reduce labour requirements. It also increases farmers' resilience to adapt and mitigate effects of climate change. In reference to the above, partial adoption of the technology as per Mr Wood, a Narok South farmer, who has been using the no-till method for some years have demonstrated improved farmers' yields (<http://tinyurl.com/mfttahc>). The objective of the training was to enhance understanding of the principles of resource-saving and sustainable agricultural technology (Conservation Agriculture) as the new way to farm; to provide practical knowledge and skills in the application of sustainable agriculture practices for different socioeconomic and agro-ecological environments in Mau forest ecosystems and enable Service Providers (ToTs) to respond competently to sustainability and productivity needs of farmers as well as strengthen the competency of the service providers to facilitate learning of conservation Agriculture technology to potential support staff (extension) and farmers. The training was done to all Ministry of Agriculture, livestock and fisheries staff and selected lead farmers in Transmara East Sub-County in Pachero Hotel at Emurua Dikirr town,Narok County on 9th -12th December, 2014.

This is geared to contribute to some of the specific objective of the TECM project to enhance environmental conservation through increased woodlots cover at private farms from 2% to 6%, introduce water and soil conservation technologies, and support to energy conservation initiatives for reduce pressure on existing woodlots within the region; support livelihood diversification and community adaptations to climate variability initiatives for improved income and livelihood asset protection.

The African Conservation Tillage Network (ACTN) as network was initiated following a Stakeholders' Workshop on "Conservation Tillage for Sustainable Agriculture" held in Zimbabwe in 1998 organized by Zimbabwe Farmers Union, German Development Co-operation (GTZ), and the Food and Agriculture Organization of the United Nations (FAO) and the Agricultural Research Council of South Africa (ARC). Driven by the desire among players to

better and share more information and experiences on CA and related aspects, the Workshop ratified the initiation of a regional network as a mechanism to stimulate and facilitate cross-cutting and mutually exchange knowledge and information from experiences of CA. ACTN is registered as a pan-African not-for-profit with its mission to enhance agricultural productivity, sustainable land management and environmental conservation through promotion of conservation agriculture principles and practices in Africa

## **1.0 INTRODUCTION**

### **1.1 Training objectives and expected outputs**

#### **Course objectives:**

1. To enhance understanding of the principles of resource-saving and sustainable agriculture technology (Conservation Agriculture (CA)) as a new way of farming.
2. To provide practical knowledge and skills in the application of CA practices for different socioeconomic and agro-ecological environments in Mau forestry/Mara river ecosystem to enable participants to respond competently to farmers' needs and have competence in the new agricultural system.
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 conservation farming technologies to potential support staff (extension) and farmers.

#### **Course expectations**

At the end of the training, participants were expected to have basic understanding of CA and to give input to the development of project zones implementation action plans aimed at facilitating promotion of CA and effective establishment of CA demonstration farms at each project zones as they introduce and promote CA technology and other climate change adaptive technology in the region. They should be able:

1. Explain and demonstrate to others the concept and principles of CA and it's applications
2. Guide farmers and other stake holders in analysing and determining solutions to problems in sustainable use of soil and water in farming
3. Plan and facilitate farmer-based trials and demonstrations for adaptation of Conservation farming technologies
4. Develop learning facilitation materials and work plans for implementation of identified field activities
5. Provided to participants relevant CA materials and Tools as well as guide them on the use and operations of the CA tools.

### **1.2 Topics covered during the training**

The training basically concentrated on Conservation agriculture technology and practices, it covered various thematic topics which 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; permanent organic soil cover and Crop rotations and/or associations); *Soil Health* ( Soil

characteristics & properties, erosion and water infiltration); *conservation 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); *Crop-tree-livestock integration in conservation agriculture systems* ( CA & Agroforestry; CA & Livestock, CA and Climate Change) and *Extension Approaches for CA* (Farmer Field School, Study circles, model farmers and contract farming)

Field based practicals accomplished included: *Practical Demonstration of erosion processes and infiltration Run-off trays*; *Cover crop types and seeds demo & display: CA techniques in manual systems* (laying, digging basins, jab planting; dibbling; manual weed control); *CA in animal traction systems* (harnessing animals for ripping and direct seeding, CA Animal Drawn equipment showcase). *CA in tractor (2WT & 4WT) based Systems* (rippers and sub-soilers) were pictorially illustrated through photographs and videos.

The topics were covered through power point presentations, plenary and group discussions intercepted by watching CA videos of various CA systems. There were also practicals on the operations and uses of various CA implements or equipment, a demonstration on the effects of CA (soil cover) on soil erosion was simulated and the results discussed.

During the training emphasis was concentrated on CA equipment utility as well as attention to CA technology package adoption to avoid impartial application of single principle which may end up not bringing expected results of the technology as proven when full system is adopted. In line with the project objectives focus was also on the understanding of how agriculture related to environment and how CA can significantly contributes to sustainable protection and conservation of environment.

## 2.0 DAY 1: TRAINING PROCEEDINGS:

### 2.1. Setting the stage for the training

The day started with Project Manager, Mr. Richard Rotich, brief introduction and welcome remarks. He commented the participants for their impressive turn-up and urges them to get set for what he regarded as another important training in the TECM project activities. He immediately, invited participants' presents to introduce her or himself and later handed over the program to Mr. Weldone Mutai who introduced the facilitators from ACT.

Together with the Manager, Mr. Mutai led the participants to establish training (house) rules and captured their' anticipation and expectation about the



**Plate 2:** Mr. R Rotich, Project Manager gives his opening remarks and welcome address.

course. These were summary of trainee's expectations as follows:

**Expectations put forward included:**

- ✓ To learn about CA and agroforestry
- ✓ To learn new skills on modern farming
- ✓ To learn more about new farm implements
- ✓ To get good knowledge on CA
- ✓ Ho to become a good and model farmer
- ✓ To get skills on how to Improvising CA implements
- ✓ How to improve farming in the sub-county
- ✓ How to rehabilitate degraded environment
- ✓ How to implement and adhere to good agronomic practices
- ✓ How to deal with Lethal Maize Necrosis Disease
- ✓ Correlation between Environmental conservation and Conservation Agriculture
- ✓ To know about ACT organization
- ✓ Soil conservation in CA
- ✓ Networking with other farmers
- ✓ why soil health
- ✓ Challenges in conservation agriculture



