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MINISTRY OF AGRICULTURE

Conservation and Climate Smart Agriculture

CAPACITY BUILDING MANUAL FOR ETHIOPIA

Produced for the Ministry of Agriculture, Ethiopia

(IFAD Supported PASIDP II Project)

By

Alliance for a Green Revolution in Africa (AGRA)

December 2020

Introduction and Background

Setting the Scene for Conservation Agriculture Practice

Learning Outcomes

At the end of this Introductory and Background Section, the User will be able to:

- Highlight the Contents and Structure of the Manual.
- Define what Conservation Agriculture is, how it is related to, and part and parcel of Climate-Smart Agriculture.
- Understand why and how Conservation Agriculture is different from Conventional Agriculture, its facets and considerations in its successful practice.
- Relate to why Conservation Agriculture practice is necessary and urgent, why and how it has succeeded elsewhere.
- Understand the various levels and application conditions and scenarios that favour successful Conservation Agriculture practice.
- Understand the field-visit observations and learnings from stakeholders upon which this Capacity Building Manual was founded and developed.

“…the health of soil, plants, animals, people and the environment is one and indivisible…”

Rattan Lal (World Food Prize Laureate, 2020)

Rather than simply expanding the use of inputs (i.e. fertilizers, pesticides, irrigation, energy) or the land area used to grow crops, Rattan Lal’s work has shown that it is possible to attain sustainable agricultural intensification practices boosting food production while decreasing the amount of land and increasing the efficiency of the inputs used to cultivate it. His models indicated that restoring soil health can lead to multiple benefits by the year 2100, including more than doubling the global annual grain yield to feed the growing world population, while decreasing the land area under grain cultivation by 30 percent and decreasing total fertilizer use by half. Making this a reality will enormously benefit farmers, food consumers and the environment.

About

The CA Capacity Building Manual

About the Manual

The Manual has been designed to have the following qualities:

- To place emphasis on ***The HOW*** of advancing CA and CSA Practice in Ethiopia and elsewhere in Africa.
- To have the ***Extension Agent as the Prime Target Audience*** but to also talk to others from Farm to Policy - to fit and guide CA and CSA advancement efforts ***Beyond the Farm*** into the ***Landscape*** and into the ***Market-Pulled Value Chain***, to work with ***Institutional*** and ***Private-Sector Partnerships*** that are coordinated at Local, Regional and National Levels, under a ***Multi-Sectorial and Multi-Level Stakeholder Committee*** of Champions who form the Leadership under a ***CSA Movement*** and ***National Desk*** Coordinator.

About the Manual *(Continued 1)*

The Manual has 8 Pull-Out (*Independent but Related*) Modules:

- Module 1: How to establish crops the CA way.
- Module 2: How to maintain soil cover on farms.
- Module 3: How to Integrate Crops and Livestock in CA Practice.
- Module 4: How to track the profitability of CA practices.
- Module 5: How to be an Active Member of a CA Landscape and Community.
- Module 6: How Institutions Collaborate in Advancement of CA.
- Module 7: How Public Private Partnerships Work for Advancement of CA Practice.
- Module 8: How to Monitor and Evaluate CA Advancement.

<u>About the Manual</u> *(Continued 2)*

<u>Each Module is divided into the following 6 sections:</u>

1. <u>Learning Outcomes:</u> which advices the User about what they will learn.
2. <u>Knowledge (*The What?)*:</u> which provides the background and the theory behind the subject matter of the Module.
3. <u>Attitude *(The Why?)*:</u> which helps the User relate to the importance (and justification) of the subject matter of the Module.
4. <u>Practice *(The How!)*:</u> which supports the User to know how to play a useful role in applying the learnings.
5. <u>Training Guides and Posters:</u> as value-add materials and tools for the User
6. <u>Module References</u>: which provide the user of the Module with additional sources of information and knowledge.

Knowledge

(The WHAT)

Features of farming in Africa

- Low productivity (Average of 1 Tonne per ha maize) smallholder subsistence, rain-fed Agriculture, expected to produce 80% of the food available, which is inadequate.
- Mixed-crop & livestock systems (Farming based around the Machete, Hand-hoe, Maresha, and other rudimentary tools or methods), many of which are, extremely destructive (land-degrading) and detrimental for the environment.
- Falling levels of Draught power and urgent call for Sustainable Mechanization of all kinds (from production to post-harvest processing). An Ox-Plough farmer needs to walk some 42 km to plough a hectare of land.
- Drudgerous farming practices of which the burden of farming is increasingly left to aging women as youth move and settle in more socially friendly environments in urban areas.
- Under-fed, roaming livestock struggling with over-stocking and competition for crop stubble between animals and the soil (cover)
- Limited access to mechanization and affordable inputs that are accessible in a timely manner and applied uniformly and accurately, based on quantified soil-health needs.
- Systems and operations that are facing vagaries of climate change without any organized central, project or community level responses for adaptation, resilience or mitigation measures.

Slide Courtesy of ACT

Opportunities, Challenges & Threats

Massive Opportunities

- Africa’s population is rising and urbanizing – 70% growth in food market in 20 years or so.
- Africa’s annual food import bill is likely to rise from $35 billion to $110 billion by 2025
- Africa has 60% of the global total uncultivated crop land.
- Africa is the youngest continent, 60% are Youth under 35 years old. 72% have access to Digital tools (CTA, 2019).

Challenges & Threats

1. Farming related **land resource degradation and loss of biodiversity.**
2. Shortage of **farm power 0.2 versus 2.5 kW/ha (in India).**
3. Declining rural labor force, **ageing farmers** and increasing **feminization** of agriculture.
4. Food crop production is increasingly **unprofitable** and national budgets for agriculture are below set expectations**.**
5. Value-chains that are amorphous, inadequately capacitated and Threatened by **climate change.**

Slide Courtesy of ACT

Box 1: What is Conservation Agriculture?

Conservation Agriculture is an ecosystem approach to regenerative sustainable agriculture and land management based on the practical application of context-specific and locally adapted three interlinked principles of:

(i) Continuous no or minimum mechanical soil disturbance (no-till seeding/planting and weeding, and minimum soil disturbance with all other farm operations including harvesting);

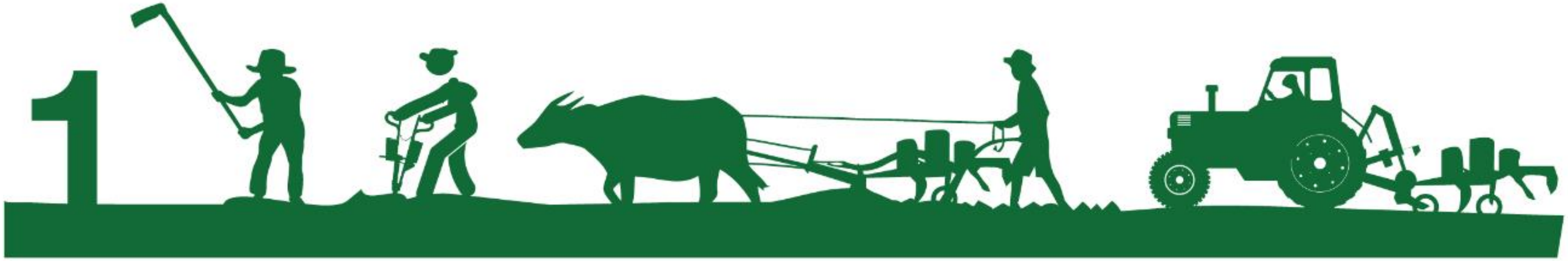
(ii) Permanent maintenance of soil mulch cover (crop biomass, stubble and cover crops); and

(iii) Diversification of cropping system (economically, environmentally and socially adapted rotations and/or sequences and/or associations involving annuals and/or perennials, including legumes and cover crops), along with other complementary good agricultural production and land management practices.

Conservation Agriculture involves rainfed and irrigated systems including annual cropland systems, perennial systems, orchards and plantation systems, agroforestry systems, crop-livestock systems, pasture and rangeland systems, organic production systems and rice-based systems. Conservation Tillage, Reduced Tillage and Minimum Tillage are not Conservation Agriculture, and nor is No-Till on its own.

(http://www.fao.org/conservation-agriculture).

Conservation Agriculture Principles



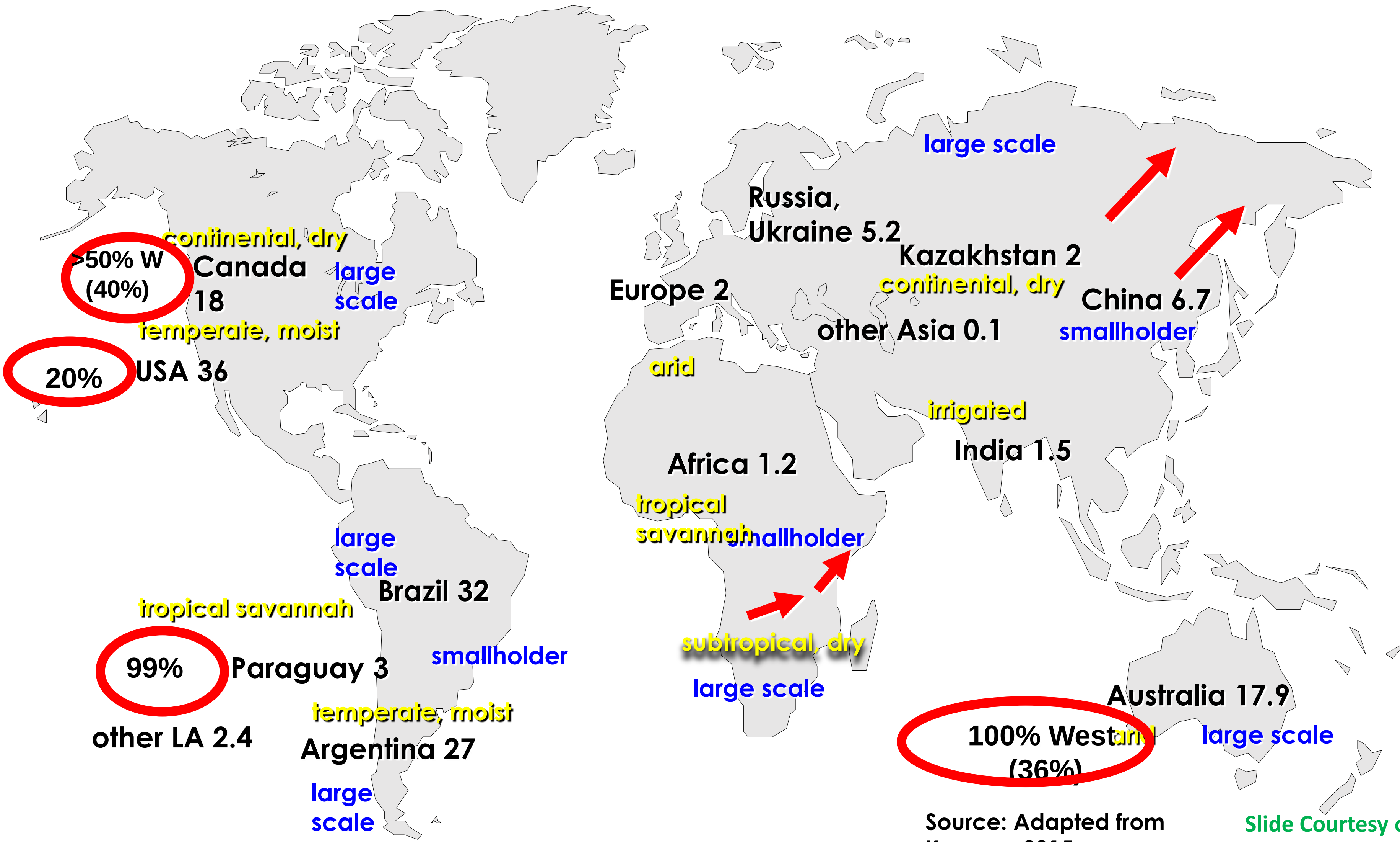
Minimum mechanical soil disturbance

Permanent organic soil cover

Crop rotation and intercropping

Conservation Agriculture globally 180 Million ha (~11% of arable cropland)

- CA adoption expanding at the rate of 10 million ha annually
- 1.5 million ha in Africa. 65% are smallholders.
- 19,000 smallholders in East Africa are beneficiaries of South-South Partnership



Source: Adapted from Kassam, 2015

Slide Courtesy of ACT

Estimates of CA Adoption in Africa

- CA has been adopted in some 20 countries in Africa as a core production component of CSA
- Cropland under CA in Africa is 1.5 Million hectares.
- Area under CA has increased by 210% since 2008/09.

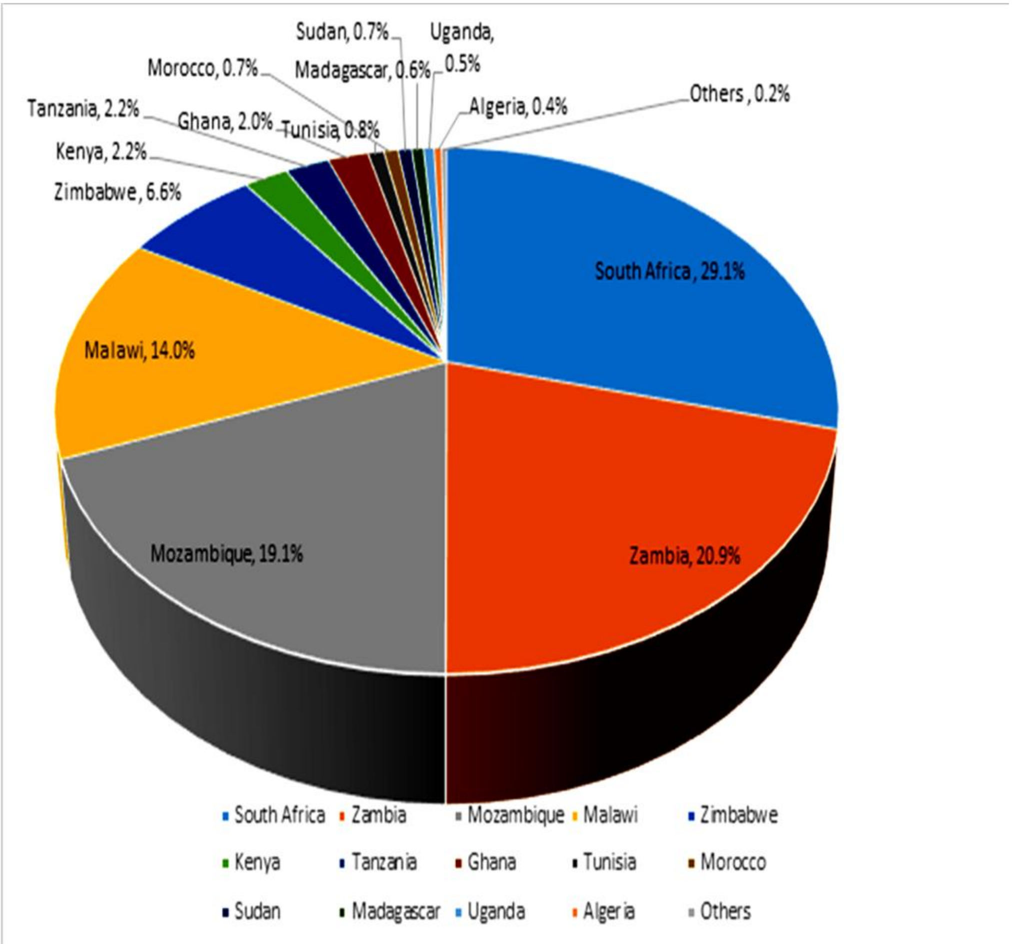
Of the land under CA:

- 30% smallholders,
- 1% medium,
- 69% large-scale
- About 1.32% of the cropped land is under CA.

