INTERNATIONAL CONSERVATION AGRICULTURE

TRAINING COURSE

AT SG NORTHERN ADVENTURE RESORT

ARUSHA TANZANIA

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1.0 INTRODUCTION

The International Conservation Agriculture Course was conducted at SG Adventure and Resort Arusha Tanzania, from 7-17th September 2011. The course was funded by the participant's employer and implemented by African Conservation Tillage Network (ACT). The course was attended by 13 participants. 7 participants were from Tanzania of which 5 participants were from the government institution. Other countries were represented by one candidate each Southern Sudan, Kenya, Malawi, Burundi and Rwanda. The participants came from Government institutions and NGOs.

General objective of the course was to contribute and building the desired capacity and ability of agricultural extension and research staff from NGOs, Government institutions and private sector in the development and promotion of conservation agriculture (CA) technologies, thereby enhancing their ability to respond to farmers' needs. The training was facilitated by 10 resource persons from several institutions from East and southern African. The organisation included Pico-Zimbabwe, Selian agriculture research Institute (SARI) -Tanzania, Ministry of agriculture food security and cooperatives - Tanzania, Mlingano agriculture research institute -Tanzania, Sokoine University of Agriculture-Tanzania, Ministry of agriculture Kenya, African conservation tillage network (ACT) and Representative from large scale farm.

Conservation agriculture has great potential in Africa because it can control erosion, produce stable yields, and reduce labour needs. Basically fall into three major principles first permanent soil cover which control soil erosion, moisture stress, suppress weed and conserve soil micro organisms which is important for organic decomposition. Secondly crop rotation helps to recycle nutrients into the soil and break disease and pest life cycle. Thirdly minimum soil disturbance- to overcome the problem of soil erosion (splash), maintaining soil structure and texture and conserve micro organisms which is responsible for organic decomposition in the soil.

The workshop started at 8: 30 am, Dr. Simon Lugandu, welcomed the participants to the workshop. He invited Engineer Saidi Mkomwa, the Executive Secretary for African Conservation Tillage Network for introductory remarks.

2.0 COURSE OBJECTIVES

Eng. Saidi shared the course objectives:

i) To enhance understanding of the principles of Conservation Agriculture (CA) as the new way to farm.
ii) Practical knowledge and skills in the application of CA practices for different socioeconomic and agro-ecological environments to enable them to respond competently to farmers' need.
iii) To provide the participants with approaches and methodologies for enhanced documentation and wide scale adoption of profitable CA.
iv) To strengthen the competency of the participants to facilitate learning of CA to CA support staff.

3.0 COURSE OUTPUTS

At the end of the course the participants could be able to:

i) Explain and demonstrate to others the concept and principles of CA and applications of the same
ii) Guide farmers and other stake holders in analyzing and determining solutions to problems in sustainable use of soil and water in farming
iii) Plan and facilitate farmer-based trials and demonstrations for development/or adaptation of CA technologies
iv) Develop learning facilitation materials and work plans for implementation of identified field activities
v) Provided to participants relevant CA materials and Monitoring and Evaluation

4.0 PARTICIPANTS EXPECTATIONS

4.1. What should happen

- See benefits of CA
- Specific technology with best practices
- More practical than theories
- Knowledge of the technology
- How to increase adoption of CA
- To get more knowledge which will be fruitful to farmers
- To learn and see
- Ideas Sharing
- To have more practical or real examples
- To have participatory learning atmosphere
- Respecting each other

4.2. What should not happen

- Falling Sick
- Late coming
- Passive participation
- Class within a class
- Neglect of participants ideas
- Time management to be out of time
- Stopping noise as it may fall on the time

4.3. Topics to be covered

- Weed Management
- Notorious weeds
- Applicability of CA in other crops (cash crops)

- Suitable and acceptable cover crops to farmers
- Harmonizing the different technologies
- CA Technology Vs
- Environmental (pesticides, fertilizers etc.
- Competition of crop residues with animal feed fuel, fence
- Contradiction on use of heavy machineries
- Steps to implement CA
- The use of tillage operation should be done in right manure in given time
- CA in arid areas
- To use CA especially traditional one
- The use of organic fertilizers

5.0 METHODOLOGIES

Some approaches were agreed to govern processes during the training, including:

5.1 Participatory Approaches

- Process monitoring committee was selected daily – to give summary of previous day's events; visualize a daily assessment on topics of the day in a creative way; share any area of concern that deserves the attention of facilitators/participants; nominate members for the next day.
- Learning Methods/ Toolbox committee composed of two members nominated or volunteering half way of the workshop next group of two were nominated/ volunteering for the same tasks. Their tasks were to describe and comment on all learning methods and tools used during each day of the workshop, e.g. games, role-plays, energizers.

- A welfare committee composed of Simon and Philbert their task were to report to the hotel and organizers any concern regarding participant's welfare. This included organization of social event, social gathering, lunch, tea and any other social concern. Deo and Lam took for the same task.
- Role plays, short stories and dynamics were introduced as appropriate to break boredom and dosing, this were individual volunteering, appointed or from process monitoring committee.

5.2 Major Principles of Interaction

To facilitate participatory learning during the workshop, the major principles of interaction were highlighted and explained in the context of the workshop. The following are some of the principles that were highlighted:

- Flexibility
- Integrity
- Inclusiveness
- Informality
- Transparency

- Ownership
- Open dialogue
- Thinking beyond the box (go the extra mile)
- Demand quality
- Appreciation of any contribution
- Honesty
- Political incorrectness.

4.4.

5.3 Adult Learning Principles

Adult learning principles were also discussed so as to create the correct learning atmosphere. It was highlighted that adult learners have the following characteristics:

1. **Adults have experience**
   Sharing of experiences should be encouraged
2. **Learn in atmosphere of active involvement and participation**
   Active participation should be encouraged – minimize long presentations
3. **Learn when content is close to their own task**
   Real world approach should be encouraged
4. **Have strong power of reasoning and observation**
   Memorizing should be minimized
5. **They are voluntary learners**
   Have a right to know why topic is important to learn
6. **Have a sense of personal dignity**
   They must be treated with respect at all times
7. **Remember 20% of what they hear 40% of what they hear and see 80% of what they discover**
   Encourage demonstrations, practicals - learning by doing.

5.4 Stakeholder Analysis

In groups of five, participants were asked to find out names, roots, interests, what they are proud of, what they would like to see happening in the workshop, should not happen in the workshop, what topics they think should be included in detail.

In the analysis, the group consisted mostly of agronomists/ soil scientist, extension officers, foresters, agriculture engineering, one natural resource person and one social economics person Based on experience with CA only two were having experience of more than ten years, the rest were five years and below, while two with no experience on Conservation agriculture.

The gender imbalance was a major concern there was no women representative in the workshop. The objectives of doing stake holder analysis help the trainer to know exactly the kind of trainee in the training based on knowledge and experience, where to start and which kind of approach to use.

6.0 SUMMARY OF THE TOPIC COVERED

The course content showing all topics that were covered is attached as Annex 1. Different methods were employed during the training, mainly group exercises, plenary presentations groups, plenary presentations & discussions; field based practical exercises, guided exposure to CA equipment, hands-on use and adjustments.