**Plate 3:** Mr. Mutai and Project Manager lead the process of capturing participants' expectations

Later, Mr. Mutai invited Mr Kuria to complete the ground setting for the training. He immediately lead the participants to organize themselves into three groups (committees) to enable them actively manage and monitor the daily activities during the training to ensure everyone remains alert and active, besides each committee was to be in charge of the every morning recap reporting the previous day proceedings and issues emerged. The groups were tasks to reorganize themselves and decide on the guiding slogan and division of roles. They groups formed included:



**Plate 4:** Mr. Kuria leads the formation of course committee and brief them on their roles.

**Overall course officials:**

1. Chairperson: Mr. Seron Joseph
2. Vice Chair: Mr. Ngetich Daniel

**Committee/ Group 1: Morning Star**

Slogan: **Bridge to hunger free zone**

<p><b>3. Spiritual leader : Pastor William Milgo</b></p> <p><b>4. Time keeper: Beatrice Salantei</b></p>	<p><b>Officials:</b> Chairperson- Sammary Rono Secretary- Mr. Langat P.</p>
<p><b>Committee/ Group 2: Arise and Shine</b></p> <p><b>Slogan:</b> <i>Performance is key</i></p> <p><b>Officials:</b> Chairperson - Joseah Bor Secretary- Peter Cheruiyot</p>	<p><b>Committee/ Group 3: Kilimo Bora</b></p> <p><b>Slogan:</b> <i>Mchumia juani hulia kivulini (Best for last)</i></p> <p><b>Officials:</b> Chairperson-Zacheus Mutai Secretary -John Langat</p>

Besides, Mr. Kuria briefly outlining the course objectives and outputs expected as mentioned above in the introductory section. He comparatively asks the participants to consider what they expect as outlined and the package we intend to offer to be able to check any deficiency and alert the facilitators as the training goes on.

## 2.2. Official opening of the training

The training event was officially opened by Mr. Joseph Kering, Transmara East Sub-County Agricultural Office (SCAO), but before he spoke, he welcomed his counterpart Sub-County Livestock Production Officer Representative, Mr. Richard Melile, to give his opening remarks. Mr. Melile begun by expressing his utmost gratitude to KUEG CBO for planning and organizing such training at the brink of challenged agricultural productivity in the region. He welcomed ACT team to the region and expressed confident that the training will proceed well as planned. He passed SLPO's apology for not making to the training. To the participants, he advised them to prepare well and take everything seriously at the course of the training considering it as opportune moment that has come amid several challenges faced by farmers in the region over time. Besides, he promised to organized with SCAO to have ASDSP County Coordinating unit team scheduled to visit them the following day have a brief session with the participants given that one of the core pillar of the ASDSP project is addressed by technologies like CA. Having said the above, he handed back the programme to Mr. Kering.



**Plate 5:** Mr. Melile Richard, DLPO representative giving his opening remarks

Mr. Kering took time to express his experience about agricultural productivity trend in the region. His emphasis was on the land degradation and effects of climate change daunted recently by invasion of Maize Lethal Necrosis disease which has rendered farmers in the region poorer. According to him, the training was timely and provided the participants and farmers in the region to reconsider crop diversification and adoption of new modern sustainable technologies that are environmental friendly like conservation agriculture. He too welcomed ACT team to the Sub-

County and applauded KUEG CBO for being a role model and organizing such training, surely we feel indebted as the Ministry, he said. In a special way also recognized the support provided

by DANIDA through CDTF to the project and agricultural activities in the region indicating that as a Ministry they have always been part of the implementation of the project as PIC associate. Besides, part of his talk focused greatly on the environmental challenges caused by the conventional farming systems and the rigidity of the region's farmers to embrace new farming techniques and crop diversification.

  
**Plate 6:** Mr. Joseph Kering, SCAO sharing his experience about agriculture in the region and officially opening the training and highlight the recommendations that has been made by the government on the disease.

During his speech he hinted that considering lots of concerns expressed by participants about MLND, he will find time at the course of the training to explain briefly and highlight the recommendations that has been made by the government on the disease.

He applauded the turn-up and huge enthusiasm expressed by the participants urging them to maintain the spirit and actively participates in all training sessions. He reiterated that the aim of the course is to capacity build trainers who are supposed to later transfer knowledge and skills gained to the farmers in the region and beyond. Notably, the training is unique since we are getting the support of the African Conservation Tillage Network (ACT), prime Pan-African organization with vast experience in CA, to carry out the capacity building. We want to thank them for accepting our request, he explained.

Based on his knowledge and understanding, he explained that Conservation agriculture, as a farming system has great potential in region as it can control erosion, enhance biodiversity regeneration, produce stable yields, and reduce labour requirements. It is also associated with adaptation and mitigation of climate change. The most critical thing is the ability of the farming system to reduce land degradation.

Lastly, we need to re-look at our individual commitment after this and be ready to provide voluntary services when engaged. The whole sub-county expects new approach to farming from you guys having gotten the privilege to be trained today

Otherwise, with those few remarks, allow me to officially welcome you to this session and declare this training on Conservation Agriculture Technology for Sustainable Food Production and Protection of Environment officially opened, He expressed.

### **2.3. Presentation on what is and why conservation agriculture: CA as a concept**

This session was facilitated by Mr. Peter Kuria. It focused on the background, history and rationale of Conservation Agriculture. The emphasis was on understanding why conservation

agriculture and deeply what has gone wrong with the conventional agriculture. Indeed several devastating ills of poor tillage systems were highlighted to underline the inevitable need for changing our farming systems and bring forth the damage caused to the environment due to application of conventional tillage practices. He gave an example of how CA started in United State of America in 1930s after the dust blown by wind increased due to highly mechanizing conventional agriculture. The country has moved steadily with use of this environment friendly way of farming to become the world's largest food producer it is today.

Moreover, to broaden the understanding, he drawn lessons from SASAKAWA 2000 programme where farmers were supplied with inputs and the necessary support and were able to increase their yield but as soon as the support stopped, they resorted to the old conventional farming practices and the yields dropped as before and the Asian green revolution where the same scenario happened. Inputs cost has gone up and produce price are not predictable. There are weak market linkages and there is over reliance on rainfall

Why Africa has failed to feed its people: Peter illustrated that Africa remains the only continent where per capita food production has declined over the last four decades. Environmental degradation coupled with other inevitable factors compromise productivity of the African smallholder farming systems. More often than not, small scale farmers face recurrent droughts and crop failures in the abnormal weather patterns that are as a result of climate change. Unusual heavy downpours are followed by prolonged droughts and inconsistent rainfall patterns usually with low moisture supply. Moreover, Conventional tillage systems often leave behind a heavily pulverized soil of low organic matter and poor structure. The said soils are easily carried off by the erosive rains and increasing wind velocities due to low tree vegetation in agricultural areas. Poor water infiltration rate as a result of soil compaction pave way for increased surface volumes of runoff that are not easily tamed and result to massive soil loss through erosion. In farmlands, 1mm layer of soil lost would translate to several tonnes per acre/hectare. Soil inversion has led to loss of sequestered carbon and nitrogen to the atmosphere and adding to the greenhouse effect.