Slide Courtesy of ACT

CA adoption in Africa

Fig 0-1



Country	CA Area '000' (ha)	%
South Africa	439.00	29.1%
Zambia	316.00	20.9%
Mozambique	289.00	19.1%
Malawi	211.00	14.0%
Zimbabwe	100.00	6.6%
Kenya	33.10	2.2%
Tanzania	32.60	2.2%
Ghana	30.00	2.0%
Tunisia	12.00	0.8%
Morocco	10.50	0.7%
Sudan	10.00	0.7%
Madagascar	9.00	0.6%
Uganda	7.80	0.5%
Algeria	5.60	0.4%
Lesotho	2.00	0.1%
Swaziland	1.30	0.1%
Namibia	0.34	0.0%
Total	1,509.24	100.0%

Slide Courtesy of ACT

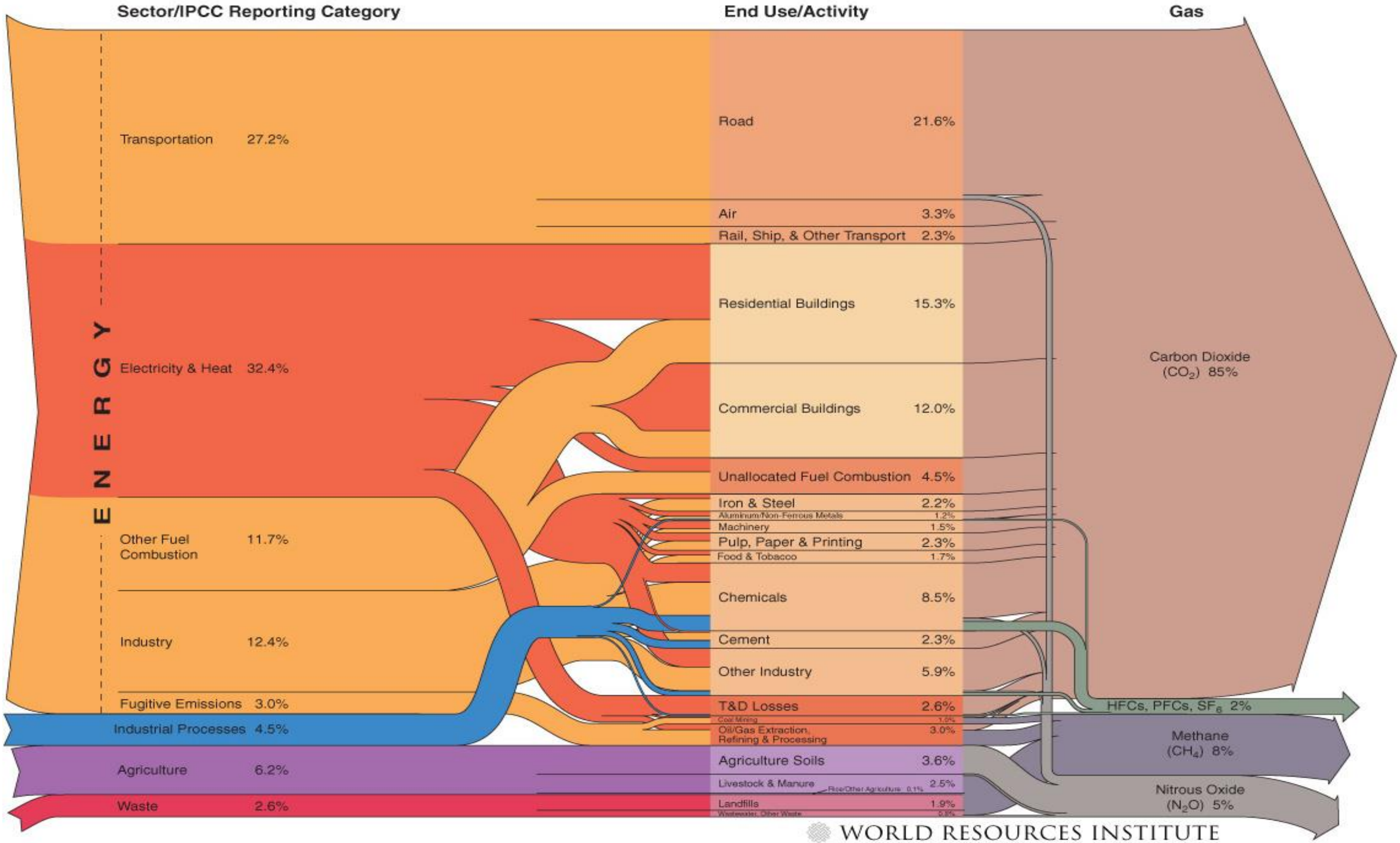
African Conservation Tillage Network (The Organisation)

- Common vision developed in Harare in 1998
- Pan-African, not-for-profit, membership organization, headquarters in Kenya
- Board of 11 Directors, Country Focal Persons & CA Centres of Excellence
- Sub-regional presence in Tanzania (East), Burkina Faso (West) and Zimbabwe (Southern)
- Partnerships and strategic alliances. Built on support from GIZ, EU, FAO, IFAD, National Governments & others
- Redefined mandate to include Sustainable Agricultural Mechanization & Ecosystem Services

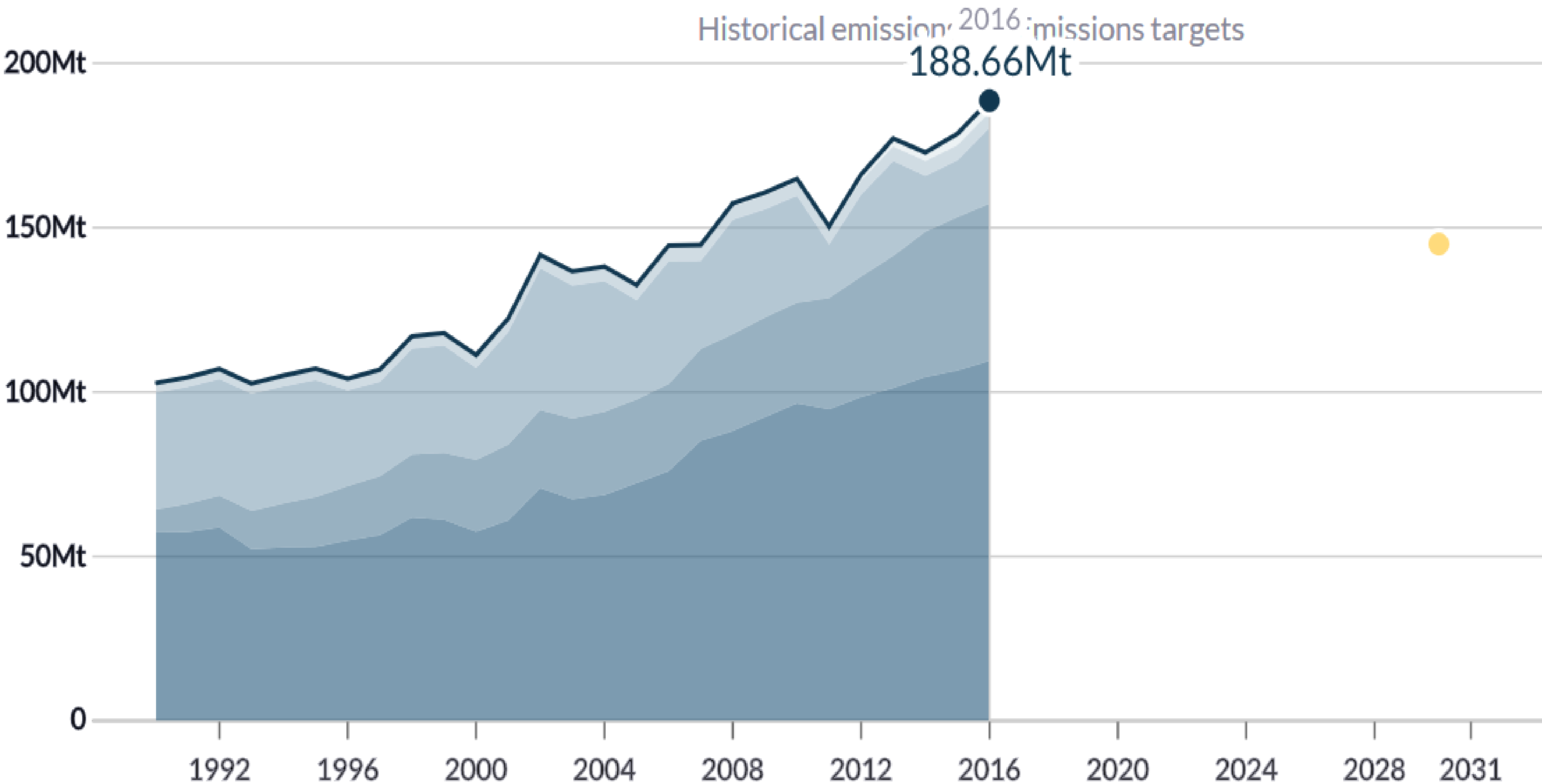
Promoting Integrated Conservation Agriculture & Sustainable Agriculture Mechanization (SAM) http://act-africa.org

Slide Courtesy of ACT

Global Green House Gas Emissions Contributions by Different Development and Business Sectors *Fig 0-3*



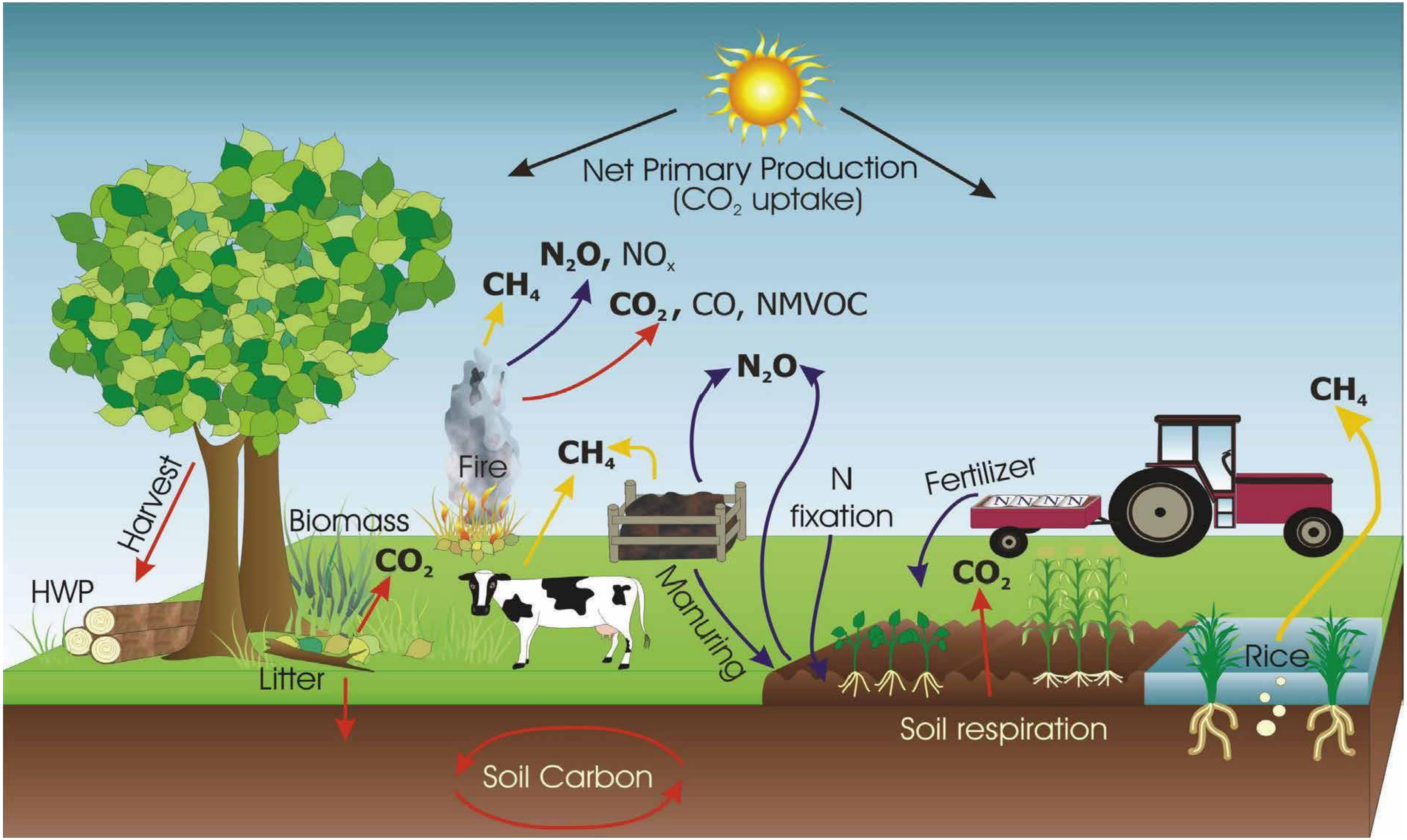
Green House Gas Emission Levels in Ethiopia *Fig 0-4*



The Yellow Dot shows the 2030 National Emission Target which has been exceeded!