6.1 Situation and Problem Analysis

Facilitated by Edward Chuma, the situation analysis highlighted the current status of agriculture in the participating countries, constraints to agricultural production and the available opportunities. Climatic change and resource constraints were mentioned by all countries. The rainfall amounts were a problem in some areas. Although the productivity in the small holder agricultural sector in most countries was declining, the crop productivity in Rwanda has increased in few years. The declining soil productivity in most countries was highlighted as a cause for concern in most of African countries. The detailed results of the situation analysis in all of the participated countries are presented below:

Country	Current Status	What has changed? How	Factors Affecting Agricultural Production
Tanzania and Rwanda	**PHYSICAL:** Geographical location Tanzania East Africa – access to sea Burundi East Africa – land locked Roads Tanzania -Mostly all-weather roads and inter regional are all tarmac Burundi-Mostly all-weather roads and interregional are all tarmac **Rivers** **Tanzania** Many rivers are big ones flowing throughout the year while small rivers are seasonal **Burundi** Many rivers all flowing throughout the year **Others – Mountains** Tanzania: Mountainous & hilly – 2 big mountains – Kilimanjaro and Meru and other ranges Burundi: Hilly, Rift Valley, Passes in both countries with greater part of it in Tanzania Lakes Tanzania; 3 big lakes and several small ones. Burundi: 1 big lake and several small ones	• Size of land under cultivation • Farmers/pastoralist-from pastoral to cultivation • Soil fertility – over cultivation result to soil infertility and soil erosion • Some crops tend to disappear in some areas. Millet, sorghum, yams, some local vegetables and fruits due to soil degradation, overpopulation and climate change	1. Low Fertility of the land/soils 2. Climate change 3. poor farming practices 4. Difficulties in accessing credit from the financial institutions 5. Farmers are still using poor/local seeds 6. Lack of transport and communication 7. Lack of proper price and market (price fluctuation) 8. Lack of enough extension officers and incentives 9. Low production and unbalanced diet. 10. Increase in HIV infection and lesser life span for the affected.

	CLIMATE/RAINFALL Tanzania Two rainy seasons (bimodal) Heavy (march – May), Light (Sept – November) Burundi: Two rainy seasons heavy Sept – Jan, Light March – June Tanzania: Dry seasons (June – August) Burundi: Two dry seasons (whole of February (June – September) **Temperatures** Tanzania: 2 temp patterns, High varying according to location, Low varying according to location PEOPLES/SETTLEMENT TZ Rural living in villages scattered in less fertile soil areas Burundi - urban population Size approximately 46 times smaller compared to Tanzania Women are more employed in agriculture than men. **CULTURES AND TRADITIONS** TZ almost 120 tribes with different cultures and dialect with one common language, Swahili, English spoken by few. BR dominated by two big ethnic groups Hutus – majority and Tutsi is the minority with one common language Kirundi.		

	OCCUPATION Tanzania majority – Subsistence farmers and others petty traders. Merchants and miners Burundi occupations similar to Tanzania. **AGRICULTURE – CROPS – CASH AND FOOD** Tanzania cash crops – coffee, tea, sisal, cotton, cashew nuts. Tobacco, FOOD maize cassava, sorghum beans, bananas, rice beans, potatoes. Burundi cash crops - coffee, tea and cotton, FOOD, beans peas, maize, bananas, cassava, yam, rice potatoes. **Livestock** Tanzania Cattle, sheep, goats, chicken, pigs, donkeys Burundi similar to Tanzania **Fields** Tanzania – small scale (sized) majority large scale large scale (minority) Burundi – small scale **Farm Implements** Tanzania – hand hoe)(majority) Animal drawn implements Tractor drawn Burundi Hand hoe (majority) Tractor (companies)		

	Farming Pattern Tanzania crops – livestock integration (mixed farming), mono cropping Burundi Inter cropping, Agroforestry and crops **EXTERNAL INPUTS/INTERVENTIONS** Development Programmes Tanzania: ASDP – Agricultural l Sector Development Programme, PADEP. Burundi Supported by Bilateral and Multilateral cooperation, NGO and FFS EXT – RESEARCH PROGRAMMES **AGRIC. INPUTS** Organic and inorganic fertilizers Seed companies **Interaction Urban Centre** – High Migration Markets farmer – local market-town market – across border **Survival Strategies** Tanzania tourism – Transportation and communication, trade, mining industries, fishing – along coast, lakes and rivers, pastoralist, e.g. Masai and Sukumas. Burundi – trading – fishing- industries, transportation and communication		

Rwanda	**PHYSICAL** Location-E. Africa Very well developed infrastructure (roads networks-tarmac); Many big rivers joining to form the Kagera river (feeding) **CLIMATE AND RAINFALL** Very cold in Northern Province and humid in Southern Province (moderate in Kigali) High rainfall – area with double seasons Sept – Jan/Feb and March/April – June/July **CULTURE AND TRADITION** Banyarwanda African origin Densely populated (close settlements) Strong traditions • Dancing • Dresses • Wedding **Occupation** Agriculture /mix farming Trade (Uganda-Burundi-Tanzania-DRC) Tourism – Gorilla **Agriculture** Wide range of annual/perennial crops (banana, coffee, tea, Irish potatoes vegetables etc.) Mixed farming, keeping high milk cows, Friesian of up to 80 ltd a day; Cropping on hills slopes = terraces	Agriculture production-Increased after end of war Irrigation is now practiced (e.g. use of wells) -Marketing of organic produce-Market is now available (compared to the time of war) - Climate has deteriorated compared to 20 -30 years ago due to cutting of trees	• -Lack of capital such as land, money, machinery/two working tools • -Reduction/lack of skills family labour • -Lack of social harmony in the community • -Malnutrition decrease the ability of the family to work • -Farmers eat seeds • -Farmers abandon farms to look for hired jobs/cheap labour • -Reduced labour force • -A lot of money spent for medication and care for the sick (the money that could be used for agricultural development) • -Burial ceremonies are expensive • -Reduced/cut off knowledge • (Inheritance) e.g. agriculture indigenous knowledge from adults to children is cut off when adults die. • -Reduced soil productivity • -Reduced water quantity & quality • -Reduced bio-diversity of soil, vegetation, animals etc.

	EXTERNAL INPUTS Lot of development programs by donors and government Extension system is well developed from sector agriculture to district and national extension program under RAB Research is well developed with ISAR but still needs to be up graded (not like Kenya, Tz, US) Agriculture Inputs Well available from government (through cooperatives) and from donors Private sector: Stockist are widely available; Interaction with urban is well developed (with town centres in every district) Survival strategies: Destruction of water catchment and wetlands (through human activities)		
SUDAN	**PHYSICAL** N.E. Africa Poof infrastructure (roads) River Nile is the main source of water/life (Other: small rivers are available as well). Flat area and mostly susceptible to floods **CLIMATE AND RAINFALL** Hot Humid for most part of the year (amounts up to 40 degrees Centigrade Rains May –Oct and dry Nov – April	-	-Drought -War -Pests and Disease -Land Degradation -Lack of knowledge and skills -Lack of government support -Lack of capital -Lack of Arable land -Lack of Extension and Research Activities

	CULTURE AND TRADITIONAL Africans (more than 40 ethnic tribes) Settlements are scattered with little urban action. Different cultures and traditions - (most Nilotes in Upper Nile) **OCCUPATION** Agriculture and Pastoralist; Employment in Oil Industry **Agriculture** Sorghum, maize, ground nuts, vegetables Livestock keeping (cattle & goats/sheep **Patterns** Inter cropping of sorghum and beans or ground nuts Maize/beans ground nuts Perennial – fruit trees (mangoes/lemons) etc. **EXTERNAL INPUTS** Development programs by NGOs, (not by government); Extension very poor due to lack of manpower (capacity) Research – only 1 station in Yei. Agricultural inputs widely available (with few stockists) located in Juba and Malakal and Wau Interaction with urban is very little Markets: mostly imports from Uganda		

	Survival strategies Charcoal Fishing in Nile Cattle Keeping		
MALAWI	PHYSICAL Lake Malawi: Located in South of Equator Eastern Africa Regional passable road mostly in low lying areas Landlocked, lakes e.g. Chitwa, CLIMATE AND RAINFALL 1 rain season; Low lands – high temperatures 1 – 40 C **CULTURE AND TRADITIONAL** 80% engaged in agriculture and live in rural areas Women do more work than me Men have big say (decision) on resources Land ownership mostly by men Cash crops and livestock by men **AGRICULTURE** Crops – coffee, cotton, cash, tea, rice, maize beans, cassava, potatoes. **LIVESTOCK** Cattle Goats, Sheep, pigs, poultry, fish Inputs – not enough and not timely **Survival Strategies** Selling crops and animals, animal products Begging Self-help groups		1. Poor agronomic practice 2. Poor access to agricultural inputs 3. Poor implementation of agricultural policies 4. Poor extension services 5. Poor markets

7.0 HIGHLIGHTS OF MAJOR TOPICS COVERED

Detailed presentations and notes are separately available

7.1 Conservation agriculture principles and concepts

This topic was presented by Engineer Saidi Mkomwa he started by explaining about CA history in United states, that started in 1930 issue of food security challenges in Africa and the world in general. Hunger and agriculture in Africa, he point out the importance of Agriculture in Africa. Also he explained challenge of climate change and how it affects human life especially in developing countries.