**Plate 7:** Mr. Kuria, making a presentation on the first topic for the training, about CA and why CA?

Having set the background, Peter went on to introduce **Conservation agriculture technology**, as a farming concept that promotes efficient input use and increases long term productivity of land and water resources. These objectives are achieved through the application, in combination with other good agronomic practices, of the following three principles; ***the principle of Minimum soil disturbance*** which involves reducing the number of till operations in our farmlands, it helps the buildup of soil organic matter which in turn increases carbon sequestration and maintenance of

improves soil structure and soil health including biodiversity. It also improves water infiltration and reduces exposure of soil to erosion and runoff; ***the principle of 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; ***and finally the principle of 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. Each of the principle was handled separately in the subsequent presentation.

During this, trainees were cautioned to pay attention to complementary CA enhancers and the normal good agronomic practices as they spread the technology. Practices such as timely planting and judicious use of certified or quality inputs like seeds and fertilizers and agro forestry, will contribute greatly to the superiority of the technology.

Besides, Peter highlighted some of the challenges experienced in promotion and adoption of CA with the intention to prepare learners to the reality. These challenges included: *fixed mindset; other competing use of crop residues; Weed control; existing land tenure systems; poor adaptation of CA within local conditions and Poor government policy support.*

Finally, Peter took the participants briefly to understand who ACT is and its profile; ACT as not-profit organization with the sole mandate to promote CA in Africa, and welcome the participants to visit ACT's website [www.act-africa.org](http://www.act-africa.org) for more information about us and CA information as well as CA farmers' experiences.

#### **2.4. Presentation on CA concept and principles: Minimum soil disturbance**

This presentation was intended to deeply look into the first principle of CA; Minimum Soil disturbances and expound on its applicability, importance and relevant tools and equipment associate with this principle. The session was facilitated by Mr. Weldone Mutai, who started off by illustrating to participants the status and importance of agriculture to Kenya's economy and briefly revisited the three principles of CA prospectively to elaborate how they are intertwine to form a applicable package. He went on to consider the two main tillage system applicable in farming; *Traditional (Conventional) and Reduced (minimum tillage/ no-till) tillage.*

In traditional tillage systems a lot was discussed,



**Plate 8:** Mr. Mutai facilitating the topic on the first principle of CA and levels of applications

this include: why till, inappropriate tillage system consequences; immediate (seems positive) and long term (greatly negative) effects of tillage/ploughing. Whereas reduced tillage highlighted the operations that emphasizes on minimal disturbance of the soil in crop production, these included: sub-soiling, ripping, zai-pits/basins, direct seeding/no-till and shallow mechanical weed control. In each of the operation, appropriate tools and equipment catering for all levels of farming were discussed and pictorially illustrated. Effects of reduced tillage were also elaborated besides challenges based in adoption of the practice.

## **2.5. Presentation on CA concept and principles: Permanent Soil Cover and Crop rotation and//Association**

This session facilitated by Mr Kuria really focuses on the two other principles of CA; Permanent soil cover and Crop rotation and associations. According to Peter, soils cover can be accomplished by crop residues (dead plant matter) or imported mulch and establishment cover crops which can be synchronized for all year round production. It is regarded as the most important principle of CA. In his presentation, he cited various leguminous cover crops that can be used and expound on the importance of using legumes relating to nitrogen fixation processes like nitrogen fixation, assimilation, ammonification/mineralization and nitrification.

Importance of soil cover was also elaborated on weed suppression and maintenance of biological activities in the soil as well as effects on soil erosion and water infiltration emphasis, this was later qualified in the practical demonstrations on the effects of CA- soil cover concept on water infiltration and soil erosion due to runoff; this was meant to bring out clear understanding to the participants of the training. Notably, soil cover increases organic matter available in the soil which in turn replenished soil nutrients.



**Plate 9:** Mr. Peter making a presentation on the the two other principles of CA; Permanent soil cove and Crop rotation and associations

## **2.6. Presentation on Soil Health: Soil fertility and management**

The session was presented by Mr. Weldone Mutai. It touched on importance of understanding soil health and fertility, basic soil science, Soil degradation, healthy soil, soil fertility, soil cover, effects of CA on soil health, fertility and soil organic carbon. Soil characteristics were looked at and the definition of soil stated, soil health and quality was defined, soil threats, degradation soil erosion and fertility decline discussed.

During this session, effects of tillage on soil properties were discussed and enhanced soil fertility. Further, effects of CA on various physical, chemical and biologicals properties were elaborated deeply and research examples cited. To broaden the understanding why promotion

and adoption of CA emphasis on application of the three principles, soil organic matter importance and contribution toward soil fertility and restoration of biodiversity was discussed at length. This was aimed at bringing out clear need building the content of organic matter in our farms which in turn contribute to environment conservation. SOM was equated to soil health and illustration of this was demonstrated. The quest to reclaim or rehabilitate the degraded land to its optimum fertility was discussed and illustrated as an option to improve environment indirectly. Thus, the session was concluded by the presenter stressing the significance of applying the three CA principles simultaneously and gradually to enhance soil health and fertility (soil quality). He ended his session by a quote that goes ‘it is good to know that, “*A good quality land yields good results to everyone. Confers good health on the entire family, and causes growth of money, cattle and grain.*” And we have the opportunity to make a difference. **CA is the course**, only we need PARTNERSHIPS to get KNOWERS working with DOERS”

A video (available online on : <https://www.youtube.com/watch?v=LbBgPekjiyc>) to illustrated the nitrogen cycle from 7 active was lastly played and participants were able to watch and comprehend the intentions and how CA can contribute to the N cycle.

## **2.7. Demonstration on the Effects of organic soil cover on soil erosion and water infiltration**

This demonstration done to establish and illustrate the effects of soil cover (mulch) on water infiltration and soil erosion due to surface runoff, this exercises was purpose to ensure every participants could have a feel of what was being discussed and how conventional farming system have greatly contributed to environmental degradation without our quick consciousness.