The link between CA and Climate Smart Agriculture (CSA): CSA is CA with due consideration to GHG emissions that have caused Climate-Change.

Fig 0-2



Soil Health is Visible: From Left to Right (*Fig 0-7*):
- Pasture,
- Conventional tillage and
- No-till with cover crop soil samples.

After 1 inch of rain the conventionally tilled soil in the Middle is bone-dry while living roots in the other two soils allowed for infiltration, and water retention.

Attitude

(The WHY)

Standard Benefits of CA Practice

- Empower smallholders to competitively produce a surplus, and become commercial
- Production of sufficient, competitively priced and quality raw materials for Market & Industrialization Agenda

Crop

- Increase and stable yield, productivity & profit
- Eventually reduce fertilizer use
- Reduced pesticides as farming turns more organic.
- Reduced machinery loading and 50 to 70% reduction in labour requirements.
- Harvest more rain water and increase efficiency of use of irrigation water needs

Land

- Greater livestock and human carrying capacity
- Lower impact of climate (drought, floods, heat, cold) and climate change adaptation and mitigation
- Lower environmental cost (water, infrastructure)
- Rehabilitation of degraded lands and ecosystem services

Livestock

- Adequate, quality diverse fodder
- Milk production consistency & increase
- Better herd management – Zero Grazing
- Feed preservation and conservation
- Productivity: 5-8 litres to 15-24 litres per day
- Increased organic matter and Manure
- Savings in Cost of production

Slide Courtesy of ACT

Why is Soil-Health Important?

- Like animals and plants, **soil is a living 'thing'**. Soil-health determines its capacity to feed animals and plants effectively and sustainably.
- Soil health measures are as complicated as trying to quantify the health of a human being or a crop. Soil Health is measured scientifically in terms of **Carbon content, Fertility Colour, Bulk Density, amino-Nitrogen, Percent of Stable Aggregates by volume, Water Soluble Carbon and Organic Matter**.
- The new Intergovernmental Panel for Climate Change (IPCC) report concludes that globally, **cropland soils have lost 20-60% of their original organic carbon content**.

Primary Benefits of CA Practice:

- ✓ With CA smallholders **save time and drudgery**, making it attractive to the youths.
- ✓ **Saved time is re-invested** in all-year-round livestock keeping enterprises; service provision or agribusiness
- ✓ With CA, smallholder farmers are able to produce **a surplus, competitively**, thus penetrate markets and transit to become **commercial**.
- ✓ Our grain marketing problem is probably not the price offered, but **our high production cost**!
- ✓ **With Mechanized CA we could lower the price of major crops/kg!**

CA => CSA provides READY opportunity: To Sustainably Transform Africa's humid as well as Semi-Arid Lands into Crop and Livestock Production Havens

Slide Courtesy of ACT

Change is needed and it must Happen NOW!

- Increases in population and wealth are leading to **ever-growing demands for food**, while increasing urbanization is leading to proportionally fewer people producing food.
- Humans have tended to deplete soils of the ingredients of fertility that the soil needs to keep animals and plants alive and healthy. In this regard, nature (soil) is getting upset and hitting back with "**climate-change**".
- **Industrial Agriculture** is growing crops and livestock purely for market and industry. It is not sustainable. It is contributing substantially to the climate emergency and having a negative impact on human health and the environment.
- **Regenerative Agriculture** addresses both of the major problems associated with Industrial Agriculture. It ***reduces the carbon footprint*** imposed by agriculture and simultaneously ***removes carbon dioxide*** from the atmosphere & sequesters it in the soil.

Practice

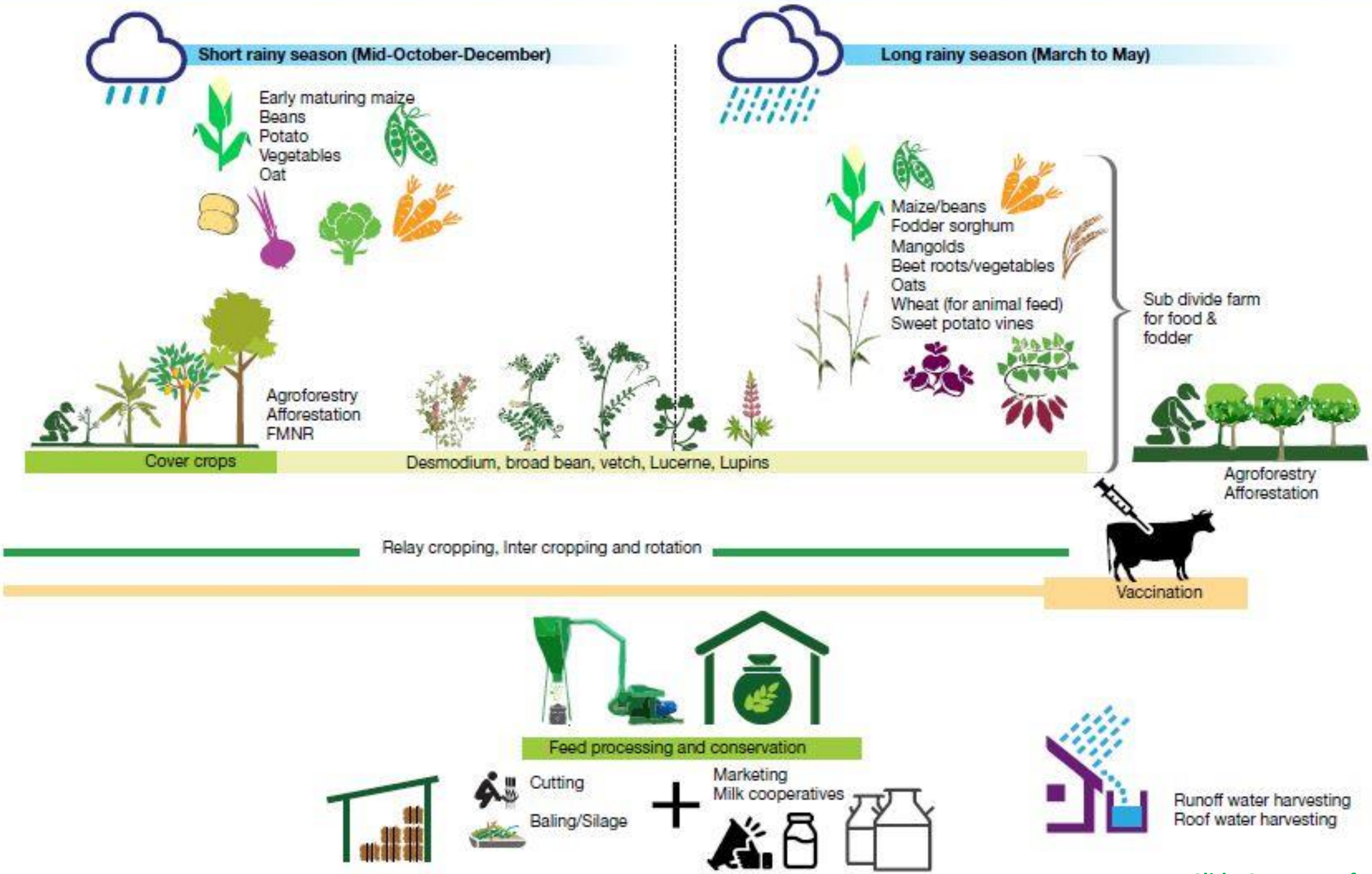
(The HOW)

CA Advancement Enhancers and Enablers ..

- **Good agronomic practices:**
  - Timely planting; Proper plant spacing
  - Effective weed control (*with and without herbicides*)
- **Use of improved, environment and farmer friendly external inputs**
  - Improved seeds
  - Judicious use of fertilisers and pesticides.
- **Crop – livestock integration.**
- **Agro-forestry –** fertiliser trees, fodder, fruit, live fences, etc.
- **Available, Accessible and Affordable Mechanization** services
- **Value-chain partnerships** vertically and horizontally, including the private sector players.
- **Institutional Support** and **Public-Private Partnerships** inclusive of Champions from all levels.
- **Policy and regulatory frameworks** that support market-linked value-chain development and sustenance.

Slide Courtesy of ACT

CA system demonstrated in mid to high land areas receiving bi-modal rain under mixed farming system



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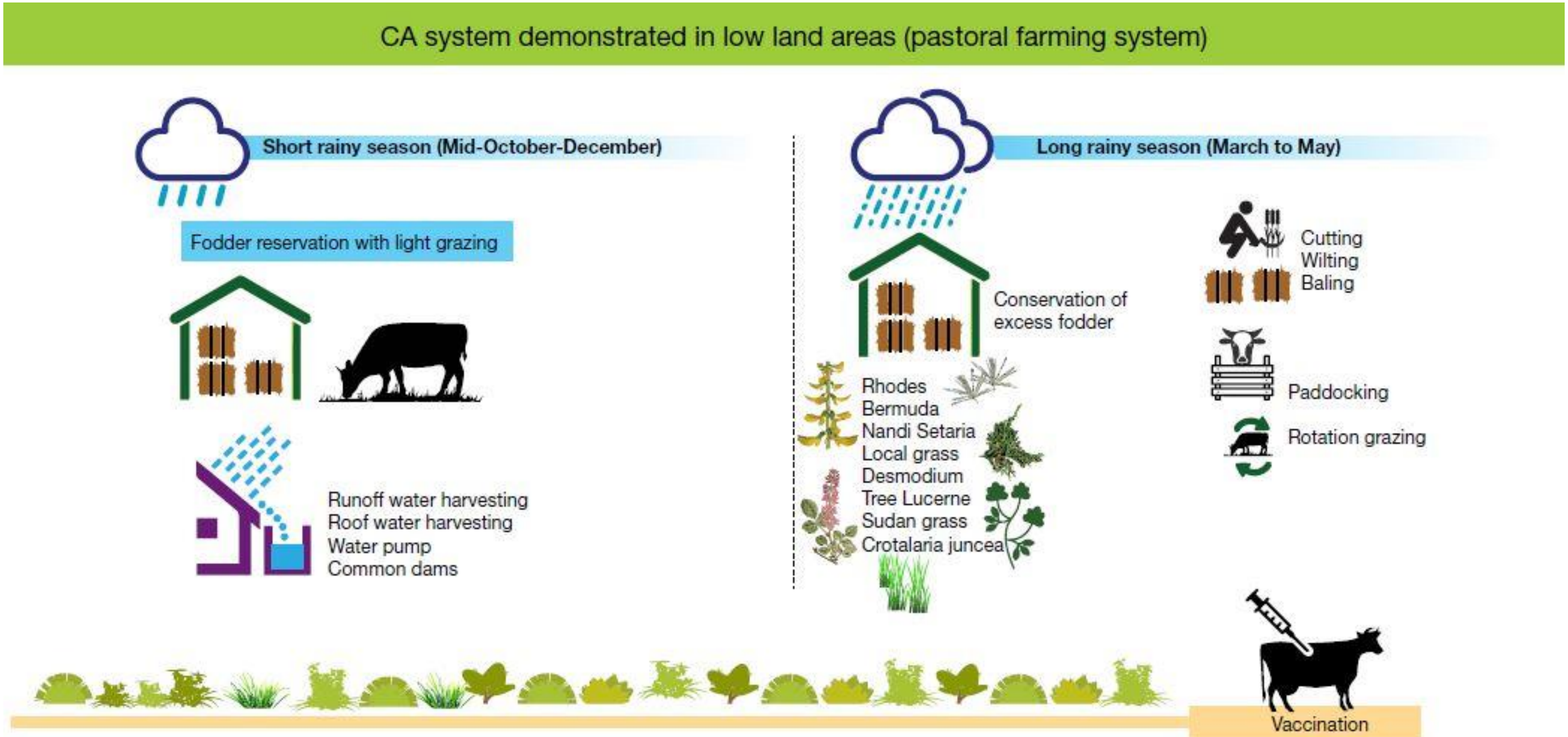
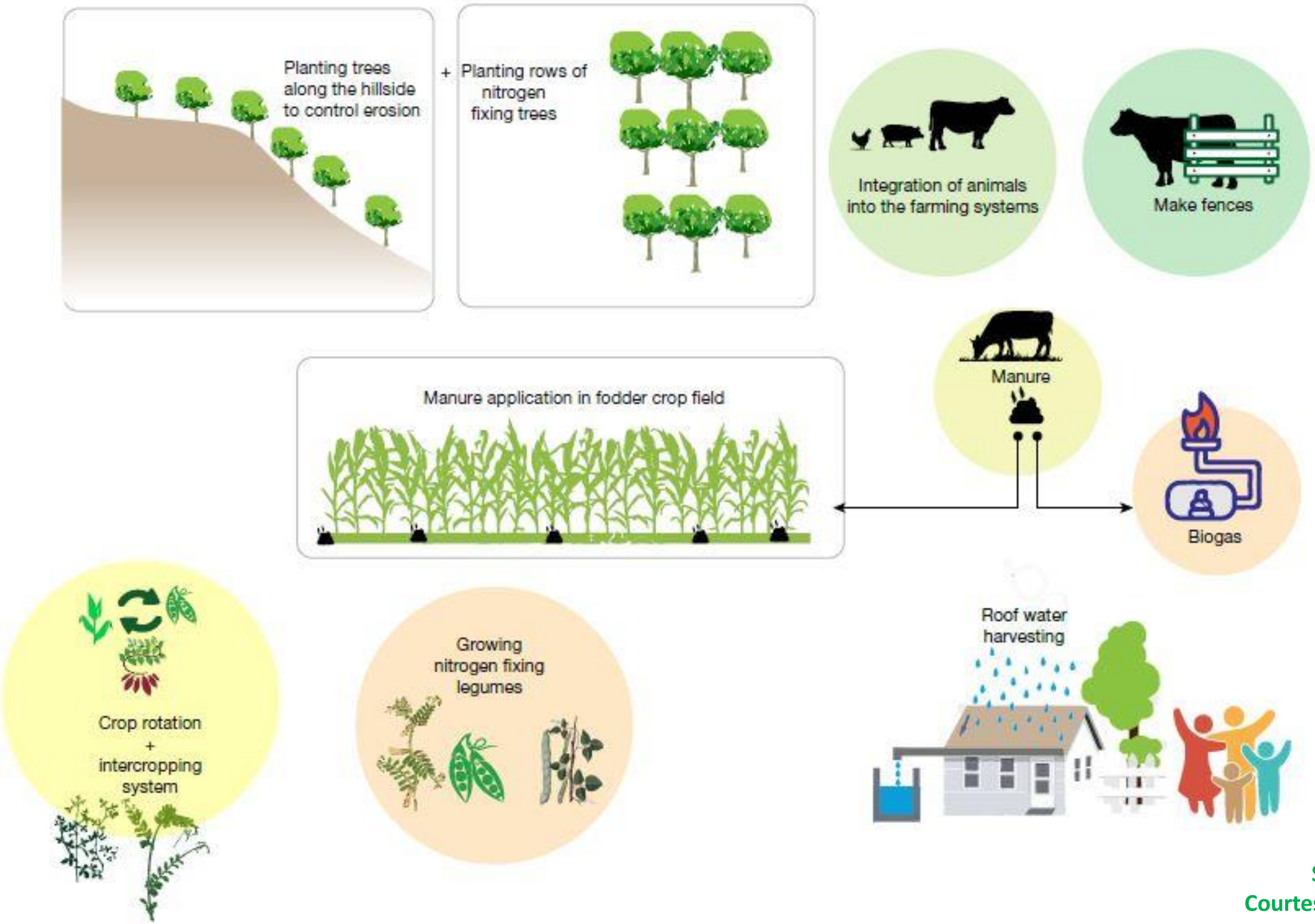