Conservation agriculture developed by three main principles permanent soil cover, minimal soil disturbance and crop and crop rotation/association. He pointed out the benefits of the three principles especially in sub-Sahara Africa countries. Some of the benefits explained were:

- Why soil cover e.g. Promote soil organisms – Humus, suppress weeds, holding water. Also he explained on cover crop selection criteria – high soil coverage, nitrogen fixing, fast rate of decomposing, easy adaptation, tolerant to drought.
- Minimum soil disturbance assist to build soil structure for minimum water infiltration and water holding capacity, also help in protecting microbial from being exposed to predators and sun which can end up their life span. He explained also on crop rotation/association this help to break up disease/pest cycle, add nitrogen in the soil when leguminous crop intercropped or rotated with monocot crops.

In this session Engineer Said also explained the problems related to ploughing, also he pointed out the immediate and long term effect of ploughing including hard pan. Different methods for minimizing hard pan were explained; including equipment to be used for example animal drawn equipment and tractor drawn equipment. Biological tillage - this is the use of plants to break up the hard pan example use of leguminous tap root plants like pigeon peas and lablab beans.

4.5.

7.2 Cover crops

This topic covers the importance of cover crops in relation to food consumption and income generation, types of cover crops.

How do we protect soil cover?

- Plant non-edible cover crops – canavalia, crotalaria.
- Bylaws.
- Fence (wire, live fence- trees-sisal).
- Demonstrate that the crop residue or the cover crops are not useless – they have value.
- Encourage cut and carry rather than free-range graze.
- Introduce high value “green” crops with higher fines.
- Comprehensive/integrated land use plan – show your grazing land first.

Figure 4: Participants observing field listening to farmer Richard Kipara during field activities.

Figure 5: Example of the field covered with lablab beans

The participants get time to share and discuss the importance of cover crops, types, availability, and economic analysis of the cover crop. The table below shows presentation done by the participants

Group 1 Presentation:

Cover Crop	Advantages	Limiting Factors
Beans	Fixing nitrogen High decomposition	Cover small area Not tolerant to drought
Pigeon peas	Fixing nitrogen leaves decompose quickly, stem takes longer time on the ground Tolerates drought	Cover small area
Yam	Provide food; Tolerate drought Maintain soil moisture	Less nutrient provider

Cover crops examples include:

(1) Pigeon peas (2) Beans (3) *Dolichos Lablab* (2*) Lupins* (5) Rye (6) Radish (7) Crotalaria orchroleuca

Advantages and limiting factors

Crop	Advantages	Limiting Factors
Pigeon Peas	Stays longer; Breaks pan; Food and provides nutrients	Pests
Beans	Fixes nutrients; Food; Suppress weeds	Uprooting during seed harvest
Dolichos	Suppress weeds; Fix nutrients Moisture retained	Availability and ability to have the seeds
Lupins	Nitrogen fixing/research; Weed control; edible as vegetable	
Rye	Covers the soil; suppresses weeds; multiple use (cover crops and food)	Availability of seeds

- Lupins - locally grown
- Pigeon peas – well known and available almost everywhere and Drought tolerant
- Beans – Grown by most farmers as a food crop
- USE OF ORGANIC WASTE
  Cheap and easy to apply – mulch; readily available; Adds nutrients to the soil
- Yes – beans-maize=pigeon-sorghum
- Rye

Group 2 Presentation:

Cover Crop to be used in my area:

1. Pigeon peas cajanus cajan
2. Cow peas
3. Pumpkins
4. Mucuna

5. Canavallia
6. Crotalaria Orchroleuca
7. Groundnuts
8. Soya beans

Advantages and Disadvantage of cover crops

Cover Crop	**Advantage**	**Disadvantage**
Pigeon Peas	Edible to human being Fire wood Last in field Enough bio mass Suitable in semi-arid and high rain fall Fix nitrogen	If not properly controlled may compete with crop for sunlight
Cow Peas	Edible Quick surface cover Fix nitrogen Good bio mass Drought resistant	
Mucuna	Very excellent cover crop Stays in the field for reasonable period Fix nitrogen	Not edible It creeps on plants
Soya Bean	Fix nitrogen Edible Reasonable Soil Cover and bio mass	
Marejea	Fix nitrogen Reasonable soil cover When dry and roots get rotten, the open chance	Need attention when plant on spacing

3. Indigenous shrubs/legumes to be used as cover crops

1. Tephrosia = fix nitrogen

- Decomposition of bio mass is faster
- Root may break the soil hard pan
- Pumpkins – edible
- Cover a large area
- Have broad leaves to break rain drop intensity
- Weeds are suppressed

4. The use of available organic Wastes

The rate of decomposition for saw dust, wood shaving and rice husks is very slow but coffee is easy to use.

Availability of the material and associated costs of organic wastes is an issue

5. The concept of cover crop Rotation is not there.

Cover crops

Pigeon peas; Lablab beans; Mucuna; Common bean; Green gram; Soya beans and Pumpkins

CA concepts and principles: Crop Rotations and Associations (by Mr Mariki)

Mariki presented on Weed, Pest and Disease Management and Control in CA. To conclude participants did a field practical on weed control using; knap sack sprayer, Zam wipe. The trainees participated in the practical sessions of sprayer calibration and every member participated full. Data were collected and sprayer calibrations were done as follows:

7.3 Practical Demonstration, Infiltration and soil Erosion

The demonstration was prepared and presented to participant by Edward Chuma.
Three sets of demonstrations were carried out local and industrial cheap available materials were used. For the first set of demonstration the following material/equipment was important.

- Two half cut plastic jar
- Soil sample
- Four glasses (jar glass) with some holes in one end and tunnel like at the top.
- Dry mulching materials
- Water
- Two watering can
- Blocks/stones

The facilitator prepared the demonstration by filling the two plastic jars with soil (same sample), covers the soil in the jar with dry mulch materials and left the second bare. He placed the plastic jars up by supporting with brick/block and place jar glass right down the holes in each plastic jar and other glasses right at the end of the tunnel.

The demonstrator pours water into two samples at the same time using watering can: Results were as follows:
The plastic jar without dry mulch on the top,
Observations

- There was soil splashes from the surface caused by forces of water
- Water surface runoff and fill the glass at the mouth of the plastic jar with half soil and half water.
- There was no water infiltrate down the glass down the hole

Figure 1 Shows the effect of conventional farming system vs Conservation Agriculture on soil

The plastic jar covered with dry mulch:
Observations

- No soil splashed out on pouring water

- No water surface runoff, instead the is good infiltration of water down the soil which fills the glass with dark colour soil which show the soil is rich in nutrients

Figure1 shows the effect of conventional farming system vs Conservation Agriculture on soil

The participants appreciated the result of the demonstration. It was highlighted that the benefits being demonstrated should always be explained to farmers and other stakeholders.