A short demonstration on the effects of the soil cover on soil erosion and water infiltration into the soil was established. The set-up included two soil trays inclined at same angle with one covered with dry grasses. At the same depth rainfall was simulated and the effects of the induced runoff were observed. The demonstration really illustrated the anticipated effects as participants were able to appreciate the heavy water erosion in the uncovered trays and the different depth of infiltration levels, the concept was internalized.



**Plate 10: Demonstration of effects of ground cover on the soil erosion and water infiltration: Soil erosion trays experiment**

### **3.0 DAY TWO: TRAINING PROCEEDINGS**

#### **3.1. Presentation on Conservation Agriculture equipment Demonstration and use: *Equipment Manufacturing and hire-service provision***

##### **Conservation Agriculture equipment Demonstration and use**

This topic was facilitated by Mr. Weldone Mutai. The presentation begun with revisiting conventional tillage equipment utilized at different level of crop production, their effects on production agents and effects of this system mechanization. Besides, it focused on the various CA equipment used for different farm operations required in CA. He touched on the tools for land preparation, planting, weed management and other operations. He also elaborated on the hand/manual, animal drawn and tractor drawn equipment used in CA system. The topic was later concluded by practical on the use, handling and calibration of the manual CA tools and animal drawn implements in the practical session.

Various equipment were illustrated through photo slides which included: tractor rippers, tractor planters and sprayers, power tiller planters and weeder, animal drawn direct planter, ripper and sprayer, hand jab planter, pedestal sprayer and hand ripper. Other innovations from farmers in terms of use and the various transformations that farmers have gone through to maximize the use of such equipment were shown and discussed.



**Plate 11:** Mr. Mutai facilitate the topic on CA equipment and use

##### **Conservation agriculture service provision:**

During this session too, Mr. Mutai, briefly share CA service provision, hire service provision model, farmers in different places have been using especially in Laikipia where service providers have successfully and profitably reaped from the provision of CA services. This regarded important give the limited access and expensiveness of CA equipment in the market and as a form creating employment to service providers. According to him, he adopted CA is energy saving especially using his draught animals and time saving due to reduced farm operations, thus one is able to serve more farmers. Economically CA compared to conventional agriculture in regards to commercialized service provision is more profitable considering the number of farmers being served within a season and less operation costs required for operations.

#### **3.2. Field practicals: practical use of CA equipment**

The participants were divided into 2 groups to familiarize, study, practice and know how to assemble including the various adjustments that are involved in handling and usage of CA equipment. The first group was to start with hand ripping (hand ripper), shallow weeding

(shallow weeder), Jab planting (Jab Planter), Li-planting (Li planter) and basin/ zai pits designs and making. The second group started sprayers (both Knapsack sprayers and Pedestrian pull sprayer), the demonstration was handled by Mutai and Kuria respectively. All the groups were taken through equipment assembling, use, safe use of chemicals with sprayers, care and maintenance of the tools and implement above.

At each category the tools/equipment handle included:

- Hand tools: Two Jab planter; Li-planter, weeds scrappers and hand ripper
- Sprayers: Pedestrian Pull sprayer and Knapsack sprayer



**Plate 12:** Demonstrations of CA hand tools and sprayers by Peter and Weldone with the participants having a feel of the tools

Later, participants were shown how to assemble, use and care animal drawn ripper, subsoiler and direct planter. A demonstration was done on the use of these implements using oxen as source of power required, each equipment was demonstrated, ripper, subsoiler and the planter. Participants were so excited and appreciated more about what was being presented in the training room, many could now admit that they have internalized the concept about the technology and could clearly sense on what has been discussed. Ripping and subsoiling was done by replacing the mouldboard in the plough frame with the ripper and subsoiler attachments and operating them as required, seeding using the planter was later demonstrated by using bean seeds and the same oxen as source of prime power. Participants confirmed that the equipment were effectively working as discussed earlier.



**Plate 13:** Participants using assembling and demonstrating with CA animal drawn equipment (Ripper & planter)

### 3.3. Weed, Pests and Diseases Management and Control in Conservation Agriculture systems

Before ending the day, the participants were taken through another topic on Weeds, pest and disease management and control in conservation farming systems, time lines, manual and chemical options as well as strategic control. Under this topic several issues pertaining weed control and management, definition and characteristics of weeds, importance of weed control and traditional methods employed were discussed. It also touched on approaches to weed control, integrated weed control methods in CA system and how CA reduces invasion of weeds in the

crop land. Several equipment used at different scales for weed control under CA systems were touched including their operation and importance.

In this session, participants were taken to understand issues relating to various weed control methods that are applicable to CA. Caution was put across to members not to confuse or attach chemical weeds control to CA as it has been in some quarters. Safety and the adherence to chemical use instruction were over emphasis, this is intended to ensure effectiveness and efficient use of the chemicals. Several tools and equipment for both mechanical and chemical weed control in CA system were pictorial illustrated. As the session concluded, brief mentioned on how to control pests and diseases in a CA system were accomplished and more plenary discussion was opened. It is here where many farmers were so curious about MLND and how to control it. SCAO was given a chance to explain and guide farmers on this issue of Maize disease, he cited several recommendations fronted by Government and urge farmers to observe them seriously. These range from carefully destroying affected plants when noticed and having closed seasons in the region if possible to control the disease. His suggestion includes controlling vectors that spread the diseases by spraying where necessary. He admitted that surely the disease is a menace in the region and went on to encourage farmers to diversify to other crops reminding them that this training provide a greater moment to start thinking outside our traditions.

### **Display of Cover crop seeds**

During this session too, samples of different cover crops seeds were circulated and a brief demonstrated and various agronomic characteristics discussed with the participants. Based on the understanding participants concluded that cover crops like *Mucuna*, *Dolichos lablab*, *Canavalia ensiformis*, purple vetch, vetiver grass and pigeon peas viable crops in the region since they confess some are already planted by farmers and they are doing well. How these cover crops controls weeds in CA system was also discussed, citing example *striga weeds* being controlled by intercropping desmodium in our main crops, a case of push pull technology.