Slide Courtesy of ACT

Model demonstrated at small scale mixed farming system



Slide Courtesy of ACT

Key public-private sector players to the CA scaling out model

Court

Synergy between CA and Livestock

- **Minimum soil disturbance**
- Reduced demand for draught power
- Ability to market cattle at young age; earn more & frequent income
- **Rotation/Association**
- Opportunity to grow adequate and high nutritive value feeds without additional demands for land.
- Diversification to conserve the legume forage as hay and silage
- **Permanent soil organic cover**
- Production of more biomass, some of which can be fed to livestock
- Enables integration of leguminous cover crops, shrubs and trees for aquaculture & livestock feeds

Slide Courtesy of

The Progression from CA to CSA

As we strive to progress CA Principles broadened to accommodate Climate Change, CA becomes CSA. Under CSA we shift from focusing on the sustainability of soil provisions for Plants, Livestock and Humans to the following broad areas of concern into the near future:

1. Future Technologies:

- Applications of cellular & digital agriculture,
- Food processing and safety, gene technology,
- Intensification, replacement food and feed,
- waste reduction,
- replacement food and feed for livestock and fish: plant-based substitutes, insects, seaweed etc.
- improved climate forecasts and early warning for pests and diseases.

Technologies for food system transformation

Acosta et. al. 2019

- As food systems transform to face climate change alternative sources of Protein will be needed, away from holding huge stocks of Livestock that need a lot of land and produce Methane, a Greenhouse Gas.
- Water & Materials will be re-Circulated or re-Purposed and Waste MUST be reduced.
- Plants that are not grown on soil will become common.
- Crop and resource intensification will call for green/biologicals for safer food.
- Wider use of gadgets for Digital Agriculture will avail critical information and data.

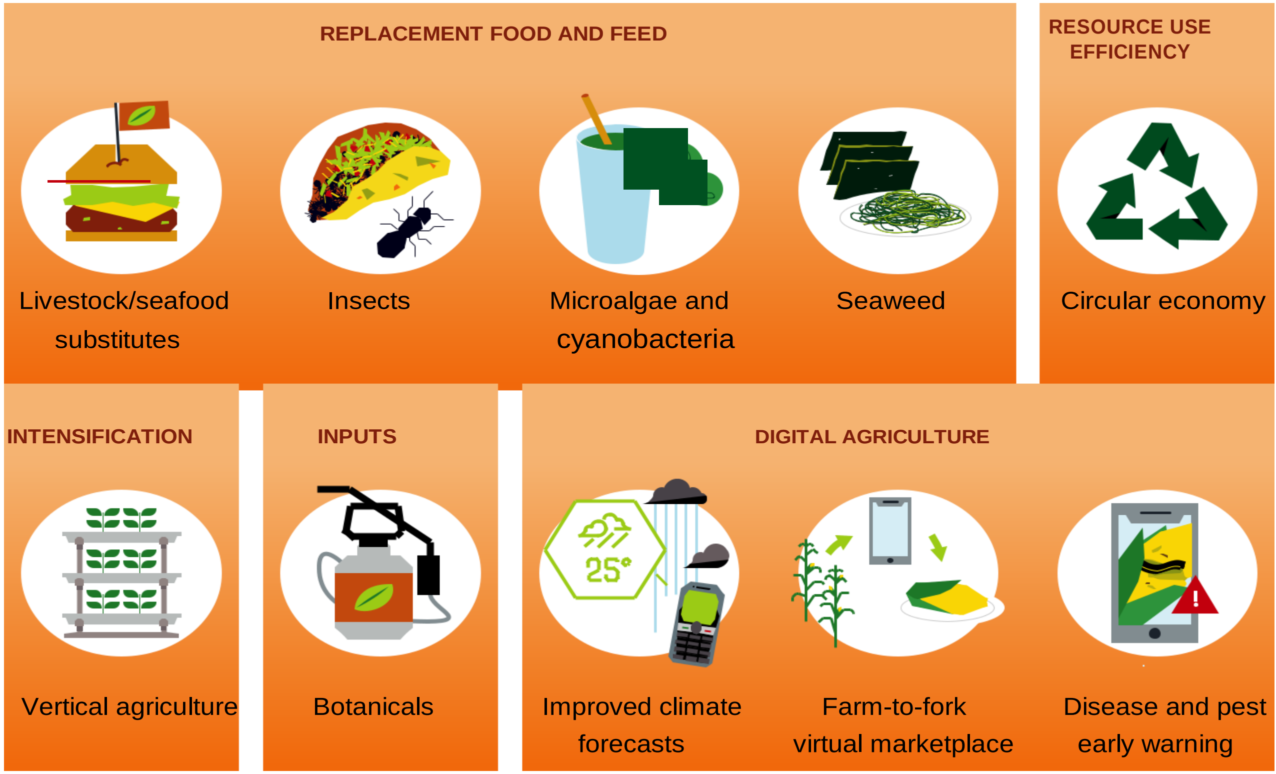


Fig 0-8

The Progression from CA to CSA: *Contd:*

2. Adaptation and development pathways for different types of farmers:

- In the coming 20 years farming will not be business as usual. Planet earth will have some 2 billion more people than it had in 2018.
- The drastic population growth, climate change, rapid urbanization, dietary changes, competing land uses and the emergence of new technologies will shape development pathways.
- Of about 570 million farms in the world, 85% are less than 2 ha and occupy only around 12% of global agricultural land (Lowder et. al. 2016). Even with best-practice farming, such small farms are financially unviable (Harris, 2019).

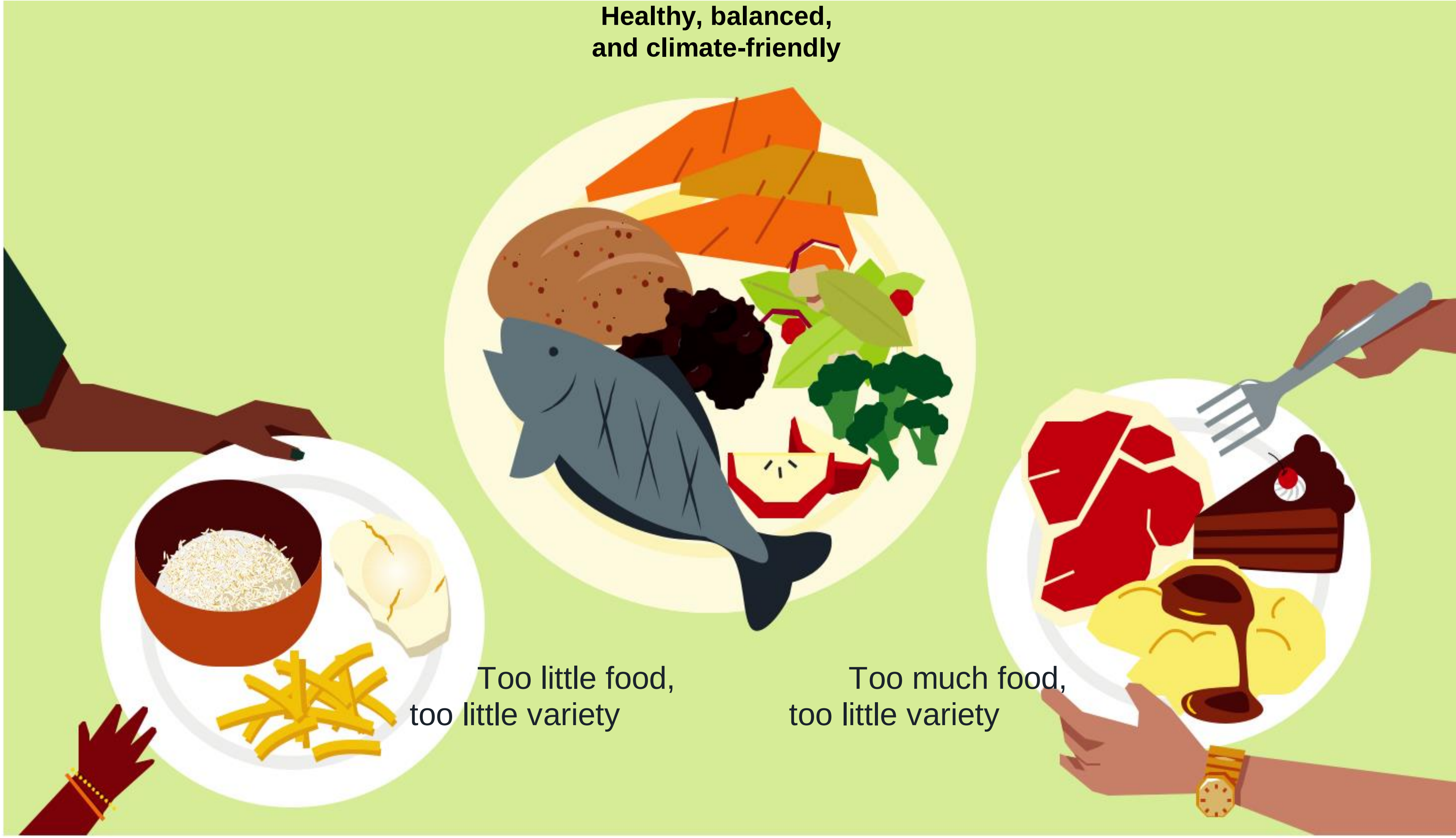
<u>The Progression from CA to CSA</u>: *Contd:*

<u>**3. On Changing diets and transforming food:**</u>

- Dietary changes are needed to tackle hunger and under-nutrition which is on the rise, as well as obesity and micro-nutrient deficiencies.
- Some food groups, such as wholegrain cereals, vegetables, fruit and nuts, should be eaten in greater quantities by almost everybody.
- Healthy and sustainable foods are more likely to be widely eaten if they are made ***more appealing*** (in terms of cost, taste, convenience and enjoyment), ***more normal*** (familiar and mainstream) and ***easier*** (prevalent and the automatic or default choice)

Shifting to Healthy Sustainable Diets

Fig 0-9



Key Factors In Consumers' Dietary Choices: Healthy and sustainable foods are more likely to be widely eaten if they are made more **appealing** (*affordable, tasty, convenient*) & normal (***familiar*** *and mainstream*) and **easier** (prevalent, and where possible the automatic or default choice) *Fig 0-10*

Appeal

Familiarity

Ease

The Progression from CA to CSA: *Contd:*

4. On Financing the transformation of food systems:

- Climate-smart investments to transform food systems, are not yet at scale. This will require *addressing core market failures* to unlocking private sector financing from food and agriculture companies, domestic and international financial institutions, and specialized investors.
- Governments will also need to create investment opportunities that are attractive to public and private investors and to build capacity to accurately assess risk and deploy appropriate risk-mitigating mechanisms.

The Progression from CA to CSA: *Contd:*

5. Local to global policy as a catalyst for change:

- Policy must remove barriers, create incentives, foster a level playing field, and ***facilitate equitable access*** to resources.
- Policy change is needed at multiple levels: Local, Regional, National and Global.
- Tackling gender inequality in food systems is a pre-requisite for transformation: ***Gender inequality runs deep in food systems, with men and women playing different roles, experiencing climate impacts differently, and articulating different priorities.***
- Policy must ***mobilize finance, incentivize and de-risk investment***, and ensure finance reaches those who need it most.

The Reconnaissance visit of PASIDP II Regions registered the following CA & CSA Status, hence Intervention Entry points:

- A highly ***vulnerable and erosion prone country*** of steep highlands and high population density especially in the plateaus.
- Mind sets that may consider ***NOT-Tilling the land as a character of LAZY farmers*** or view CA as “Herbicide Farming”, bad for the environment.
- Farmer confusion of ***too many CA and ISFM technologies***, introduced by many and different projects: No-till, Cover-crops, Mulching, Green-Manure, Vermi-compost and Hydroponics etc.
- ***CA Misconceptions*** due to Limited Training & CA practice Model Farms among Extension Agents in the regions.

The Reconnaissance visit of PASIDP II Regions registered the following CA & CSA Status, hence Intervention Entry points:

- ***Training had been mostly in Knowledge (What?)*** i.e. the theory, not in Attitude (Justification) and Practice (The How?) for self-proof and sustained advancement.
- Livestock stocking levels are high, seemingly inconsiderate of farm carrying capacity and observable overgrazing. ***High competition for crop residue*** between animal feed and soil cover. Crop-Livestock Integration learning is Critical.
- Limited access to new and CA Crop and Cover-Crop seeds and inputs, some of it due to Federal Government managed supply systems which were reported as inefficient, ***best left to private sector***.

The Reconnaissance visit of PASIDP II Regions registered the following CA & CSA Status, hence Intervention Entry points:

- Huge value-chain gaps in ***overly traditional (non-mechanized) subsistence farming practices*** poorly linked to markets and incapable of competing in a globalizing world.

- To progress faster, CA practice in Ethiopia (like elsewhere in Africa) needed ***modern mechanization to counteract the drudgerous farming operations,*** soil and environmental destructing practices etc. ***Mechanization business models*** that have worked elsewhere in the continent (and beyond), would need specialized attention and introduction.

The Reconnaissance visit of PASIDP II Regions registered the following CA & CSA Status, hence Intervention Entry points:

- There were lose links between CA and CSA, between the place for gender and youth, research interventions and private sector, job creation and employment, among other development considerations. These cross-cutting considerations would need to feature in all modules, to bring out a more holistic approach.