The second set of demonstration were two mineral water plastic bottle sliced into half, filled with soil, and place over white paper, one covered with mulch and the second uncovered. Water was poured slowly like rain drops, the uncovered one splashed soil drop down the paper, while the covered there was no splashes observed. See figure below

Figure 2: The effect of rain drops in bare land/soil

The third set of demonstration involved

- Two mineral water plastic bottles
- gravels
- soil
- Water and two glasses
- One bottle was filled with gravels by three quarter of the bottle then the remaining portion was filled with soil.
- The second bottle filled with soil only.
- Two persons hold glass of water with equal amount; each person poured the water in her bottle starting at the same time. Once the level of water decreased continued to add until water was finished in the glasses

Figure 3: Water infiltration under CA and conventional farming soils

Observations: the bottle with gravels (gravels act as soil aggregates) and soil shows that water infiltration was good while the second bottle with water only water infiltration

was very poor.

Soil with poor water infiltration resulted to poor water drainage, which hence to plant water logging.

Water with low organic matter, water infiltration rate is very poor.

7.4 Conservation Agriculture equipment
By Dr Joseph Mutua

Dr. Mutua made a presentation about CA equipment, under the following categories:

- Minimum tillage equipment
- Direct seeding equipment
- Equipment for weed management and
- Equipment for cover crop management

The second presentation was done by Alistair Dennis also this presentation covered more on larger scale CA Equipment.

Course participants had time to visit SARI where they were exposed to some CA equipment and technologies listed;

Ripper, direct seeder (animal drawn) no till planter attached to the power tiller, jab planter, seed drill from China (harrow type), Intermech hybrid 1 tiller and Tractor drawn ripper. Participants practiced how to use some of these implements, their advantages and disadvantages.

7.5 Field practical's - CA techniques
4.6.
Field visit was conducted to SARI, whereby manual, animal and tractor based CA techniques were demonstrated. Thereafter Feedback on CA equipment practicals was facilitated by Eng. Saidi Mkomwa

Direct seeding equipment
Jab planter calibration:
Seed rates and plant population
Step 1: Determine the plant population per unit area (in this case per acre). For the purpose of this calibration assume row spacing of 0.75 m and inter-row spacing of 0.35 m.
Plant population = 4,000m² x 2 = 30,476 plants/acre
0.75m x 0.35m
Step 2: Determine planting stations (holes) per acre.
Planting stations (holes)/acre = 4,000m² = 15,238 holes
0.75m x 0.35m
Therefore, number of seeds/station (hole) = plant population / planting stations
= 30,476/15,238 = 2 seeds per hole

Figure 6: Participants looking on jab planter and its working mechanism

Figure 7: Service provider and farmer innovator assist one of the CA participant from Malawi to control direct seeder drawn by animal.

Saidi presented feedback for the field practical done on Saturday at SARI. Mr. Mariki presented on crop rotation association and crop cover. This was followed by another presentation by Saidi on Crop-Livestock Integration in CA.

Discussion points by participants, following field visit at SARI are highlighted below:

THE LIKES	DISLIKES
1) Explanations were clear and comprehensive. 2) Were able to know CA equipment and practical use. 3) All necessary equipment for CA practices are available and still undergoing improvement. 4) Practical demonstration of the CA tools. 5) To see practically what is being done when using CA implements. 6) Practicals with Jab planter, AD Seeder, On-going tests with CAMARTEC. 7) AD direct seeder, planter, jab planter ripper, direct planter by power tiller. 8) AD ripper and seeder honorable names given to the animals (e.g. Obama) 9) Chisel plough by using animal drawn (respectively by using donkeys).	The tractor drawn seeders – had mechanical draw backs which need a lot of consideration (the 2 wheel CAMARTEC tractor). Note: this equipment is still under development Time was too short and we started late for the oxen "were tired" Time we started the practicals in the field There was insufficient time to know how to make adjustment to (power tiller drawn equipment)

Calibration exercise

How much water required per hectare if 174ml is enough to spray in $10m^2$?

1) *174ml=10m²*

How many ml/ha
1 ha= 10,000 m²
174m=10 m²
174 x 10, 00Ø = 174,000 ml
1Ø
174000 = 174 lts /ha
1000

How much water do we need per hectare if 250ml can be used in 16 lts.

2) *16 lts – how many /ha/= 174 lts/ha*
= 174 lts/Ha
= Ins= 16 lts
= 174 /16
= 10.9 N.s. ≅11 ns/ha

3) *16 lt, 250 ml chemical*
Ch/ha s
= 1 ha-11
=250 m=1

= 250 x 11; = 2750 ml/Ha

= 2.75 lts/Ha

7.6 Soil health and management of soil fertility
By Dr George Ley

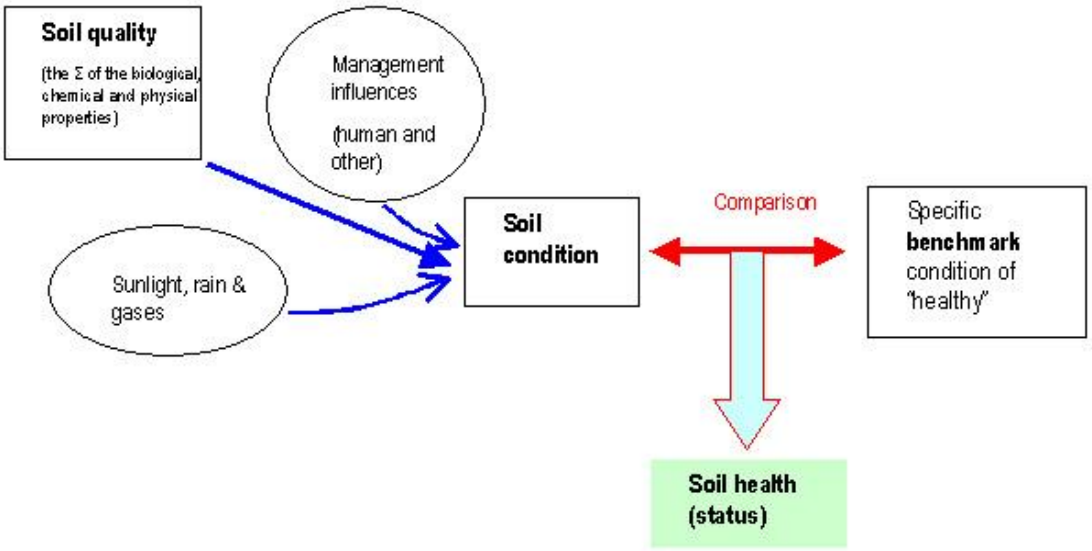
A power point presentation by was presented. Dr. George Ley started by knowledge rating practice, every participant were given piece of paper to rate his/her knowledge himself/herself. The rating were as follows 5 rate the highest knowledge of soil and 0 the lowest knowledge

RATING OF SOIL KNOWLEDGE

Rate	Number
0	1
1	0
2	2
3	5
4	4
5	2

What is a healthy agricultural soil?
Dr George Lay started by involving participants in defining what is soil health, different ideas were came out and at the end connected together and the clear definition is: One that is capable of supporting both an adequate production of food and fibre and also the continued delivery of other essential ecosystem services.

Conceptualizing soil health



Soil nutrients

Major Nutrients	Minor Nutrients
N P K Ca So Su mg	Zn Cu Iron Bo

Impact of agricultural practices on soil health

After clearing the natural vegetation to establish agricultural fields, all the major soil properties describing its health are changed, largely negatively.
The decline in soil organic matter over years immediately following clearing and the initiation of cultivation is well documented.
All agricultural soils have been altered from their natural state by human interventions which aimed at maximizing production functions and which, to some degree, always result in a loss of other ecosystem functions

Effects of mechanical tillage
A disruption of the spatial organization of the soil, rendering previously physically protected organic matter available to microbial decomposition, and previously inaccessible soil organism prey to predation.