## **4.0 DAY THREE: TRAINING PROCEEDINGS**

### **4.1. Pictorial Illustrations: CA in Tractor based systems**

Due to lack of tractor CA implements for this session, it was agreed that the topic could be accomplished through watching videos on tractor based systems. This was to give a clear picture and practical understanding to participants on the case of tractor based CA systems. Videos watched included:

- ✓ *Motorized shallow weeding*
- ✓ *New John Deere S610i- Corn Harvest*
- ✓ *John Morison planter in operation*
- ✓ *Two Wheel tractor planters in operation*
- ✓ *Fitarelli planters in operation*
- ✓ *PSE WorkHorse ATV Boom Sprayers*

All these videos were provided to participants for further reference together other materials and presentations later. Other than these videos, photographs for different CA tractors' implements both powered by two wheel or walking tractors and four wheel tractors were flashed through especially during PowerPoint presentations.

#### **4.2. Presentation on Crop Tree – Livestock Integration in Conservation Agriculture Practice**

Under this session, several issues were presented by Peter Kuria, these included that surrounded: Climate change and CA; CA and agroforestry and crop-livestock integration. It emphasizes that farmers should embrace adoption of CA as an opportunity to generate income and integrated other enterprises that are complementary to crop production. Including agro forestry in CA system will enhance the performance of CA on the environment and creating microclimate as we biodiversity, this system is create more tolerant and resilience to climate fluctuations farming system. Integrating CA with agroforestry established 'symbiotic' existence and improved environment as well as restoration of soil fertility. This integration could be achieved through: incorporating Fertilizer trees (*Faidherbia albida*, ) in our farms; establishing multi-purpose trees for fruits, fuel wood, building materials in ore farms, creating live fences – croton, cypress, Grevillea, Calliandra, Leucaena, euphorbia; and finally growing trees to act as wind breakers in wind prone areas.



**Plate 14:** Peter handling the topic on CA with trees and livestock integration

In regard to livestock integration, various options were presented, for instance adoption of dairy goats rearing for milk and income: It was viewed as a cheaper way of producing milk and income with the animal since they are; Low feed consumers, adaptive and can rely on diverse wild feeds such as shrubs

Another important aspect looked at was evergreen agriculture regarded as a method of preserving the natural herbs, shrubs and trees so that they can be of help to the farming ecosystems, provide feed for animals, break wind and provide fuel.

The introduction of legume fodder trees in the systems was also considered as a boost to adoption of CA and promotes the integration of livestock into the system, such legume shrubs as *Lucaena lucocephala* and *Calliandra*. As it has been noted, failure to consider animal as part of CA creates conflicts with mixed farmers. Diversification of crops such as *Canola*, *Simsim*, and other high nutritive crops like sunflower would provide alternative feed for livestock.

Participants were able to be shown a video on feeding the cow or the soil (available on: <http://act-africa.org/videos.php?com=60&item=&vid=36#.VLZJBcmGew8>) and this gave an

elaborate comparison of the various systems and situations that exist in Kenya, Tanzania and West Africa.

#### 4.3. Presentation on Action plans development: Consortium planning- Action plans

This session was facilitated by Mr. Weldone Mutai. This session was meant to illustrate how to develop and decide on the way forward in implementing the dissemination of the knowledge acquired and setting up demonstration plots in the different project zones within the region. It concentrated on guidelines on how to devise an action plan to implement the trials and generally promotion of the technology illustrating step by step methodology towards developing action plan sheet and implementing strategy. An illustration was given to assist in selection of feasible options of CA in the area and development of the zones' action plans. Given the planned KEUG had on the design of farm demonstration and establishment of treatments, the development of the plan was guided towards KUEG intentions especially considering the inputs and tools they were able to acquire.



**Plate 15:** Weldone providing guideline on the formulation of action plans

After the **session (4.4)** on extension approaches for CA by Peter, participants went into their respective zones groupings (for group discussions) to discuss and develop an illustrative action plans on how to implement introduction of CA technology practices in their areas of jurisdiction. They were present later to the plenary what each had developed but due to time they could not, but rather a plenary discussion on the same was accomplished. These zones included: **KAPSAIAN (KAPASAIAN WARD); EMURUA DIKIRR (ILKERIN WARD) and MOGOR (MOGONDO WARD)**. The produced drafts were submitted in flip charts.



**Plate 16:** Project Zones' representative (TOT) developing their action plans on how to implement CA, i.e *Kapsasian, Mogor, and Emurua Dikirr respectively*

#### 4.4. Extension Approaches for Conservation Agriculture

This session was facilitated by Mr. Peter Kuria. It started with a highlight of current agricultural service delivery in Kenya citing three different models being used, which includes: *Free public extension services* - smallholder farmers engaged in staple foods and minor cash crops; *Partial cost shared provision of extension services* - limited commercialization. E.g. farmers study tours

when farmers are required to meet their costs for transport and meals; and *fully commercialized* - private (e.g. private companies and Cooperatives) and parastatals (commodities such as tea, coffee, sugar, pyrethrum, barley, tobacco, horticulture and dairy). Under this system, extension services are usually embedded in agricultural services. This was then followed by plenary discussions on extension approaches participants were aware of and their effectiveness, several approaches were raised that included; FFS, contact farmers, study circles, Common interest groups, Training & visits and contract farming. Others includes; Catchment Approach, Focal Area Approach, Lead Farmer Approach and Model Farmer Approach.

Some of approaches were handled in detailed differently through facilitator presentation and plenary presentations, while others were briefly mentioned. FFS methodology was discussed at length with focus on its core principles which included; FFS facilitation principle (not teaching), Hands-on learning (field is the class room), learning focuses on principles not the technology, season-long comparative experimentation, agro-ecosystem analysis (AES) and team building or group dynamics. Major steps in FFS implementations and participatory M& E in FFS were also discussed.

Study circles as one of the extension approach was touched with emphasis on the understanding of the study circles, implementation steps and advantages of the method. It also captured the role of the facilitator in the study circle approach.

Contract farming was discussed, basically the approach implementation, definition and advantages to both the farmer and the buyer (contract parties). Lead Farmer Approach and Model Farmer Approach were briefly discussed and their effectiveness and importance illustrated citing successful examples in Laikipia and other regions where CA is being implemented through the support and guide of ACT.

#### **4.5. Field based exercise: Field visit and establishment of demonstration plots and setting up of treatments illustrations**

To break the monotony of the classroom training participants were taken to one of the KUEG project beneficiary who has well established tree nurseries and Rabbit keeping for Urine production supplied to a factory in Makineny, Bomet County. He also has a fish pond and he has been harvesting fish and supplying one of the Hotel in town. It was unbelievable for some of the participants to see the industrious work and commitment of the farmer in doing his farm, maintenance of the indigenous trees shrubs. In addition he was also the host farmer for the model CA on-farm demonstration.