- ATA is doing much to propel transformative and climate-smart agribusiness support systems through projects. However ATA could do with external support to make real their ambitious plans, borrowing from Business Models that have worked elsewhere for CA and CSA advancement.

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Module 1

How to Establish a Crop the CA Way

Learning Outcomes

At the end of this Module the User will be able to:

- Understand the principles of crop establishment and why the CA approach and mechanization applications make them more attractive, achievable and adoptable by farmers.
- Consider crop establishment conditions and select the most suitable mechanization options in terms of crop-type, technology level, power needs and other application concerns.
- Understand the principles and the breadth of mechanization (application) considerations and adherence to CA principles in establishing and nurturing crops.

Knowledge

(The WHAT)

Agronomic principles of appropriate crop establishment

Good seedbed preparation, seed placement and soil nutrition will give the seed the best possible foundation, to bring about the healthiest crop.

Factors affecting good crop establishment include input and management factors such as:

- Seed size and quality
- Good seedbed preparation
- Depth of planting
- Soil and water and Soil temperature
- Soil structure
- Soil PH levels
- Soil fertilization
- Weed management
- Soil organisms
- Integrated pest management (IPM)

Conventional versus the CA Way of Crop Establishment

- Conventional crop establishment methods (left) involve **excessive soil disturbance**
- Direct planting through mulch involves **minimal soil disturbance** and facilitates good agronomy (right).

Conventional versus the CA Way of Crop Establishment

- Effects on soil health and quality
- Effects on soil moisture
- Effects on soil temperature
- Effects on soil erosion
- Effects on soil productivity
- Effects on water quality
- Effects on soil microbial activity
- Effects on soil cover and soil carbon
- Effects on cost of production and productivity

Agricultural degradation with tillage

- Loss of organic matter
- Compaction & sealing – structure & porosity
- Erosion, water & wind
- Waterlogging, flooding & avalanches
- Agrochemical pollution
- Contamination with microorganisms
- Loss of (functional) biodiversity below and above ground
- Loss of soil health
- Loss of water resources, quantity & quality
- Loss of productive capacity and functions
- Loss of ecosystem goods & services

Soil health and quality

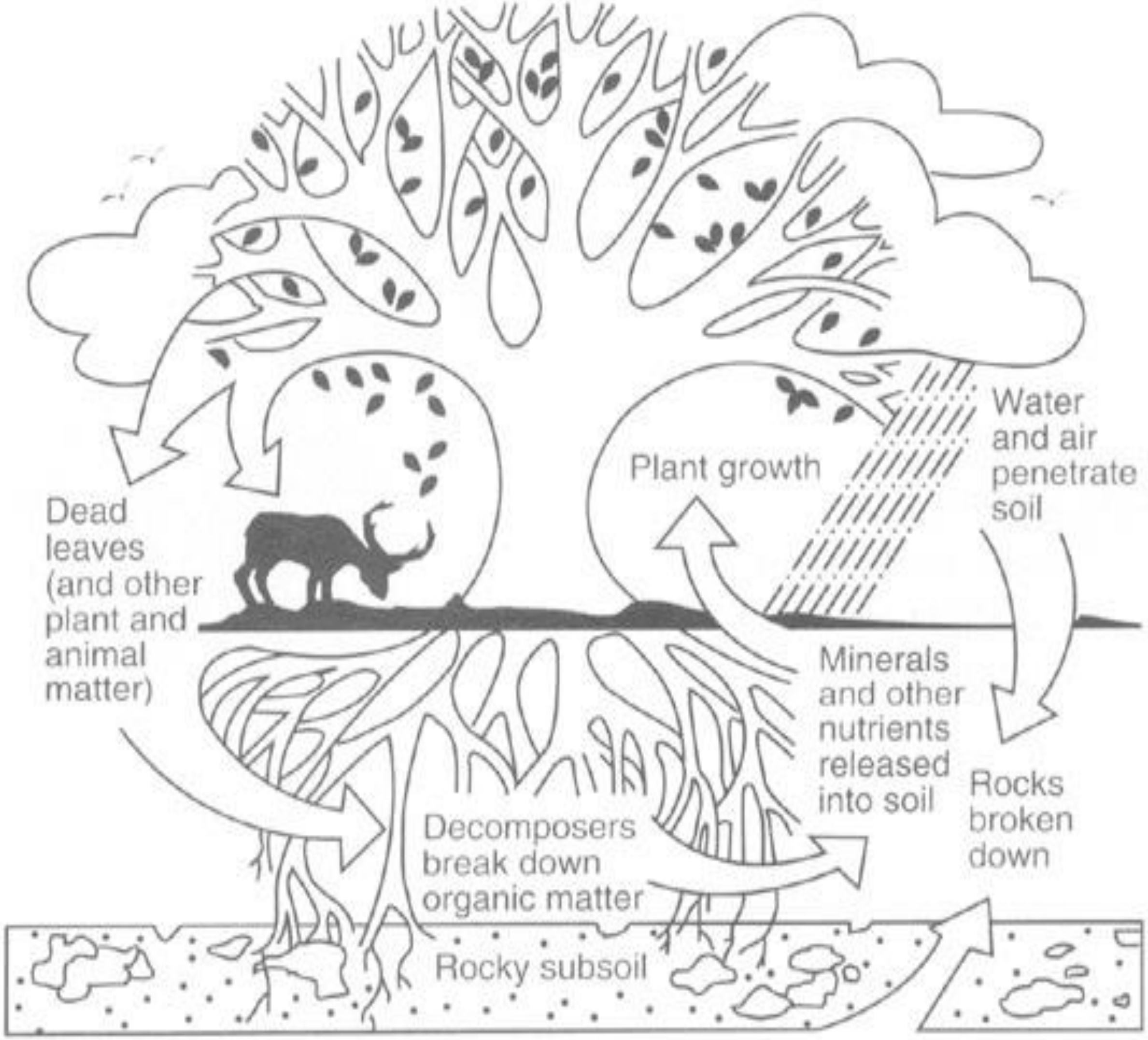
Photo credit: Steve Culman

Healthy, high-quality soil has:

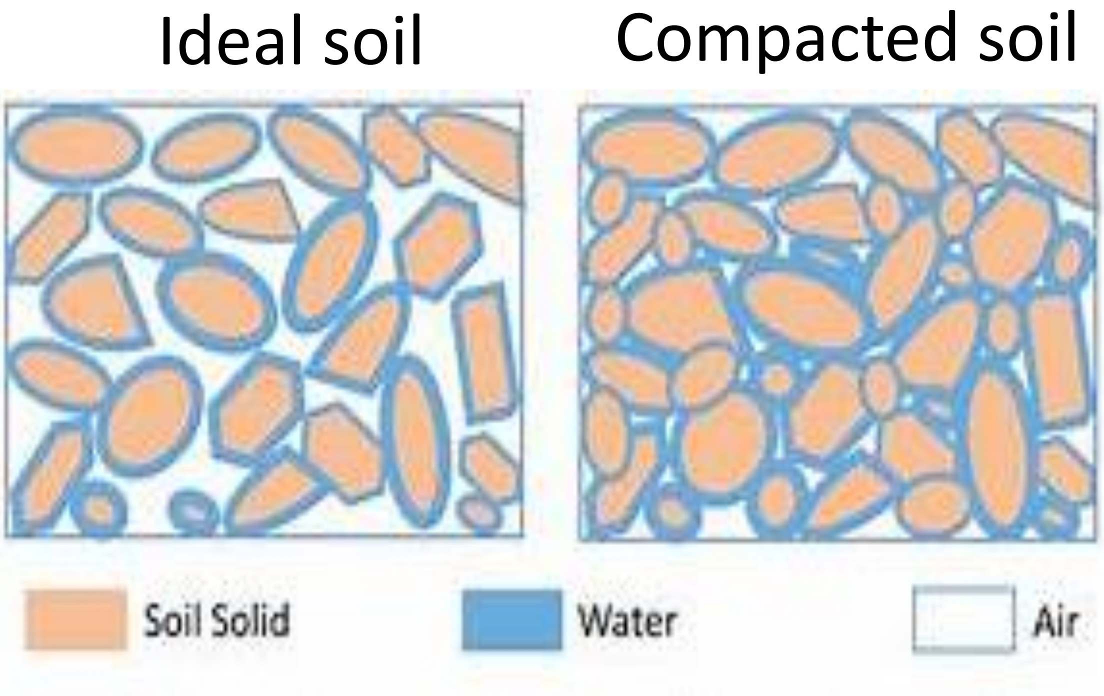
- Good soil tilth
- Sufficient depth
- Sufficient nutrient supply
- Small population of plant pathogens and insect pests
- Good soil drainage
- Large population of beneficial organisms
- Low weed pressure
- No chemicals or toxins that may harm the crop
- Resilience to degradation and unfavorable conditions

A a healthy soil functions as a vital living ecosystem that sustains plants, animals, and humans.

Nutrient cycle.



Effects of compacted soils due to excessive conventional tillage on water and air availability in soil



Ideal soil: 50% solids, 25% air, 25% water

Excessive tillage and bad agricultural practices result in high erosion rates and destruction of soil structure

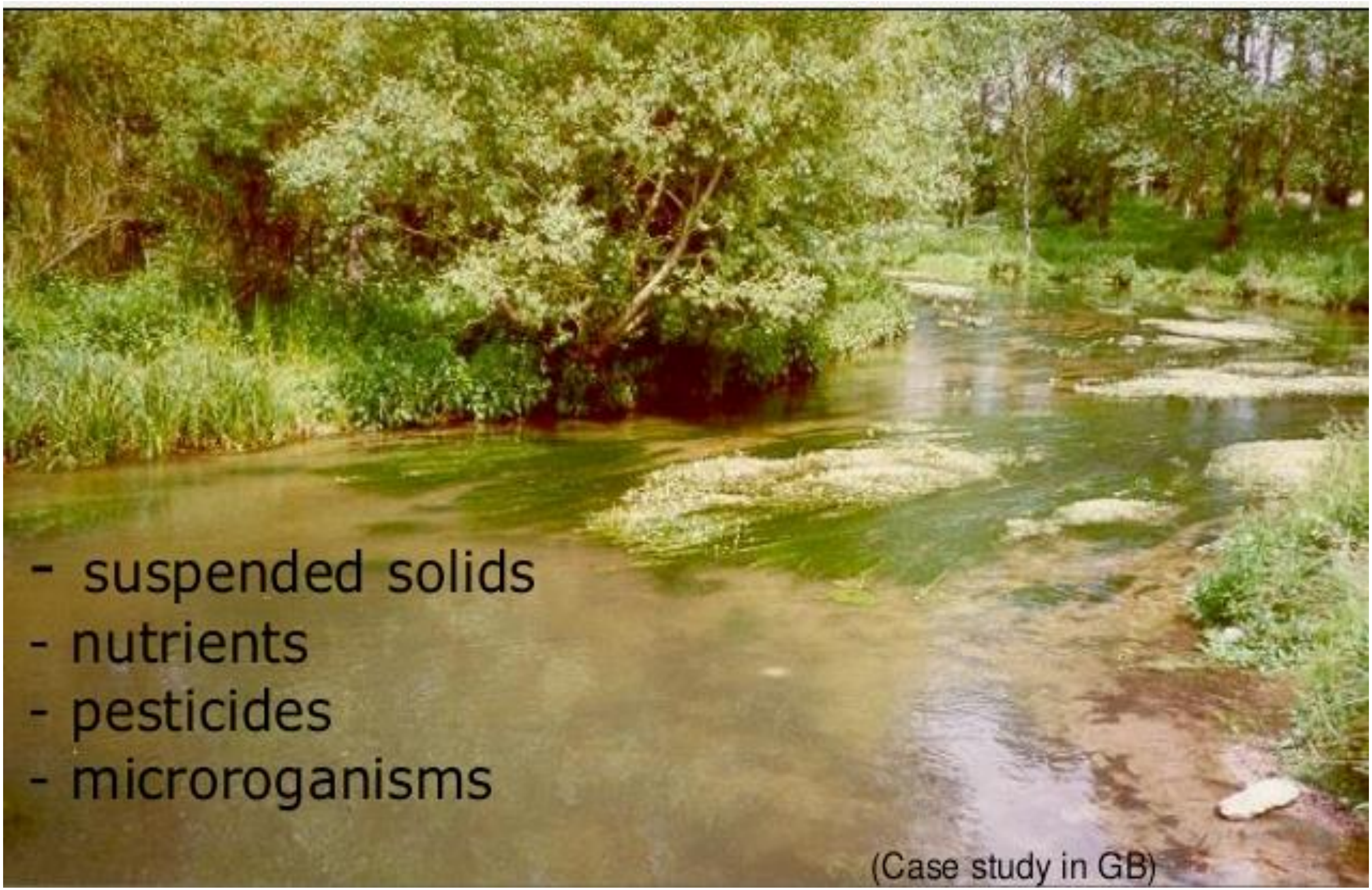
Soil erosion due to unprotected landscape

Soil capping due to excessive tillage

A well preserved landscape

Soil cover preserves moisture and minimizes soil erosion

Soil degradation and runoff can cause water pollution



Carbon sequestration

Improved management can make it easy to come with more cropping intensity and/or cover crops and result in **net carbon sequestration**

Excessive tillage accelerates residue decomposition and **loss of soil carbon** to the atmosphere

Attitude

(The WHY)

Land degradation and decreased productivity

- **Land degradation** in Africa is a major cause for decreased land productivity, Ethiopia included.
- Ethiopia permanently loses up to 200,000 ha land per annum due to soil erosion associated with tillage.