Effects of a decline in soil organic matter (SOM) content
A decline in SOM reduces the capacity of the soil system to retain nutrients (loss of ion exchange capacity). Nutrient leakage from the soil system may lead to degradation of surface and underground water and pollute drinking water supplies.

Principles of establishing and maintaining soil fertility
Inputs of organic matter to meet the demand for carbon and energy supply to the soil biota will balance with nutrient demand of the crops. Development of integrated (i.e. organic plus inorganic) nutrient management systems where inorganic fertilizers are used in precise dosage with equally carefully designed practices of organic matter management that conserve nutrients and levels of soil organic matter.

Dr George Ley concluded that; **Soil fertility = Soil health**

7.7 Field Visit to Ekenywa Village and Farmer Field School
Field visit was organized by the course coordinator (ACT) in collaboration with Selian Agricultural Research Institute (SARI). Some checklist questions were prepared to guide course participants when they are in the field.

Q1 (a) Are the farmers aware of the main CA principles?

(b) Mention the CA principles practices by the farmers.
(c) Are there justifications/good reasons to the way they practice or research on CA? Explain.
(d) Describe violated CA principles – if any.

Q2 (a) Is the practiced/adopted CA beneficial to the farmers?

(b) List the benefits - if any.
(c) What CA challenges are the farmers encountering?
(d) What are your recommendations to solve them?

Q3 From your assessment, how is **management** of the FFS in terms of:

(a) A defined management structure?
(b) Defined roles and responsibilities?
(c) Establishment and enforcement of bylaws?
(d) Gender balance?

Q4 From your assessment, how is **sustainability** of the FFS

(a) strength of leadership
(b) common interests/successes which encourage connectedness
(c) mobilization of own resources
(d) vision and group ownership of resources

Participants were categorized into groups for answering the questions as follows

GROUP	QUESTIONS		
1	1	2	3
2	2	3	4
3	4	2	1

4.7.

7.8 Group presentations on the field visit to Ekenywa Village

Group 1 Presentations

Question 1

a) Yes – Farmers demonstrated/explained the 3 principals well and could be seen in form (crop rotation, minimum tillage & crop cover – rotations)
b) Cover cropping (Dolichos lablab, pigeon peas, crop rotation and minimum tillage (ripping) jab planter
c) Contour bands) because of slope to reduce soil erosion & feed for animals (trees – Agro Forestry) for wind breaking. (Ripping) enhance root penetration and H_20 infiltration
d) No clear balance on how much cover crop residues to be given to animals & left in the field

Question 2

a) Yes: labour saving, increased yield, crop diversifications, soil rehabilitation and soil erosion control. Management of livestock & crops well done (feeding systems).
b) Benefits: as above + improved crop health, reduced cost of production (input Vs output) = food security enhanced
c) Shortage/insufficient tools, adoption of CA by non-FFS members, drought in the area, pests and diseases management, animals and soil feeding balance
d) Equipment – link with available manufacturers, like CARMARTEC, NANDRA engineering. SIDO Adoption – awareness creation to non FFS Farmers
e) Drought -liaise with SARI for drought resistant crops varieties
Water harvesting structures for supplemental irrigation (weeds, water pits, bore holes, consultations to experts, pests diseases, training on IPM (integrated pests management, Nature pesticides (plant extracts, pepper etc.)

Question 3

Management Structure- well-structured leadership and balanced. Is frequency of meeting ok? Roles and responsibilities well defined frequency of meeting ok, roles & responsibilities well defined (chairperson, secretary, treasurer, matron, key keepers

Well defined roles & responsibilities was available among leaders

By laws in place guided by Constitution, book keeping available, meeting agenda, minutes. Members note abiding was excluded from the group membership.

Gender imbalance – more women than men (7 men – 15 women =22)

Recommendations

1) 30% of crop residue to be fed to animals and 70% to be left as cover crop.
2) Equipment – link farmers with local manufacturers and farmers to prioritize on purchase of equipment.
3) Animal byproducts – utilized as source of energy by utilizing it as biogas (animal slurry).
4) Graduations of VICOBA – involve, influential agricultural officers.
5) Increase on cover crop varieties for the area.
6) Embrace water harvesting structure for the area.
7) Trainings on past & disease management.

GROUP NO. 3 PRESENTATIONS

FIELD VISIT TO TUAMKE TUAMKE FFS – EKENYWA VILLAGE

Question 1

a) Yes
b) - Permanent soil cover
- Minimum soil disturbance
- Intercropping

Justifications:

(i) Lablab and pigeon peas provide soil cover for

- Moisture retention
- Enrich the soil with nutrients
- Improve soil structure
- Improve microbial activities

(ii) Use of ripper

- Breaks the hard pan to allow water infiltration
- To ease penetration of roots
- Improves aeration

(iii) Break disease/pest cycle

Proper utilization of soil nutrients

c) Violated CA principles

Uprooted crop residue (maize)

Question 2

a) Yes
b) Increase yields
   Improves soil fertility
   Minimize soil erosion
c) Availability of CA equipment
   Livestock invasion
   Animal/cover crop competition
d) Policy to address the problem – availability and prices
e) Proper land planning and by-laws
f) Use of live fence

Question 4 - SUSTAINABILITY

a) Good
b) Increase yield/fight against poverty
   - They are all CA oriented farmers
   - They are all members of village banking
   - They are integrated farmers (poultry, goats, dairy cattle)
c) Establishment of village banking
   - Sales from FFS plot
   - Penalties
   - Interest form loans
d) VISION
   Food self sufficiency

   Better livelihood

   OWNERSHIP
   Governed by their constitution
   Members are well informed of group resources.

OBSERVATIONS/COMMENTS

Group members were:

- Well organized
- Participatory
- Gender sensitive
- Middle aged group
- Innovative
- Dry land farming (for discussion)

GROUP 2

a) According to the farmers CA is beneficial to them.
b) Benefits:
   - Conserve moisture
   - Saves time (instead of 4-5 hrs – 20-30)
   - Reduce cost production: 120,000 before CA for tilling, now ripping: 25,000 TShs.
   - Saved money: school fees and other issues
   - Provide soil fertility (soil cover)

- Biological till (pigeon peas acting as ripper)
- Source of income (cover crop)
- CA has brought them together

c) Challenges

- Insufficient equipment
- Insufficient rainfall
- Neighbors animas grazes on the CA plots
- Buying sufficient equipment (from own resources)
- Growing drought resistance crops: sorghum, millet, etc

Question 3

MANAGEMENT

a) Structure in place
b) Chairman
   Secretary
   Constitution
   Treasurer
   Advisor
c) Bylaws are in place and enforced
d) No gender balance: 15 female + 7 male

Question 4. SUSTAINABILITY

a) Weak leadership (Mzee Kipara dominating)
b) ETs of projects keeping them together e.g. Poultry keeping, VICOBA (Loan Interest)

c) Own Resource
   Interests from VICOBA
   Fines on violation of by-laws
   Sale of farm produce

   Recommendation: Visitors to the group should be charged for the knowledge and time.

d) Vision
   Group seems not to have vision (only Kipara)
   The group doesn't have an action plan

General Recommendation

1. The 1.5 acre farm should be used for further learning. The learning plot should be divided into several experimental plots.
2. The group lacks "group dynamics"
   Capacity building
3. Authority division to address Kipara's dominance (Kipara is a Farmer Facilitator)
4. Opening bank account

7.9 Extension Approaches for CA

Hamisi Dulla presented a number of topics on the subject especially on Farmer Field schools (FFS) methodology. Core principles of FFS were highlighted and discussed. Specific Conservation Agriculture FFS issues were raised and discussed.