**Plate 18:** Brief visit to one of the project beneficiary (Mr. Ismael Chepkwony) who has adopted various enterprises in his farm courtesy of KUEG Project

Besides, participants were taken through how they will establish the layout of various proposed treatments in their demonstrations and how to control weeds and maintained the demo farms. Getting the right plot sizes were critical and farmers were elaborately taken through the steps of marking out the plots in order to enable acceptable comparison of the various treatments in the long run and be able to ascertain which practice best fit the region.



**Plate 17:** Participants being taken through steps on how to establish demo plots and treatment layout as well as land preparation

## 5.0 Brief meeting with Agricultural Sector Development Support Programme (ASDSP) Narok County County Coordinating Unit Team

During the second day of this training, a team from Narok County ASDSP CCU made a brief visit to the training venue and holds a quick meeting with the participants. The team included: Mr. Munyao (Coordinator), Mr. Shem (NRM), Mrs. Ngugi (VC Expert), Mutindwa and Alex.

ASDSP is a program purposed to transform Kenya's agricultural sector into an innovative, commercially oriented, competitive and modern industry that will contribute to poverty reduction, improved food security and equity in rural and urban Kenya. The programme will, through its activities, contribute to the realization of the Kenya's wider development goals expressed in the Millennium Development Goals, *vision 2030* and the *constitution of Kenya 2010*.

**Components of the programme** includes: a) Sector wide coordination, b) Natural resources management and c) Value chain development

Component two, on NRM majorly involve activities such as disseminate relevant technologies for adaptation to cc; disseminate climate forecast to stakeholders; identify and mobilize resources for climate change adaptation and mitigation; create partnerships for carbon credit schemes among other expected activities or outputs.

The value chain development is the main thrust of the project and involves analysis and identification of the value chain actors in the region based on the three levels, namely: micro-, meso- and macro-level. This geared towards establishing in relation to agriculture and environment the outstanding linkages and roles of the various actors in the three levels.

Sector wide coordination component basically identify and brings together all the stakeholders involved in the agriculture sector per region and set up joint-coordinated planning, programming and implementing of the project together to bolster synergistic approach to issues of agricultural development. This involves collective endeavours in identifying and rolling out various the project activities that subscribe to the program objectives.

Under NRM component, major focus is in Environmental resilience and social inclusion; Attention is focus on creation of awareness and enhancing communities' resilience to climate change effects and equitable consideration in the society. Therefore, this dictates proposals developments by the line ministries and other actors in the sub-counties. Mr. Shem Okora, County Coordinator of NRM, highlighted several issues citing many problems related to environment and climate change that has affected agricultural productivity. Issues of land degradation came up strongly as a major daunting challenge in Narok County, problems of deforestation, pollution, floods and droughts were also appended as witnessed in the region. .

The project implementation modality require proposal development, which are then evaluated at the county coordination unit level and approved before rolling out the project, this is basically of issues relating to environment resilience and social inclusion. But, this could be guided further by identified commodity in the region that attracted value chain development; the commodity identified in the County are: Maize, Beef and Dairy.

AT the end of their presentation, it was agreed that ASDSP will engage with ACT and develop a joint proposal to implement CA trainings in the region under NRM component. Thus ACT was task to make follow up and see how they can synergies with ASDSP and implement CA.

## **6.0 CLOSURE AND ISSUANCE OF CA MATARIALS**

Closure of the training was graced by Mr. Richard Tanui, Ward Administrator, Ilkerin Ward, who applauded the organizers and the facilitators of the training and encourage the ToTs to take up the challenge bestowed on them to ensure the knowledge and skills acquired is transferred appropriately. He applauded the organizers of the event, the facilitators and the participants for



**Plate 19:** Narok ASDSP CCU Coordinator, Mr. Munyao addresses the participants during their brief visit to the training.

their fruitful and active participation in the training as reiterated by the other speakers who were part of the training. He urges the participants repeatedly to deliver the message to their jurisdictions and implement planned demonstrations adequately to enable farmers see the difference and be able to adopt CA since we are convinced it works, he promise to be part of the team within his Ward.. He recognized the role play by KUEG in implementing several activities targeting the community with his ward and pledge constant support to the organization.

Finally he presented, CA manuals and other materials prepared for the participants. Sunflower seed from one of the participants were distributed too. Participants were really impressed with this issuance of the materials and expressed their appreciation to ACT and KUEG.



**Plate 20:** Respectively: DLPO Reps giving his closing remarks and Mr. Tanui addressing the participants and later issuing them CA materials

## 7.0 CONCLUSION

The training went on as planned and all the planned topics and activities were achieved and adequately covered despite the challenge of limited time. Field practicals and the short field visits were quite impressive and boosted the understanding of participants on CA, it even build great confidents as expressed by the trainees.

Participants were very enthusiastic about the subject and noted that more sensitization and follow-up trainings and support needs to be done to ensure successful implementation of the anticipated demonstrations to be established in each project zone areas as demonstrated in their draft action plans

## 8.0 APPENDICES

### APPENDIX A: LIST OF FACILITATORS, PARTICIPANTS AND GUESTS

#### B1: FACILITATORS: From ACT

No .	NAMES	ORG	Designation	CELL PHONE	E-MAIL	CONTACT ADDRESS
1	PETER KURIA	ACT	Program Officer- Kenya	0722451704	<a href="mailto:peter.kuria@act-africa.org">peter.kuria@act-africa.org</a>	P.O BOX 10375-00100, KARLO, NARL, Waiyaki Way Nairobi. <a href="http://www.act-africa.org">www.act-africa.org</a>
2	WELDON MUTAI	ACT	Program Officer- P & KIM Support	0723577267	<a href="mailto:Weldone.mutai@act-africa.org">Weldone.mutai@act-africa.org</a>	
3	KENNEDY S. OTIENO	ACT	Office & Logistic Officer	0710708189	<a href="mailto:Kennedy.shikhule@act-africa.org">Kennedy.shikhule@act-africa.org</a>	