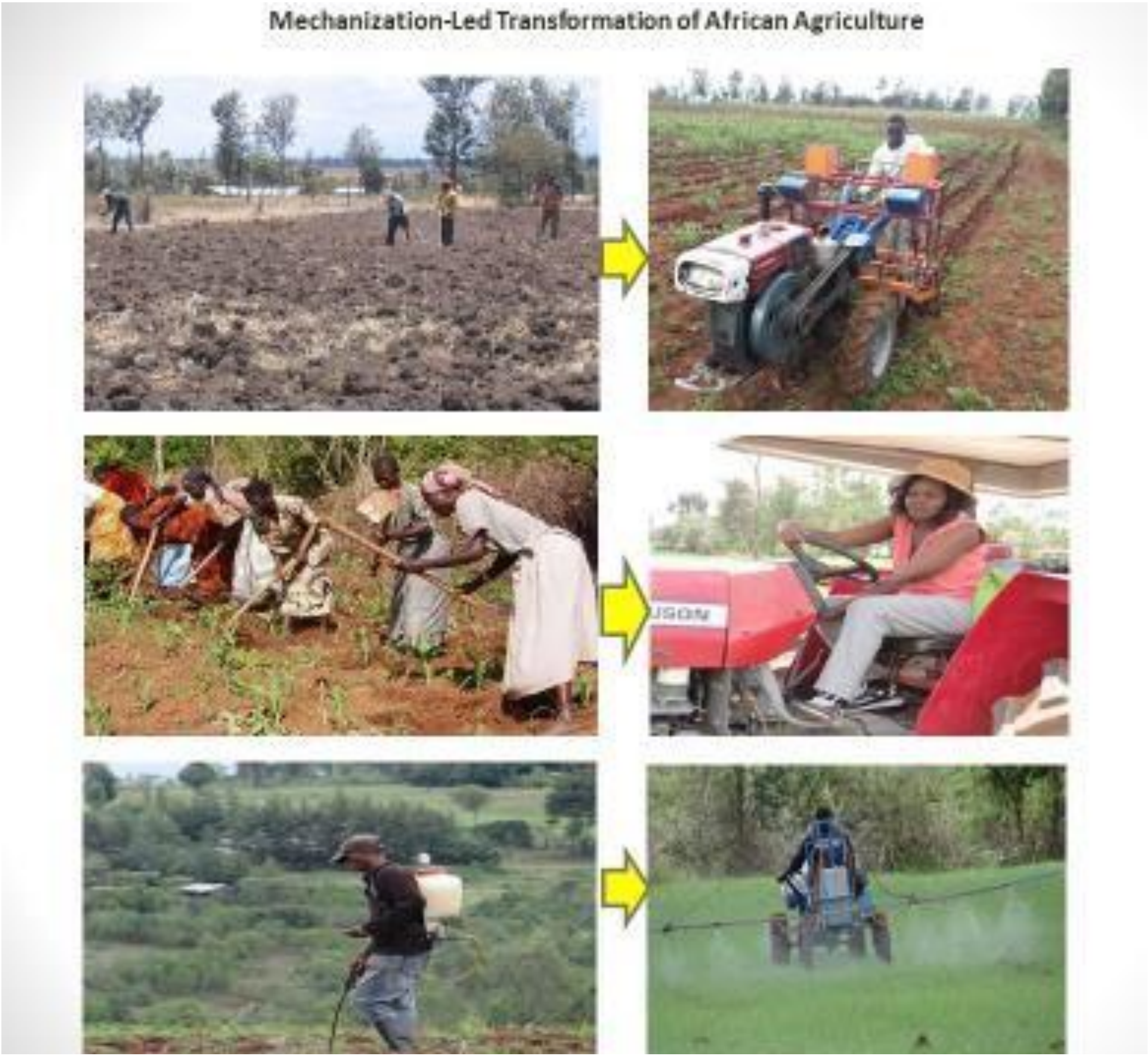
Harvest and Post-harvest losses


- In Ethiopia postharvest loss rates are reported to range from 30 to 50% depending on the crop
- Globally, food losses and postharvest waste are estimated at 30 to 40% of production.
- Any loss of produce translates to lost production resources, mainly land, water, energy and inputs. It is also lost income for the various actors in the supply chain.
- Utilizing improved postharvest practices often results in reduced food losses, improved overall quality and food safety, and higher profits for growers and marketers.

CA-based crop establishment methods are Urgent in Africa

- To **protect the environment**, increase **land use efficiency** and productivity.
- Farmers are increasingly feeling the **effects of CSA** – CA crop establishment methods can help farmers **mitigate the effects of warmer temperatures & decreased water supply.**
- To **improve use of resources and returns** to land, water, farm-power and labour.
- To create **new opportunities** for participation in agriculture by **younger populations** as value-chain gaps are closed and value-chain delivery capacities are enhanced.
- Take advantage of **renewed Continental Level Support for CA and Mechanization** Advancement

It’s time to shift from back-breaking manual methods to mechanized systems (*Left to Right*)



Introduce gender and age-sensitive mechanization types to farming……

…..They will sustainably attract youth into farming, to take the burden off women farmers.

Practice

(The HOW)

Questions a Farmer Should ask Self Before Planting a Crop:

Planning the necessary operations well in advance of the planting season will increase chances of success. Some questions to be considered in advance of the planting season are such as:

- Has the **soil** been tested?
- Is the **right seed** available (type, & quality)?
- Is the **right fertilizer or manure** available?
- What is the **best planting time** (based on rainfall, soil type & availability of inputs)?
- What is the **recommended seed rate** for the type of crop to be planted?
- What **types of weeds** are anticipated?

Questions a Farmer Should ask Self Before Planting a Crop: *(Contd)*

- What planting and **weed control technology** is available or accessible?
- If chemical weed and pest-insect control methods are to be applied, are the **right chemicals available?**
- If the farmer will be using his own **tools and equipment**, are the tools and equipment to be used in good condition to carry out the anticipated operations?
- Has the equipment been **calibrated**?
- If the farmer will be using hired services, are there qualified **service providers** in the area?
- What is the **condition of the field** to be planted?

Asking these questions and considering each one of them will help to plan a successful crop establishment season.

Apply planting method best suited to your conditions & means in line with CA principles

- Planting with human powered manual tools.
- Planting with animal-drawn equipment and single-axle tractors.
- Planting with Full-Scale No-till Seed drills and Precision planters.
- Planting Tubers, Tree-Crops and Fine Seeds like Teff the CA way.
- Transplanting.

Observe GAP

Good Agricultural Practices (GAP)

GAP

an integrated set of recommended crop, soil, water and weed management practice

Hoe Minimum Till planting

- Start by clearing weeds from the field to be planted.
- Stretch a rope and mark positions for seed-holes along the line.
- Dig planting holes (Pitting) only where the seed/fertilizer/manure will be placed.
- Place seed/fertilizer and manure at the right depth & spacing and cover manually.
- Use of premeasured guiding sticks for both inter-row and intra-row can help this process.

Planting with jab planters

- The Jab planter can be used directly on un-ploughed land.
- It can be used on pre-ripped planting rows.
- It allows the farmer to plant from a standing position and faster than with other hand tools (average 2 days per hectare).
- To work on new land, there is need to first clear the weeds with hand tools or by spraying.

Planting with animal-drawn equipment and single-axle tractors

- Animal-drawn and single-axle CA planting equipment are designed to **reduce soil tillage**. Examples are the Berken maresha, Ayber Broad Bed furrow Maker (BBM), the animal-drawn ripper and tie-ridger.
- The use of animal power or single axle small tractors enables small scale farmers to **adopt the CA Practice** without investing in high cost machinery, and using locally available livestock as animal power or buying relatively affordable equipment.
- The planters must be **calibrated** for different crops to ensure successful planting.

Two-pass strip-till planting using animal-drawn ripper

- Make **one pass to loosen soil** and open up furrow for planting and fertilizer or manure placement
- **Seeding** can follow, manually or with a suitable seeder
- Advantageous when used in problematic soils to obtain improved crop stands and yields

The Ethiopian traditional Maresha

- Planting using the Maresha involves multiples passes causing a lot of soil disturbance.
- The Maresha has undergone modifications aimed at performing planting operations that are more in tune with CA principles (Berken & BBM)

The Berken Maresha and Ayber Broad-Bed and Furrow Maker

Traditional Maresha with Metal Tip

Berken Maresha

Broad Bed and Furrow Maker (BBM)

The Berken Maresha is applied in areas where zero tillage is not practical due to several reasons (compacted soils, poor SOC, no mulching, etc). Berken Maresha can be used during transition to CA where we need to disrupt plough pans as well as to increase root growth and biomass production.

One-pass no-till planting

- Conducted directly into undisturbed, firm, residue covered soils.

- Can be used for both drilled and row crops.

- Switching to no-till reduces the amount of power needed from the power source, meaning a smaller tractor can be used.

- Results in reduced soil compaction.

Modern-day animal-drawn and single-axle planters have a coulter to cut through trash, open a slot into the ground and place seed and fertilizer, close the slot and firmly compact the slot to secure good contact between soil and seed.

Rotary strip-till planting

- Tilled strips correspond to planter rows width of the crop being planted
- Moisture is concentrated in the tilled strip
- Conserves energy and fuel because only partial tillage occurs.
- Reduces soil erosion. That's because crop residue covers most of the soil throughout the year. The residue blanket also conserves soil moisture.
- Releases less carbon into the atmosphere and maintains higher levels of soil organic matter.
- Reduces expenses by eliminating some primary and secondary tillage.

Planting with Full-Scale No-till Seed drills and Precision planters

- Suitable for large farms and are rarely applied in small scale farming due to economic considerations.
- Allows farmers to plant the seeds in well-spaced rows, at specific depths, and at a specific rate.
- Gives farmers much greater control over depth and spacing.
- It allows them the ability to cover seeds without backtracking.
- Focuses on precision in larger grain crops like corn and sunflowers.
- Allows specific row spacing, depth and also the distance between plants.

Different types of Planters

Left-Top: An Air-Seeder (of which
the tractor blows fine seed like wheat or barley and the fertilizer
into the ground with high precision); Top-Right: A manually-fed
Seedling Trans-planter; Bottom-Left: A Large- Grain Planter with
Fertilizer Hopper; Bottom-Right: A self-propelled Rice-Trans-planter.

Planting Tubers, Tree-Crops and Fine Seeds like Teff the CA way

- Cultivation of tubers calls for excessive soil disturbance
- CA in farming of tubers is possible by ensuring there are adequate channels for rainfall to go in.
- Use Chisel Plough to dig deep into the subsoil but leave the soil unturned.
- Use harrow and a ridger if necessary. Aim to reduce tillage operations
- Alternatively a Bed- Maker with a soil-beater like a rotavator can be used to ensure the fine tilth for the seed to thrive.

Potato planting equipment

Controlling weeds and pests the CA way

- Cultural agronomic methods
- Physical methods of weed control
- Weeding with animal and tractor-drawn weeders
- Chemical methods of weed and pest control
- Using drones for spraying crops

Cultural agronomic methods

- Leave soil covered with Mulch
- Use cover crops that have high organic matter and residue
- Consider row spacing and crop density
- Practice crop rotations
- Practice intercropping
- Timely weeding



Soil cover, intercropping & closely spaced plants help in controlling weeds

Physical methods of weed control

- Manual weeding by hand
- Manual Weeding by Shallow-Weeders
- Weeding with animal and tractor-drawn weeders

Hand weeding is effective, selective but slow. You will require a lot of human labour, a costly undertaking.


Appropriate animal or tractor drawn CA weeders are designed to **minimize soil disturbance**, just like the shallow weeders. They work by **cutting weeds just below the soil surface** and **leaving the biomass on top of the soil.**

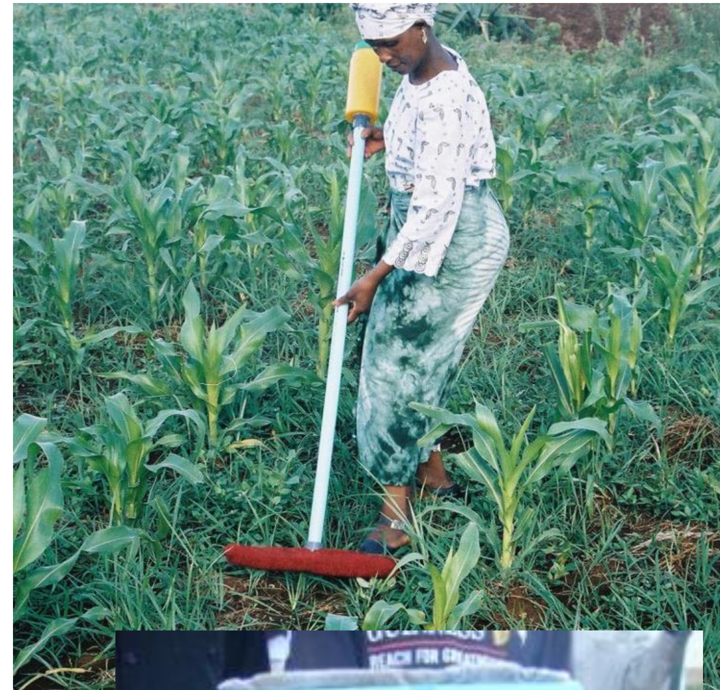
Chemical methods of weed and pest control

- Chemicals that are **harmful to humans** may also be harmful to the environment and to the animals that live in aquatic ecosystems.
- The release of some chemicals into the **environment** can accelerate climate change.
- Chemicals must therefore be used **judiciously**, preferably in combination with other control methods such as used in organic farming.
- Their use must adhere strictly to **guidelines** provided for each specific application.
- **Personal Protective Equipment** must be used at all times.

Chemical application methods in weed and pest control

- Wick application.
- Knapsack sprayers
- Hand, Animal-pulled and self-propelled sprayers
- Tractor-drawn sprayers
- Using drones for spraying crops

Wick Herbicide Applicators



- A wick applicator is used to apply highly concentrated herbicide solution by wiping it directly onto plant surfaces.
- The equipment is used between the rows of the primary crop killing the weeds and leaving them on the surface.
- Before using the applicator, remove weeds close to the crop by hand, about 10cm from crop. Wipe weeds lightly but do not allow the applicator to touch the ground.

Knapsack sprayers

- Knapsack sprayers are ideal for small-scale farmers.
- They are reliable, efficient & durable
- They are reasonably cheap and easily available.
- Can be used for a variety of applications – spraying water, insecticides, fertilizers and even paint
- Must be calibrated before use
- The sprayers may be manual or powered by battery or small petrol engines.
- Use according to instructions provided
- Handle chemicals carefully and wear PPE
- Dispose chemicals properly

Hand, Animal-pulled and self-propelled sprayers

Pedestrian sprayer

Hand-pulled motorized sprayer

Animal-drawn sprayer

These sprayers consist of tank mounted on a carriage with wheels. The wheels provide the pumping action through a connecting rod attached to the pump. At the back of the carriage is the boom with several nozzles attached to it. This means the sprayer can cover larger areas. The spray is behind the operator, thus posing much less risk of the spray chemical coming into contact with the operator.

Single-axle and 4Wheel tractor-drawn sprayers

Tractor-drawn sprayers come in different forms and sizes. Their basic components and function consist of a tank, pump, pressure control valves and nozzles. Single-axle tractor drawn sprayers are relatively inexpensive and suitable for small-scale farmers. 4W sprayers are pricey and due to their size, they are best suited to large scale farms.