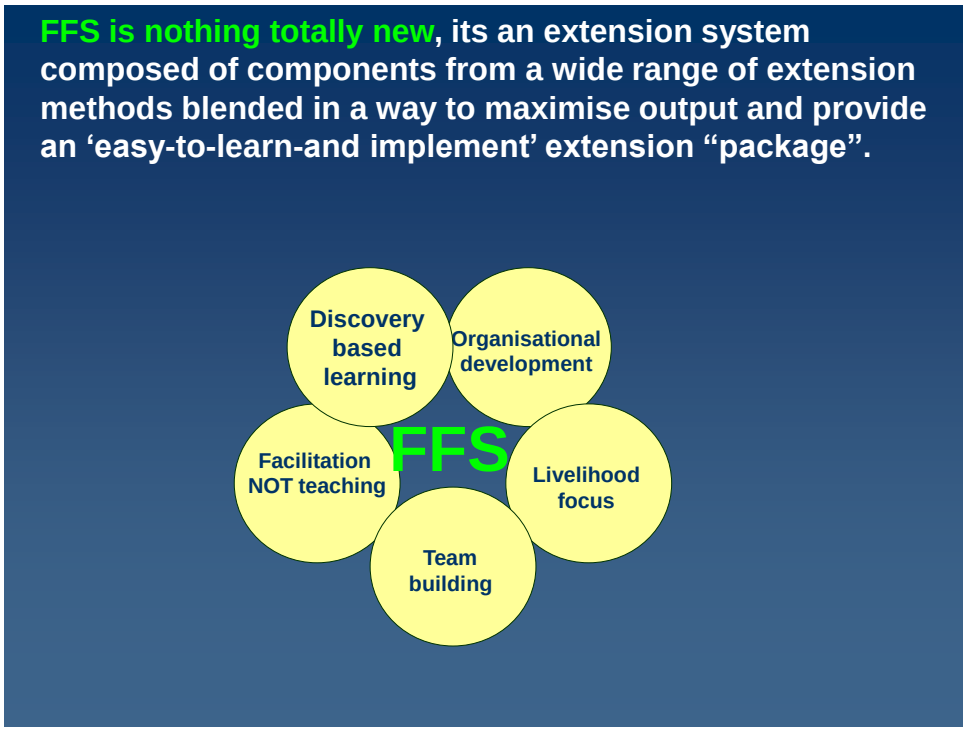


Figure 7: FFS Extension model

Additional topics of interest to participants were presented by Hamisi Dulla including Field days, facilitation skills, training of facilitators, steps of establishment of FFS and others.

7.10 CA and Climate Change

Eng. Richard Shetto presented on CA and Climate change. Participants discussed the presentation and relate to their home countries and how climate change could be mitigated. Participants appreciated the role of conservation agriculture in mitigating or adapting to the effects of climate change. The main topics presented by Eng. Shetto are as follows:

a) **Introduction**

- What is climate change?
- What are the causes
- Green House Gas Emissions
- Some key words in climate change
-

b) Agriculture and climate change

- How does agriculture contribute to climate change?

- Consequences of conventional agriculture

7.11 CA and Agroforestry

A presentation was made by Dr. Simon Lugandu. He defined Agroforestry (AF) – Integration of trees on farms and landscapes for improved livelihoods and land. Advantages of agroforestry were mentioned to include:

- Systems more tolerant to climatic fluctuations
- More and diverse products
- Food, fodder, fuel and finance
- Carbon sequestration
- Nutrient cycling from deeper layers

As far as CA is concerned Dr Simon showed what tree contributed to the three principles of CA; as follows.

1. **Minimum soil disturbance**. The roots of tree/shrub species and the soil fauna take over the tillage function, soil nutrient mobilization and balancing

2. **Adequate soil cover**. The trees add biomass, which **protects the soil** and **feeds the soil biota (i.e. biological plough)**. This also ensures better carbon storage

3. Trees in the rotation/ intercrop reduces weeds, insect pests and diseases; Thus increasing savings from inputs such as fertilizer and herbicides

Participants shared experiences on agroforestry and CA from their home countries or projects.

7.12 Social economic aspects of CA

The session was facilitated by Dr Lusambo. He mentioned that farmers and other stakeholders who are new or are at the initial stages of converting to CA still require tangible evidence on the benefits and impacts of CA. They ask:

- Will CA significantly increase productivity and food security for their families?
- Will CA help them save on production costs and generate income?

To be able to answer these farmers questions Dr Lusambo showed that it is thus imperative to undertake analysis on:

- Labour demands
- Crop yields
- Returns on investment and profitability
- Sustainability of various CA technologies to different farmer categories.

Some reports from socio economic analysis were shared. Participants discussed and shared experiences on the various factors affecting adoption of CA and agreed that before any CA intervention is undertaken some assessment along the factors need be done

7.13 Guidelines on Preparation of Country Action Plans

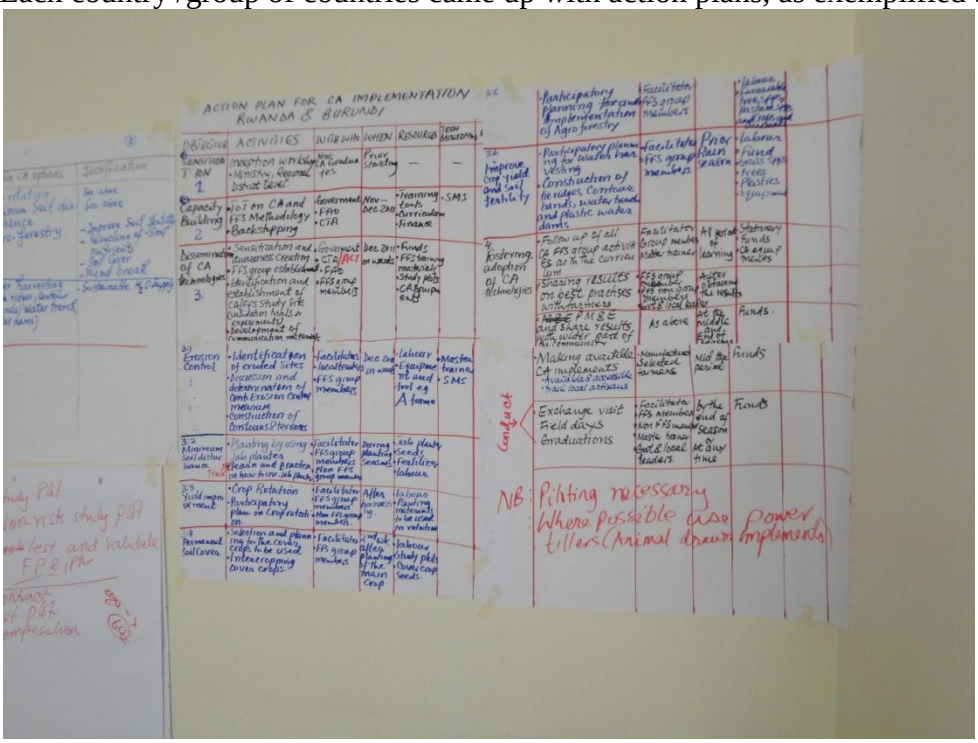
Dr Simon Lugandu provided the guidelines to support participants to prepare their country CA Action plans, which they should push or think of implementing when they are back home.

GUIDELINES FOR COUNTRY/ AREA ACTION PLANS

Considering the knowledge and skills you have acquired from this course and in line with Ministry of Agriculture's target programmes and other experiences, develop an **action plan** for implementation in your area:

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.

Each country /group of countries came up with action plans, as exemplified below



7.14 Monitoring and Evaluation of CA programmes

The session was facilitated by Eng Shetto. Participants shared their understanding about monitoring and evaluation.

Monitoring

- A continuing activity that involves the collection of data on a regular, ongoing basis in order to track inputs, outputs, outcomes and impact while the project/programme is being executed
- Assists in identifying deviations from initial goals and expected outcomes.

- conducted at specific times: daily, monthly or quarterly
- can answer questions such as:
  - How well are we doing?
  - Are we doing the right things?
  - What difference are we making?
  - Does the approach need to be modified, and if so how?