#### B2: PARTICIPANTS' LISTS FOR CA TRAINING IN TRANSMARA EAST, NAROK COUNTY, HELD ON 9th -12th Dec 2014

No .	NAMES	ORGANIZATION	PROJECT ZONE	CELL PHONE	E-MAIL	CONTACT ADDRESS
1	CHERUIYOT J.K. MELILEI	MOALF		710769920	<a href="mailto:dlpotransmaraeast@yahoo.co.uk">dlpotransmaraeast@yahoo.co.uk</a>	BOX 110-20401, Chebunyo
2	BEATRICE SALANTEI	MOALF		723589366		BOX 48, Chebunyo
3	DAVID NGETICH	Dairy Farmer - Kabolecho	Kapsasian	727943827		BOX 42, Chebunyo
4	JOHANA KIPRONO LANGAT	MOALF		714031008	<a href="mailto:daotransmaraeast@gmail.com">daotransmaraeast@gmail.com</a>	BOX 54-40700, Kilgoris
5	JULIUS MUTAI	Farmer	Kapsasian	728338084		BOX 69, Chebunyo
6	SAMWEL K. LANGAT	MOALF		724994235	<a href="mailto:slangat2010@gmail.com">slangat2010@gmail.com</a>	BOX 54-40700, Kilgoris
7	EDWIN KIMUTAI SIGEY	Farmer		702448099	<a href="mailto:sonkim@gmail.com">sonkim@gmail.com</a>	BOX 56, Chebunyo
8	JOSEPH KERING	MOALF		720283168	<a href="mailto:daotransmaraeast@gmail.com">daotransmaraeast@gmail.com</a>	BOX 54-40700, Kilgoris
9	LANGAT K. JOHN	JOYWO- Framer		713289218		BOX 107, Chebunyo
10	CHARLES K. LANGAT	MOALF		726415115	<a href="mailto:dlpotransmaraeast@yahoo.co.uk">dlpotransmaraeast@yahoo.co.uk</a>	BOX 110, Chebunyo
11	JOSEPH K. SERON	KUEG-PIC/Farmer	Kapsasian	724121894		BOX 88, Chebunyo
12	JULIUS KIPKOECH TONUI	KUEG-PIC/Farmer	Emurua Dikirr	711127701		BOX 19, Chebunyo
13	SAMMARY CHEPKIRUI	Farmer	Emurua Dikirr	703716101		BOX 47, Chebunyo

	CHEPKULUL					
14	DAISY CHEBET KOSGEI	Farmer		719631445		BOX 56, Chebunyo
15	WILLIAM K. MILGO	Farmer	Emurua Dikirr	723314809		BOX 47, Chebunyo
16	JOSEPH KIPKERRING MUTAI	Farmer		721612303		
17	ISAIAH KIPKEMOI ROTICH	Farmer		726432712		BOX 42, Chebunyo
18	MUTAI KIPKURUI OLEBARTAI	Farmer		710648326		BOX 201, Ndanai
19	THOMSON TERER	Dairy Farmer/Director		736291409		BOX 24, Siongiroi
20	PAUL KIPRONO KERING	Farmer		727825079		BOX 100, Chebunyo
21	DAVID KIPKOECH SIGEI	Farmer		707480312		BOX 91, Chebunyo
22	ROBERT CHERUIYOT	Farmer	Kapsasian	719220359		BOX 8, Chebunyo
23	BII JOHN	Teacher (MOE) /Farmer	Emurua Dikirr	721700894	<a href="mailto:bii.john535@gmail.com">bii.john535@gmail.com</a>	BOX 47, Chebunyo
24	BOR JOSEAH	MOALF		726492933	<a href="mailto:borjoseah@yahoo.com">borjoseah@yahoo.com</a>	BOX 54, Chebunyo
25	BII K DANIEL	Farmer	Mogor	727997460		BOX 96, Chebunyo
26	MUTAI K. ZACHEUS	KUEG-PIC/Farmer	Mogor	711336382	<a href="mailto:mutaizkipkirui@gmail.com">mutaizkipkirui@gmail.com</a>	BOX 58, Chebunyo
27	SIMION KIPNGENO TONUI	MOALF		703941535	<a href="mailto:simiontonui@yahoo.com">simiontonui@yahoo.com</a>	BOX 54, Kilgoris
28	ROBERT K. LANGAT	KUEG-PIC/Farmer	Kapsasian	710259131		BOX 90, Chebunyo
29	KIPRONO KOSGEY DAVID	KUEG ACC/Farmer		724436318	<a href="mailto:kipronodavid69@gmail.com">kipronodavid69@gmail.com</a>	BOX 117, Chebunyo
30	ROTICH KIBET RICHARD	KUEG-PM/Farmer		727058478	<a href="mailto:rrotich15@gmail.com">rrotich15@gmail.com</a>	BOX 117, Chebunyo
31	PAUL LANGAT	Farmer		704827311		BOX 91, Chebunyo
32	PETER CHERUIYOT	Farmer		720956229		BOX 8, Chebunyo
33	KIPKEMOI ROTICH JOSEAH	KUEG-PIC/Farmer	Mogor	720868480	<a href="mailto:rotich.joseah@yahoo.com">rotich.joseah@yahoo.com</a>	BOX 117, Chebunyo
34	BENARD CHEPKWONY	Farmer		720868480		BOX 28, Chebunyo

**B3: LIST OF GUESTS WHO ATTENDED SOME SESSION**

No .	NAMES	ORG	Designation	CELL PHONE	E-MAIL	CONTACT ADDRESS
1	JOSEPH MUNYAO	MOALF, ASDSP-NAROK COUNTY COORDINATING UNITY	CCU Coordinator			
2	SHEM OTIENO		NRM Coordinator			
3	JANE NGUGI					
4	JOHN MUTINDA					
5	ALEX					
7	RICHARD TONUI	NAROK COUNTY GOV'T	Ward Administrator, Ilkerin Ward			

## APPENDIX B: TRAINING PROGRAMME



**KURESOKE EMPOWERMENT GROUP (KUEG)  
CBO**



### Training of Trainers (ToTs) on Conservation Agriculture Technology for Sustainable food production and protection of environment

**'Transmara Environment Conservation Movement 2030 Project'**

#### PROGRAMME FOR TECM PROJECT ToTs TRAINING

**VENUE:** Pachero Hotel, Emurua Dikirr, Transmara East.

**DATES:** 9<sup>th</sup> – 12<sup>th</sup> December, 2014

<b>Monday, 8th December, 2014</b>		
14.00-20.00	☞ Arrival of training facilitators at Emurua Dikirr, Transmara East	
DAY 1	<b>Tuesday, 9th December, 2014</b>	
<b>07:45-08:30</b>	Arrival & Registration of Participants	KUEG
<b>08:30-10:30</b>	<b>Setting the scene</b> Introductions; logistics; participants' expectations;  course objectives and workshop processes including committees <i>Official opening and Group photo: 10.30 am</i>	KUEG/ Weldone  Peter  MoA/SCAO
<b>10:30-11:00</b>	<b>Health Break</b>	
<b>11:00-12:00</b>	<b>What is CA and why CA?</b> Background, historical perspectives, rationale, benefits, challenges. <b>Conventional farming: what has gone wrong?</b> (Plenary presentations & discussions)	Peter
<b>12:00-13:00</b>	<b>CA Concepts and principles I: Minimum Soil Disturbance</b> • Manual; animal traction & tractor based systems (Plenary presentations, discussions)	Weldone
<b>13:00-14:00</b>	<b>Lunch Break</b>	