- Observe proper use of chemicals and use Personal Protection Equipment (PPE)
- Calibrate the sprayer before use. Follow instructions provided for the sprayer
- Conduct regular maintenance as prescribed in the technical manual
- Wash equipment thoroughly after use
- Dispose chemicals properly

Drones

- Drones are becoming increasingly popular in agriculture.
- Drones can be used during wet season when tractors are not allowed or able to traverse the filed.
- Other modern uses for drones include irrigation, crop observation, assessment of crop health, crop planting as well as analyses of fields and soils.

Integrated Soil Fertility Management (ISFM)

- Judicious use of mineral and organic matter.
- Disease and pest resistant crop varieties.
- Good agronomic practices (GAP).
- Crop rotation cycles.
- Soil amendments (lime & phosphate rock).
- Compost and green manure.

Composting

- Controlled decomposition of a mix of *green* and *brown* organic materials.
- Green organic material includes grass clippings, food scraps, and manure, which contain large amounts of nitrogen.
- Brown organic materials includes dry leaves, wood chips, and branches, which contain large amounts of carbon but little nitrogen.
- Obtaining the right nutrient mix requires experimentation and patience.

Vermicomposting

What Can Be Composted - Vermiculture?

- Food scraps
- Paper
- Yard trimmings such as grass and plants

- Improves biological, chemical, and physical properties of the soil.
- Red worms in bins feed on food scraps, yard trimmings, and other organic matter to create compost.
- The worms break down this material into high quality compost called castings.
- One pound of mature worms (approximately 800-1,000 worms) can eat up to half a pound of organic material per day.
- It typically takes three to four months to produce usable castings.
- The castings can be used as potting soil. The other byproduct of vermicomposting known as "worm tea" is used as a high-quality liquid fertilizer for houseplants or gardens.

New ways of farming

Hydroponics

- The farming is generally carried on in enclosed areas and the irrigation and fertilizing is passed though the irrigation water.
- This method of farming is best suited to high value crops such as peppers, cucumbers, tomatoes and other vegetables.

Green houses

- A greenhouse keeps plants in isolation, away from most insects, rodents and other animals and diseases they transmit.
- Plants grown in a greenhouse are protected from weather elements such as blizzards, dust storms, and high winds or soil erosion due to torrential rain or flash floods. This gives farmers the comfort of knowing that their plants survive during periods of inclement weather.

Irrigation

- Prudent irrigation water management encourages the application of water in an amount that meets the need of the growing plant in a manner that avoids extended soil saturation and runoff.
- By increasing application precision and reducing unneeded applications, water can be conserved and energy can be saved.

Improving water use efficiency can substantially reduce annual mains electricity and diesel consumption per unit area.

Irrigated agriculture is essential in meeting food and fiber production needs of rapidly growing populations.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Module 1 (Continued)

How to Conduct Harvest and Post-Harvest Operations the CA Way

Learning Outcomes

At the end of this Module the User will be able to:

- Consider different methods used in harvesting and post-harvesting processes and technological applications, and the adherence to CA principles.

- Match harvesting and post-harvesting methods that are CA compliant, based on crop types, field conditions and available technologies.

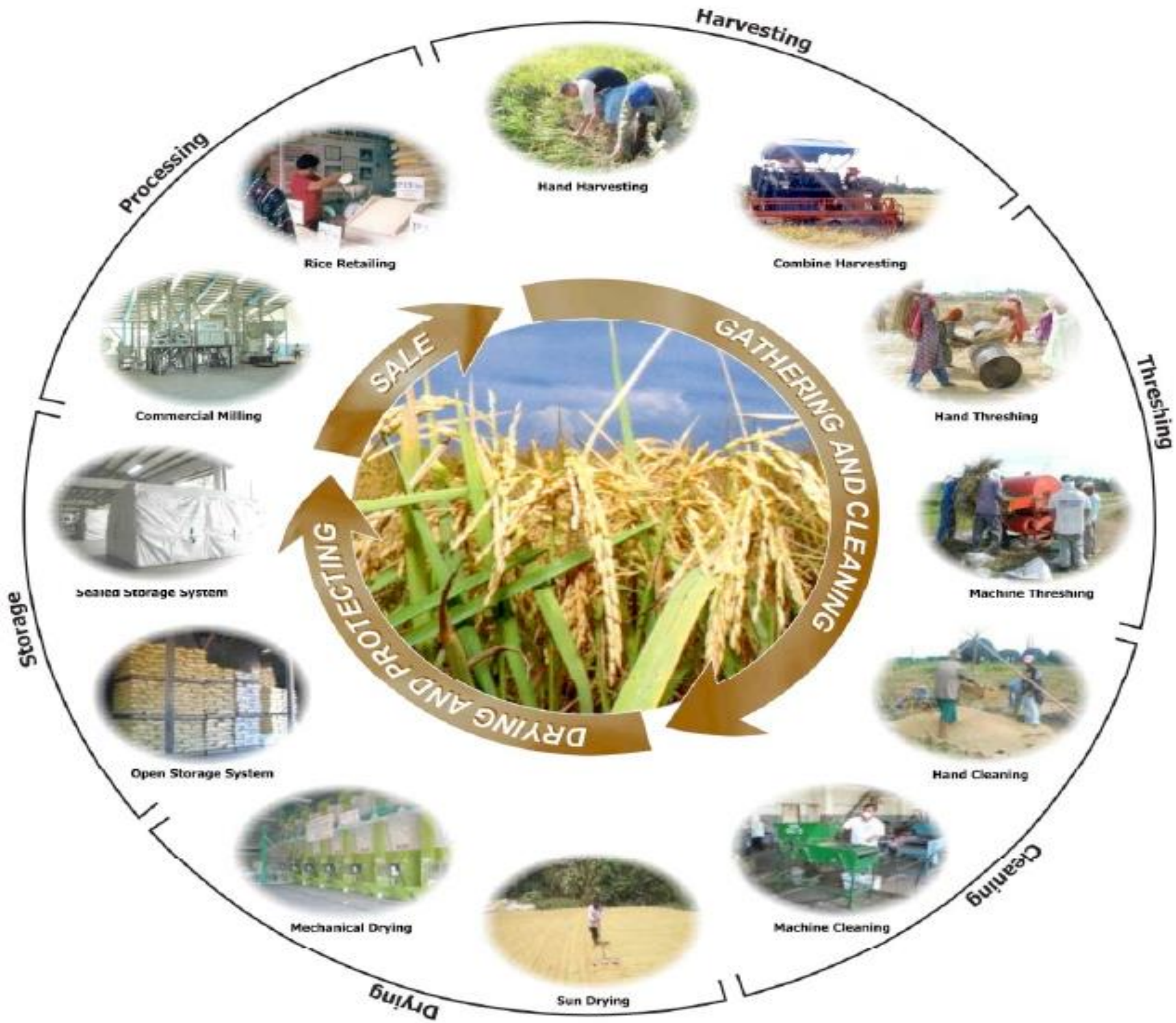
Knowledge

(The WHAT)

What are Harvest and Post-harvest Operations

- Application of inter-disciplinary science and techniques to agricultural commodities for the purpose of preservation, conservation, quality control/enhancement, processing, packaging, storage, distribution, marketing, and utilization to meet the food and nutritional requirements of consumers in relation to their needs.
- The operations start from field harvesting to the final consumer.

POST HARVEST PROCESS



Harvesting

- The **process of cutting and gathering a crop** is called harvesting.
- Harvesting is carried out when the crop has reached its **physiological maturity.**
- Harvesting can be done **manually** – using implements such as the sickle, knife, cutlass (cutting); handhoe (digging) or hands (picking/stripping).
- Modern methods involve use of **machines** to cut, dig or pick the crop.
- Some of the more advanced machines combine several processes to make harvesting more efficient. These are called **combine harvesters**.
- The type of method to apply will depend on crop type, part of the plant to be used, intended purpose, pricing and markets, farm size and conditions, labor availability as well as available technology.
- Several other operations follow after the crop has been harvested. These are referred to as **Post-harvest processes**.

Shelling, threshing and cleaning;

- **Traditional methods** – beating against hard surfaces with a flail; being trodden underfoot by humans or animals.
- **Mechanical methods** – by stationary machines or propelled machines.
- Cleaning by **winnowing** using wind to remove light elements from the grain, or by mechanical means.
- Mechanical means - fan-originated air current to remove dirt from the grain.
- **Seed cleaning** - using combination of forced air and screen graders (cereal crops).
- **Combine machines** - perform the three operations simultaneously
- Some crops are **stacked** on the plot (e.g. rice, wheat, maize etc.) for pre-drying before shelling/threshing.

Sorting and grading

- Grading of fruits and vegetables after harvesting is an essential step in post-harvest management.

- Grading involves sorting the vegetables and fruits into different grades to fetch high price in market.

- Grading of fruits and vegetables is based on physical characteristics like weight, size, colour, shape, specific gravity, and freedom from diseases depending upon agro-climatic conditions.

- The known methods of grading of fruits and vegetables are manual grading , size grading.

Storage

- Cereals and pulses can be stored much longer than fruit and vegetables

- Spoilage, depends to a great extent on the moisture content of the food to be stored.

- The way grains are stored differs from the way fruit and vegetables are stored.

Grains

- Harvested should dried before being stored to avoid growth of microorganisms.
- Usually stored in metal or earthen containers, gunny bags or grain silos.
- Fumigation may be necessary to get rid of pests.
- Fumigation is the process of using the vapours of a chemical to get rid of pests and infections. The chemical can be sprayed using hand-operated machines.
- Stored grains need regular inspection to make sure that they are free from diseases and pests.
- Allow ample space between stacks of gunny sacks to facilitate inspection and air circulations.
- Government-owned godowns provide storage alternative to those who have access to them.

Fruits & Vegetables

- Require **cold storage** (0-4°C) to discourage the growth of microorganisms and stop the enzymes present in the fruit and vegetables from spoiling them.
- Too **low temperatures** can lead to the stored vegetables being destroyed.
- **Humidity** should be kept high to avoid loss of moisture when the humidity is low.
- Fruit and vegetables to be stored should absolutely clean and not damaged in any way.
- Store fruits & vegetables in crates, racks or trays, stacked one on top of the other with plenty of space for the circulation of air.
- Keep the cold store as clean as possible and avoid opening the doors too often.

Attitude

(The WHY)

Harvest and Post-harvest losses

- Food losses occur in the field, during harvesting, processing and in storage.
- Farmers lack access to modern methods for harvesting, processing and storage.
- Post-harvest food loss is one of the largest contributing factors to food insecurity and under-nutrition.
- In Africa, field studies have shown that 40 to 50% of the perishable horticultural crops are lost before they can be consumed, (25 to 30%), for grains and root crops mainly due to high rates of bruising, water loss and subsequent decay.
- Factors for food loss are constraints in harvesting methods, storage, transport, process, cold chain, road infrastructures, package and market Integration system.
- The process of removing crop (harvesting) from the field also reomoves significant levels of nutrients from the field, especially in crops in which harvested protion represent a large fraction of the total plant biomass.
- Removal of biomass from the field leads to reduction in soil organic matter in addition to leaving the soil bare and exposed to weather elements. This leads to decrease in productivity.

Harvest and post-harvest losses can result in significant losses (as high as 60%). Any loss of produce translates to lost production resources, mainly land, water, energy and inputs. It is also lost income for the various actors in the supply chain.

In Ethiopia

- In Ethiopia postharvest loss rates are reported to range from 30 to 50% depending on the crop (WFP, 2014)
- According to USAID, 2016 the post harvest losses for fresh produce are 40-50 %, for cereals 30 % and for oilseed 20%
- Ministry of Ag also reported in 2015 that post harvest loess account 20 – 30 % in all agricultural items
- Over 8 million people have no sufficient food (FAO, 2015)

Globally

- Globally, food losses and postharvest waste are estimated at 30 to 40% of production. Losses of perishable foods such as fruits and vegetables can be even higher during the postharvest period, depending upon the weather, access to storage or distance from markets.

- Utilizing improved postharvest practices often results in reduced food losses, improved overall quality and food safety, and higher profits for growers and marketers.

Practice

(The HOW)

Harvesting methods

- Harvesting involves detaching the plant part of interest from the rest of the plant,
- Gathering it for transport from the field for drying/processing and Storage or for sale.
- The process can be done manually or by using machines (mechanical means)

Harvesting and managing harvests the CA way

Considerations:

- Preservation of **biomass** and soil cover during harvesting.
- Harvesting crops at the **right moisture content** to reduce drying periods.
- **Judicious use of chemicals** in combination with organic methods in stored pest and disease management to reduce impact on environment.
- Preference for applications that **reduce CO2 emissions** – e.g. fuel efficient dryers/engines
- Application of **green energy** (clean power) sources for post-harvest operations – e.g. biofuels, solar power, wind power, hydroelectricity etc.

Manual harvesting

- Slow and laborious
- High labor cost
- Less damage to crops
- Accurate maturity and grade selection
- Allows multiple harvests
- Less weather dependent
- Most effective in lodged crops
- Winnowing/cleaning necessary
- Zero CO2 emissions

Manual harvesting

When harvesting manually, cut crop at least 20cm above ground…

Hand picking of fruits and digging of tubers –Slow, labourious but results in better quality of harvested crop

Mechanical harvesting

- High capacity than manual
- Lower labor requirement
- Less dependent on field size
- Multi-crop ability
- Clean grain (e.g. combine harvesting)
- Less power required for subsequent threshing & cleaning operations
- High capital cost
- Dependency on availability of service providers
- Less effective in lodged crops
- Not suitable for small sized fields

Mechanical harvesting

Combines various actions of harvesting & processing crops- Faster, efficient and cost effective

Leave adequate biomass on the ground

Cutting the crop above the ground is a good practice to help build soil organic matter. The stems eventually fall and rot on the surface of the field providing cover and soil organic matter.