Evaluation

- Activity carried out at distinct and discreet moments of time to determine the worth or significance of a development activity, policy or programme.
- Is judging, appraising or determining the worth, value or quality of proposed, on-going, or completed programme, generally in terms of relevance, effectiveness, efficiency and impact.

-Effectiveness refers to the degree to which goals have been achieved.
-Efficiency refers to the cost effectiveness of the activities
-Impact refers to the broad, long term effects of programme

Methods of M&E, Indicators were discussed.

8.0 CRITICAL ISSUES

Summary of identified critical issues in CA were raised, discussed and presented discussed

9.0 COURSE EVALUATION

Evaluation questions were given to participants and later analysed.

INTERNATIONAL CA TRAINING COURSE, HELD AT SG NORTHERN ADVENTURE RESORT ARUSHA TANZANIA, 8 – 17 SEPTEMBER 2011

Kindly place a tick (√) against the ranking - 1 representing the lowest and 5 the highest score

Ranking 1 2 3 4 5

A. Course logistics	**1**	**2**	**3**	**4**	**5**
○ Transport from your country to the meeting venue	-	-	10%	45 %	45%
○ Accommodation arrangements at SG Resort	-	-	18%	27 %	27%
○ Entertainment during the training period	-	-	64%	27%	9.0%
B. Course Facilities					
○ Training Venue		-	27%	37%	37%
○ Food services during the training (meals and snacks)	-	-	18%	28%	54%
C. Course content					
○ Did the course content cover your expectations?	-	-	18%	36%	45%
○ Rate the presentation methodology	-	-	-	73%	27%
○ Quality of session facilitations	-	-	-	73%	27%
○ Facilitators	-	-	9%	45%	45%
○ Handouts	-	-	18%	45%	36%
○ Technical content	-	-	-	64%	18.
○ Were your questions answered satisfactorily?	-	-	-	73%	36%
○ Timeliness & overall logistics of course sessions	-	-	27%	64%	9.1%
○ Logistics of field day	-	-	9.1%	27%	64%

Note: 27.3% of the participants indicate I don't know because they were not staying at SG resort and 18.2% of the participants didn't rate on the technical content.

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

- I managed to get good knowledge on Conservation Agriculture and Conservation Agriculture practices
- I can proudly train others on Conservation Agriculture as an International ToT
- Field practical experience sharing
- Am better able to plan and put in place, with respect to CA in facilitating methods have been interacting and easy to use.
- The potential of CA to combat climate change
- Monitoring and evaluation of CA technology
- Practical session on soil cover, use of CA implements
- Training content
- Am mainly satisfied by the mainly three core principles of CA
- Participatory Monitoring and Evaluation
- Managing soil fertility
- Social economic aspects of CA
- Monitoring and Evaluation

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

- God bless thanks to ACT that there was no frustration nor disappointment
- Course extended by a day which certainly hadn't budgeted financially
- Arrival was two days before course started
- Handouts/reading materials not given during the training so that we could make revisions in the evening

Please provide specific recommendations for the organizers of the next course

- Gender balance
- More field / CA farms visit
- Very important training , factor in more participants from countries that didn't started
- Increase number of days in this kind of course
- Contacts for participants and pictures on a pamphlet of ''who is who'' need to be sent to participants before they have arrive for the course
- Invite women for the next course, the number to 50% F and 50%
- For the training to be real international you should look a way to cover more than east Africa countries, otherwise you can call sub regional training.
- Encourage ladies to cover such kind of course
- To update graduates with CA training, with new information and technological advancement.
- The course was well organized
- Spear enough time
- Time should extended at least 4 weeks
- Social economic aspect to be taught widely

Free comments & suggestions (can also use back of this form)

- In general the course were well conducted, there was an excellent facilitators and participants. Participatory approaches, friendly atmosphere, good presentations logistics etc.
- Very well confident training and free for participatory training
- Training was very joyful and trainers were very friendly
- Facilitators were competent and have sufficient skills
- Practical sessions should be increased and case studies al.
- Presentation by the facilitator should be given to participants at the end of each day.
- We need to concentrate into power tiller animal drawn and not animal power draft in CA because the power tillers will soon have very wide application in Tanzania. Tractor drawn CA implements should continue to be promoted where tractor are high used.
- More practical should be done; time should be increased to allow more time for practicals even training other parties of the country to witness CA technology e.g. Dodoma, Karatu, Babati etc.
- There should be a follow up / evaluation world workshops for all CA trainees to meet and share experiences of CA training. Activity and curriculum in their respective working areas.
- CA is a process which will create a new developments
- Communication and notification of new and sources of CA options through our emails

The course was good.

10.0 ANNEXES

Annex 1: INTERNATIONAL CONSERVATION AGRICULTURE TRAINING COURSE PROGRAMME

7 – 16TH SEPTEMBER 2011, ARUSHA TANZANIA

Date - Time	08:00-08:30	08:30-10:30	10:30-11:00	11:00-13:00	13:00-14:00	14:00-15:30	15:30-15:45	15:45-17:30
7 September (Wednesday)	***Arrival of participants***							
8 September (Thursday)	Participants Registration	**Setting the scene [EC]** Introductions; logistics; participants' expectations; course objectives and workshop processes Official opening: 10.00 am	**B**	**Situation analysis - Regional Experiences with CA by Participants [EC]** *Country group exercises*		**Situation analysis: + coping strategies [EC]** *Plenary presentations by country groups*	**B**	**What is CA and why CA?** Background, historical perspectives, rationale, benefits, challenges **[SM]** *Plenary presentations & discussions*
9 September (Friday)	Committee reports	**Conventional farming: what has gone wrong? [SM]** **CA Concepts and principles I: Soil cover [SM]** *Plenary presentations and discussions*	**R**	**CA Concepts and principles II:** Minimum Mechanical Soil Disturbance **[SM]** • Manual; animal traction and tractor based systems *Plenary presentations, discussions*	**L**	**Practical Demonstration of erosion processes and infiltration [EC]** Run-off trays etc. *Field based practical Exercises*	**R**	**Practical Demonstration of erosion processes and infiltration [EC]** Run-off trays etc.
10 September (Saturday)	Committee reports	**Conservation Agriculture Equipment [JM]** **CA Equipment Manufacturing and hire-service provision [AD]** *Plenary presentations, discussions*	**E**	**Field practicals: CA techniques in manual systems [JM]** • laying, digging basins • jab planting • dibbling; manual weed control *Field based Practical Exercises*	**U**	**Field Practicals: CA in animal traction systems [JM]** • harnessing animals for ripping /subsoiling /direct seeding • showcase of CA equipment *Guided exposure to CA equipment, hands-on use and adjustments*	**E**	**Field practicals: CA in Tractor based Systems [JM, MD]** • tractor subsoilers, rippers and direct seeders • Tractor sprayers *Field Practical Exercises*
11 September (Sunday)	***Free day***							