<b>14:00-15:30</b>	<b>CA Concepts and principles II: Permanent Soil cover CA Concepts and principles III: Crop rotations and Associations</b> <i>(Plenary presentations, discussions)</i>	Peter
<b>15:30-15:45</b>	<b>Health Break</b>	
<b>15:45-16:45</b>	<b>Soil Health</b> <ul style="list-style-type: none"><li>• Soil characteristics &amp; properties; Soil Fertility &amp; Management</li><li>• Erosion and water infiltration</li></ul> <i>(Plenary presentations and discussions)</i>	Weldone
<b>16:45-17:30</b>	<b>Practical Demonstration of erosion processes and infiltration Run-off trays</b>  <b>Cover crop types and seeds demo &amp; display.</b> <i>(Field based practical Exercises)</i>	Weldone  Peter
<b>DAY 2</b>	<b>10<sup>th</sup> December, 2014</b>	
<b>08:00-08:30</b>	Committee reports	Weldone
<b>08:30-10:30</b>	<b>Conservation farming/ Agriculture Equipment</b> <i>Demonstration of use</i>  Equipment Manufacturing and hire-service provision <i>(Plenary presentations, discussions)</i>	Weldone
<b>10:30-11:00</b>	<b>Health Break</b>	
<b>11:00-13:00</b>	<b>Field practicals: CA techniques in manual systems</b> <ul style="list-style-type: none"><li>• laying, digging basins</li><li>• jab planting</li><li>• dibbling; manual weed control</li></ul> <i>(Field based Practical Exercises)</i>	Weldone / Peter
<b>13:00-14:00</b>	<b>Lunch Break</b>	
<b>14:00-15:30</b>	<b>Field Practicals: CA in animal traction systems</b> <ul style="list-style-type: none"><li>• Harnessing animals for ripping and direct seeding</li><li>• CA equipment showcase</li></ul> <b>Guided exposure to CA equipment, hands-on use and adjustments</b>	Weldone / Peter
<b>15:30-15:45</b>	<b>Health Break</b>	
<b>15:45-17:30</b>	<b>Weed, pest &amp; disease management and control in CA systems</b> timeliness; manual and chemical options; strategic control <i>(Plenary presentations, discussions)</i>	Peter
<b>DAY 3</b>	<b>11<sup>th</sup> December, 2014</b>	
<b>08:00-08:30</b>	Committee reports	Project Manager <i>(KUEG)</i>

<b>08:30-09:30</b>	<b>CA in Tractor based Systems</b> • tractor sub-soilers, rippers and direct seeders • Tractor sprayers • Tractor ploughing (photo illustrations & discussions)	Weldone
<b>09:30-11:00</b>	<b>Crop-tree-livestock integration in conservation Agriculture systems (CA):</b> CA & Agroforestry; CA & Livestock; CA & Climate change. (Plenary, discussions, exercises)	Peter
<b>11:00-11:30</b>	<b>Health Break</b>	
<b>11:30-13:00</b>	<b>Extension Approaches for CA</b> Farmer Field Schools; Study circles; model farmers & Contract farming;	Peter
<b>13:00-13:45</b>	Lunch Break	
<b>13:45-14:45</b>	<b>Action planning:</b> Subsequent farmers trainings & Establishment of on-farm demos <i>Feasible CF options; Plans for implementation</i> <i>Exercises visualized on flip charts</i> (Groups discussion)	Weldone
<b>14:45-16:00</b>	<b>Field Based Exercise:</b> Establishment of Demonstration plots and setting up of treatments illustration	Weldone
<b>16:00-16:15</b>	<b>Health Break</b>	
<b>16:15-17:30</b>	<b>Group Presentations; Course evaluation and Closure of the training</b>	Weldone <i>Groups Rep Guest</i>
<b>DAY 4</b>	<b>Friday, 12<sup>th</sup> September, 2014</b>	
<b>08:30-10:30</b>	KUEG (PIC) & ToTs Wrap-up Meeting	KUEG & Participants

## APPENDIX C: COURSE EVALUATION RESULTS

### CONSERVATION AGRICULTURE WORKSHOP AT PACHERO HOTEL, EMURUA DIKIRR, TRANSMARA EAST ON 9<sup>TH</sup> TO 11<sup>TH</sup> DECEMBER, 2014.

Kindly place a √ against the ranking - 1 representing the lowest and 5 the highest

	Ranking	1	2	3	4	5
<b>A. Course logistics</b>						
○ Transport from your station to the meeting venue						5
○ Facilitation with Transport						5
<b>B. Course Facilities</b>						
○ Training Venue					4.3	
○ Food services during the training (meals and snacks)				3.9		

<b>C. Course content</b>					
○ Did the course content cover your expectations?				4.8	
○ Rate the presentation methodology				4.7	
○ Quality of session facilitations				4.8	
○ Facilitators				4.9	
○ Handouts				4.7	
○ Technical content				4.4	
○ Were your questions answered satisfactorily?				4.7	
○ Timeliness & overall logistics of course sessions				4.6	

- What is your major satisfaction(s)/Lesson about this training?

<i>Summarized responses</i>	The practicals were interesting and really enlighten the understanding of CA and why CA
	Lessons were appropriate and well done
	The concept of CA and their applications

- What is your major frustration(s) / disappointment(s) about this course, if any?

<i>Summarized responses</i>	Most of them alluded Poor time management- lack strict adherence to time schedule

- Please provide specific recommendations for the organizers of the next course

<i>Summarized responses</i>	Plan well and allocate adequate time to various activities especially practicals
	Increase the number of training days to have more time and adequately cover every content
	Most of the respondents appreciate d organizers for considering them in the training.

- Free comments & suggestions (use back of this form for more comments)

<i>Summarized responses</i>	Appreciated the organizers of the training as well as the facilitators greatly.
	Need accessible place to purchase the CA equipment and inputs (cover crop seeds)
	The training to be more of practical based.
	More reference materials to be provided.

## APPENDIX D: ASSORTED PHOTOS