Date - Time	08:00-08:30	08:30-10:30	10:30-11:00	11:00-13:00	13:00-14:00	14:00-15:30	15:30-15:45	15:45-17:30
12 September (Monday)	Committee reports	**Feedback on CA Equipment practicals [SM]** **CA Concepts and principles III: Crop rotations and Associations [WM]** *Plenary presentations, discussions*	**A**	**Crop-livestock integration in conservation agriculture [SM]** *Plenary, discussions, exercises*	**N**	**Weed, pest & disease management and control in CA systems [WM]** timeliness; manual and chemical options; strategic control *Plenary presentations, discussions*	**A**	**Practical session on weed control [WM]** Calibration of sprayers *Practical exercises*
13 September (Tuesday)	Committee reports	**Soil Health [GL]** • Soil characteristics and properties • Erosion and water infiltration *Plenary presentations and discussions*	**K**	**Managing Soil fertility in CA systems [GL]** Soil fertility recovery options *Plenary, discussions, exercises*	**C**	**CA and Climate Change [RS]** **CA and Agroforestry [SL]** *Plenary, discussions, exercises*	**K**	**Field Visit Preparations [WM; HD]:** Approaches; Questions; Logistics
14 September (Wednesday)	Committee reports	**FIELD VISIT** CA FFS Group I **[WM/HD]**		**FIELD VISIT** CA FFS group II and adopters **[WM/HD]**		**FIELD VISIT** CA Equipment Service providers **[WM/HD]**		**FIELD VISIT** CA for the environment **[WM/HD]**
15 September (Thursday)	Committee reports	**Report back on the Field Visits [HD]**		**Extension Approaches for CA [HD]** Farmer field schools; Study circle; Contract farming	**H**	**The FFS and On-farm experimentation [HD];** Data/ Information management		**Optional: Discussions [HD]**
16 September (Friday)	Committee reports	**On-farm CA trial set-up [RS]:**		**Social economic aspects of CA [LL]**		**Social economic aspects of CA [LL]** Group work and presentations		**Guidelines on Preparation of Country Action Plans [SL]** **Action planning [SL]** Feasible CA options; Plans for implementation *Exercises visualized on flip charts*
17 September (Saturday)	Committee reports	**Monitoring and Evaluation of CA programmes [RS]**		**Way forward: [SL]** Group presentations of Country /Individual Action plans		**Summary of identified critical issues in CA [SL, RS]** **Special open debate** on CA and the way forward		**Course evaluation [SL]** **End of course [Guest of Honour]**
18 September (Sunday)	***Departure of participants***							

Resource persons list

No.	Name	Initials		Dates Available								
			Thursday 08 September	Friday 09 September	Saturday 10 September	Sunday 11 September	Monday 12 September	Tuesday 13 September	Wed 14 September	Thurs 15 September	Friday 16 September	Sat 17 September
1.	Joseph Mutua	JM			◙							
2.	Edward Chuma	EC	◙	◙	◙							
3	Wilfred Mariki	WM					◙		◙	◙	◙	
4.	Simon Lugandu	SL	◙	◙	◙	◙	◙	◙	◙	◙	◙	◙
5.	Allystar Dennis	AD			◙							
6	Leopold Lusambo	LL									◙	
7.	Hamisi Dulla	HD							◙	◙	◙	◙
8.	George Ley	GL						◙				
9.	Saidi Mkomwa	SM	◙	◙	◙	◙	◙					
10.	Richard Shetto	RS						◙	◙	◙	◙	◙
DAYS' FACILITATOR			E Chuma	E Chuma	S Mkomwa	D Ngotio	S Lugandu	S Lugandu	S Lugandu	S Lugandu	H Dulla	H Dulla

Annex 2: OFFICIAL CLOSING REMARKS

OFFICIAL CLOSING REMARKS FROM THE PRINCIPAL SECRETARY, MINISTRY OF AGRICULTURE FOOD SECURITY AND COOPERATIVES ON INTERNATIONAL CONSERVATION AGRICULTURE TRAINING THAT WAS HELD AT SG NOTHERN ADVENTURE AND RESORT, ARUSHA TANZANIA 16 SEPTEMBER 2011

Director of Mechanization, Ministry of Agriculture, Food Security and Cooperatives

Representatives from African Conservation Tillage Network

Participants to the International CA Training Course

Ladies and Gentlemen

I would like to take this opportunity to thank God for allowing us the opportunity to gather here for this important occasion of the closing of the International Conservation Agriculture Training Course. I also wish to thank you for inviting and honoring me to be your Guest of Honor. I would like to use this opportunity to send my condolences to our relatives who lost their lives in the sad events of the sinking ship in Zanzibar and fuel fire blast in Kenya. May God rest their souls in peace, Amen. We are also praying for the quick of all who were injured in these sad events so that they can regain their health and continue with their duties.

Dear Participants,

Improved agricultural practices are the primary drive for modern economy and poverty alleviation. There is therefore, need to embrace on techniques and technologies that conserve soil and water in the fields, in order to deal with the problem of soil erosion and loss of moisture from the soil.

Dear Participants,

I have been informed that conservation agriculture focuses on three principles of permanent soil cover (for example leguminous plants or crop Stover); crop rotation or association and minimum or no tillage. Crop rotation is known to control pests and plant diseases. Cover crops are important in the control of weeds and soil erosion and for improvement of soil moisture and fertility. All these interventions help to make the agriculture enterprise sustainable and efficient. Minimum or no tillage reduced disturbance to the soil. We all have witnessed the difference between Conventional agriculture and Conservation agriculture. However Conservation agriculture may be more beneficial if it is accompanied by proper agronomic practices such as use of right seeds and fertilizers, timely planting and weeding.

Dear Participants,

In your training, you have been able to meet and share experiences with various stakeholders. Also you were able to see a variety of Conservation agriculture equipment such as rippers drawn by animals and tractors, jab planters and planters drawn by oxen, power tiller and tractors. Some of these equipments are locally manufactured in our countries. However there are still many challenges on the availability of these equipments at reasonable costs. I would like to use this opportunity to request you go and encourage the private sector in your countries to use the existing opportunities for the needed equipments in production and marketing of the conservation agriculture equipments.

Dear Participants,

There is a problem of availability of capital and loans for agricultural equipments. I am requesting you to advise farmers to strengthen their saving and credit associations which can serve as collaterals for accessing loans for purchase of conservation agriculture equipments. I am opportunistic that your governments will be ready to create conducive environments for farmers to access loans in financial institutions.

Dear Participants,

I am aware that conservation agriculture requires change of mind set. Let us collaborate work together to provide conservation agriculture education so as to have efficient and sustainable agriculture that considers conservation of our and future generation environment. I am requesting extension officers to use most of their time working with farmers in the field than sitting in offices.

Lastly, I would like to thank the organizers who enabled this training happen. I am wishing you safe journey back to your homes. I would like to also say, for those coming from outside of Tanzania - welcome once again.

I would now like to declare that the international conservation agriculture training is officially closed.

THANK YOU!

ASANTENI SANA!

Annex 3: LIST OF PARTICIPANTS AND FACILITATORS

CONSERVATION AGRICULTURE TRAINING OF TRAINERS COURSE, EASTERN AFRICA REGION
7-17 SEPTEMBER 2011
PARTICIPANTS LISTS

	NAME	ORGANISATION	POSITION	TEL/CELL PHONE	POSTAL	EMAIL
1	Jimmy Macha	Ministry of Agriculture of Tanzania	Agricultural Officer (mechanization dept)	0713 299950	Box 9192 Dar es Salaam	Jifema86@gmail.com
2	Linus Ngowi	Ministry of Agriculture Food Security and cooperatives	Agricultural Mechanization Officer	0713 213 102	Box 9192 Dar es Salaam	linyibidii@yahoo.com
3	Yandemye Philibert	FAO – Burundi	FFS Consultant	+257 798 77370 +257 77766222	c/o FAO Burundi	yandemye@yahoo.fra
4	Sifuel Akyoo Joseph	CPAR-Canadian Physicians for Aid and Relief	Field Officer	+255 765 625 920 +255 714 736 644	Box 17 Karatu	Akyoo87@yahoo.com
6	Lam Ruach Guok	Concern Worldwide	Agronomist	+249 902 737 695		Lampuar123@gmail.com or lam.guok@concern.net
7	Julianus Thomas Suleman	FAO (UN)	Regional FFS Master Trainer	+250 783865086 +255 7844233 423	c/o FAO Rep. Kigali RWANDA	ffskagera@hotmail.com
8	Ndamugoba Dennis Simon	TAMP-KAGERA Tanzania & Trans boundary Agro Ecosystem Mgmt.	FFS Master Trainer	+255 755 560 811 +255 782 729 900	Box 1157 Bukoba TANZANIA	ndamugoba@yahoo.com
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