Comparison of harvesting methods

Method	Description	Advantages	Disadvantages	CA/CSA considerations
Manual: Reaping/shelling /threshing	Cutting, stacking, bundling, handling and piling by hand Threshing by beating Cleaning by winnowing	Most effective in lodged crop Less weather dependent	High labor cost· Skill dependent Susceptible to grain damage	Harvest at the right moisture content Cutting should be made at 20cm above ground Retain most of the residue in the field Zero CO_2 emissions
Manual reaping and threshing/shelling by machine	Cutting and stacking by hand Threshing by machine Cleaning by machine or by hand	More effective in wet season conditions Higher capacity than manual Lower labor requirements Less dependent on field size	Higher capital cost Dependency on the availability of contractor	Cutting should be made at 20cm above ground Retain/return residue in the field Use fuel efficient machines Zero CO_2 emissions
Reaping and threshing/shelling by machine	Reaping by machine Threshing by machine Cleaning by machine	Higher capacity than manual Lower labor requirements Less dependent on field size	Higher capital cost Dependency on the availability of contractor	Use fuel efficient machines
Combine harvesting	Harvesting, threshing, and crop cleaning are done mechanically	High throughput Timeliness Produces Clean grain Spreads straw back in the field Multi-crop ability (often used for wheat)	Higher Cost More straw left behind in the field Less effective in partially lodged crop Not suitable for small sized fields	

Post-Harvest Management

Goals:

- Minimize losses:
  - From stage of harvesting to the stage of consumption.
    - ***Qualitative losses*** *(nutrient loss, change in texture & taste, presence of excreta of birds, rodents and contamination by mycotoxins)*
    - ***Quantitative losses*** *(weight loss, spillage, attack by moulds and pests)*

Post-harvest processes

- Threshing or shelling
- Drying the produce to the right moisture level,
- Further treatment of the produce such as cleaning, sorting and grading.
- Other value-addition processes such as milling, which may happen before or after storage.

Shelling

Threshing

Drying

Storage

Drying

- Traditional methods such as sun-drying

- Artificial or forced-air drying
  - Electricity, fossil fuel based dryers
  - Biomass based (wood or crop waste like rice straw, rice husks, maize cobs)

- Solar drying

Sun-drying

Crops have traditionally been sun-dried for many years.
As climate-change kicks in and dry- days become increasingly unpredictable, drying with artificial heat is becoming important

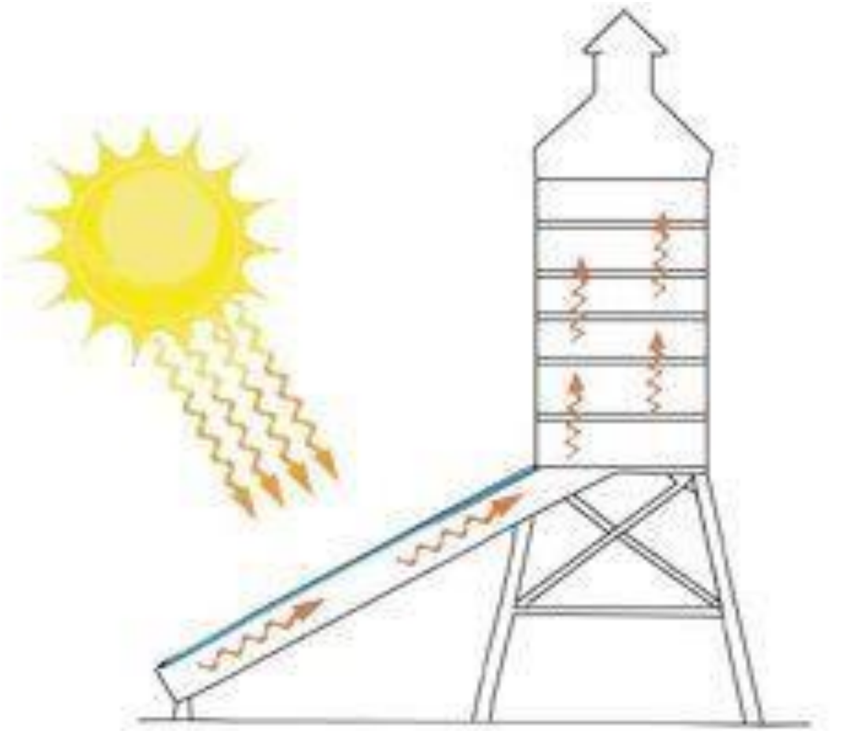
Mobile Artificial drying

Artificial drying methods require electricity, oil or other means of producing hot-air for the drying. These are capital investment methods and out of reach for small-scale farmers. Use of fossil based fuel adds to the emission of carbon to the atmosphere adding to climate change.

Biomass aided drying

Artificial dryers that depend on crop or wood biomass add utility to these by-products, reduces costs and helps mitigate climate change. Here, a small petrol engine is used to blow hot air from burning crop-waste and pass it through the grain crop in a tray. That way the hot-air carries away the moisture. Drying capacity ranges from 1 to 5 tonnes per hour depending on tray size.

Solar drying



Solar agricultural dryers are great alternatives to use of fossil fuel in artificial dryers. Using solar drying methods helps reduce high costs associated with use of fossil fuels, avoids emissions of gases, thereby militating against climate change.

Comparison of drying methods

Method	Description	Advantages	Disadvantages	CA/CSA considerations
Traditional methods: Field drying and stacking	A method for pre-drying hand-harvested crops before threshing Crop is stacked in small piles	Low cost Labor intensive	Can lead to high losses when grains become overdried and shattered. Weather dependent	Does not rely on fossil fuel
Traditional method: Sun drying	Spreading grains under the sun, on mats and pavements		Potential contamination of produce Variability in drying time Rain damage	Does not rely on fossil fuel
Solar drying	Indirect type with collector box and drying chamber	Faster drying rates. Enclosed chamber keeps away contaminants Higher rate also gives a higher throughput of food and hence a smaller drying area (roughly 1/3). Dryers can be constructed from locally available materials and are relatively low cost. More complete drying allows longer storage	Low capacity Complex to construct compared to direct solar dryers	Great alternative to use of fossil fuel thus helps reduce carbon footprint

Comparison of drying methods cont…

Method	Description	Advantages	Disadvantages	CA/CSA considerations
Drying with small biomass powered dryers	Air heated using biomass Small gasoline engine used to blow hot air through crop	Farmers can use residue & waste from their crop Faster drying rate	Use of gasoline fuel can deter adoption due to the costs involved	Artificial dryers that depend on crop or wood biomass add utility to these by-products, reduces costs and helps mitigate climate change.
Artificial drying methods that require electricity, oil or other means of producing hot-air for the drying.	Static type: Current of hot air is blown from bottom to top through a thick layer of grain	Less complex compared to continuous type dryers.	Drying does not take place uniformly. Grain may require ventilation at ambient temperature after hot air drying to obtain more homogeneous moisture content.	Reliance on fossil fuel contributes to CO2 emissions
	Continuous type: Continuous flow of grain is passed in a thin layer through a shaft traversed by a current of very hot air	Grain is constantly stirred and drying is fairly uniform. High flow dryers – thus suitable for big centers, silos or warehouses where large quantities of produce are treated	Relies on electricity which is unavailable or unreliable in rural areas or fossil fuel which is costly. Requires complex infrastructure & complimentary equipment	Reliance on fossil fuel contributes to CO2 emissions

Storage of grains:

Main objectives of storage:

- At the food level, to permit deferred use (on an annual and multi-annual basis) of the agricultural products harvested;
- At the agricultural level, to ensure availability of seeds for the crop cycles to come;
- At the agro-industrial level, to guarantee regular and continuous supplies of raw materials for processing industries;
- At the marketing level, to balance the supply and demand of agricultural products, thereby stabilizing market prices.

Storage cont…

- Grain must be kept dry during storage
- Grain should kept at uniform temperature
- Grain must be protected from insect attack, rodents and birds

The size and type of storage facilities is likely to be dictated by:

- Total volume of crop to be stored.
- The storage requirements for the crop to be stored.
- The unit cost of various types of storage.
- The form in which the crop is stored, i.e. cob maize vs shelled maize or bagged wheat vs bulk wheat.

Types of storage

Two methods of grain storage:

- Bag storage
- Loose in bulk storage

The choice based on the local factors:

- Type of grain
- Duration of storage
- Value of grain
- Climate
- Transport system
- Cost labor availability
- Cost and availability of bags
- Incidents of rodents and certain types of insects

Advantages and disadvantages of bag and bulk storage:

Bags	Bulk
Flexibility of storage	Inflexible storage
Partly mechanizable	Mechanizable
Slow handling	Rapid handling
Considerable spillage	Little spillage
Low capital costs	High capital costs
High operating costs	Low operating costs
Easy inspection	Inspection more difficult

Moisture Content is critical factor in crop storage

Moisture content:

- Timing the harvest and properly preparing it for storage is critical for maximizing both crop yield and quality
- Moisture content (%MC) is a critical factor in ensuring crop quality and yields at the time of harvesting and in storage.
- Harvest crops at the recommended moisture content for the specific crop.

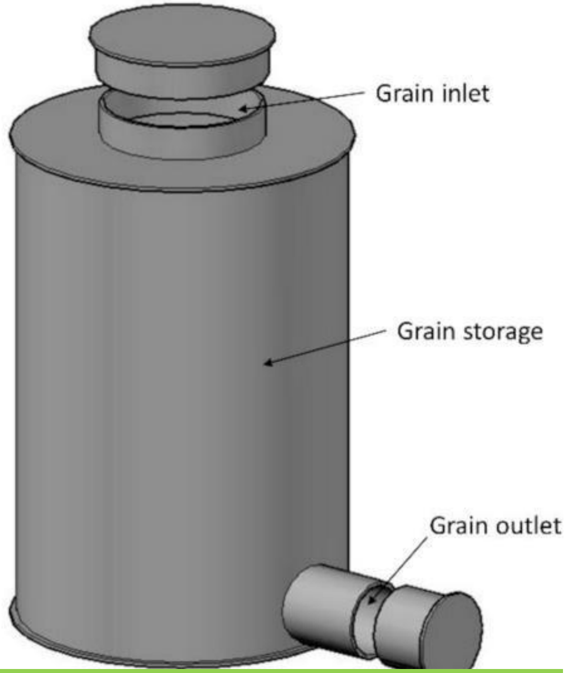
Measuring moisture content:

- Weight-based "oven" test.
  - Very slow and not suited for checking moisture in-field
- Grain moisture meters
  - Provide instant measurement
  - Portable and suitable for in-field moisture measurement
- Salt and bottle methods
  - Uses locally available material and can be used in-field

Maximum moisture contents for safe grain storage

GRAIN	MOISTURE	GRAIN	MOISTURE
Paddy	14.0%	Sunflower	9.0%
Rice	13.0%	Wheat	13.0%
Maize	13.0%	Millet	16.0%
Sorghum	12.5 %	Coffee	13.0%
Beans	15.0%	Cocoa	7.0%
Groundnut	7.0 %	Copra	7.0 %

Hermetic storage



Hermetic storage bags (left) are perfect fit for climate-smart agriculture as a cost- efficient alternative to more conventional options such as cold storage or the use of silos.

Airtight small metal silos (right) preserve grain quality by ensuring grain is kept fresh for an extended period of time.

Crop Harvesting and Post-Harvest considerations

- Type of crop
- Maturity of the crop
- Weather,
- Availability of harvest equipment
- Storage facilities,
- Transport.
- Economic and marketing

Considerations for choice of harvesting method

- Grains of cereals and legumes (example, corn, rice, wheat, and soybeans) are easily harvested by mechanical methods.

- Most horticultural crops (fleshy fruits such as apples and tomatoes, ornamentals, and vegetables) are hand harvested for the fresh market. Mechanical harvesting is done, but the damage incurred is usually so severe that the fruits and vegetables are only fit for processing

Livestock Feed Management

- CA practice recognizes the importance of farming in systems that integrate crop, agroforestry and livestock.
- Finding enough livestock feed, especially during dry periods is always a challenge. At these times farmers are forced to allow their livestock to roam and graze on crop residue left in the fields.
- This makes it hard to maintain soil cover as required under CA practice.
- It is therefore imperative that farmers learn to preserve feed, which is in plenty during the rainy season and scarce during the dry periods.
- If they can preserve enough, then animals will not need to trample on the land and compact it during the dry season.
- Animal feed is normally preserved in two forms: as silage, or as hay.

Making silage

- Locate a suitable ground and dig an open pit in advance of silage making. The pit is lined with 0.6 to 2 mm think plastic which will help keep oxygen and moisture out of the pile.
- Cut the crop at milking stage and pack it in the pit, compacting it (to remove all pockets of air) and adding molasses. Cover the pit as soon as possible to avoid losses with spoilage. Cover all sides and all parts of the pile and ensure the plastic cover is held down well so as to ensure the pile properly ensiles and spoilage is minimized.
- The safely stored and dry feed can be fed to the animals after about 2 weeks of curing. It is not unusual to see large-scale farmers storing well ensilaged feed for 20 or 30 years.

Making hay

- Hay is made by a multiple step process: cutting, drying or "curing", raking and baling. The leaf and seed material in the hay determines its quality, because they contain more of the nutrition value for the animal than the stems do.
- Harvest hay at the point when the seed heads are not quite ripe and the leaf is at its maximum when the grass is mowed in the field.
- Allow cut material to dry so that the bulk of the moisture is removed but the leafy material is still robust enough to be picked up from the ground by machinery and processed into storage in bales, stacks or pits.
- Methods of haymaking thus aim to minimize the shattering and falling away of the leaves during handling.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Module 2

How to Maintain Soil Cover on Farms

Learning Outcomes

By the end of this Module the User will be able to:

- Utilize yet another Good Agricultural Practice in line with conservation agriculture; the basic importance of soil-cover in sustainable crop productivity.

- Identify the problems and solutions regarding the vulnerable bare farms experienced in conventional farming and agriculture.

- Understand and be able to demonstrate soil covering techniques available in CA way of farming.

Knowledge

The What ?

Conservation Agriculture

Conservation Agriculture (CA) is an approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment.

CA is characterized by three linked principles:

1. Continuous minimum mechanical soil disturbance.

2. Permanent organic soil cover.

3. Diversification of crop species grown in sequences and/or associations

Definition

- Crop residues: Any biomass left in the field after the crop have been harvested.

- Intercropping : Growing two or more crops simultaneously on the same piece of land (field

- Mixed Intercropping: Growing two or more crops simultaneously with no district row arrangement.

- Relay Intercropping: Seeding two or more succeeding crops after flowering and before the harvest of the standing crop.

Soil covering

Two primary ways of keeping soil covered in CA Practice.

1. With crop residues, meaning, any biomass left in the field after the crop have been harvested.
2. With cover crops, where leguminous crops are preferred so that they can, not only spread fast and cover the soil, but also fix nitrogen from the atmosphere.
   - cover soil as well as enhance, rather than compete with the primary crop for nutrients.
   - Good crop rotations and associations will help the primary crop or both primary and secondary crops develop well and thrive, one complementing the other .

Cover crops

Cover crops are plants grown to improve soil fertility and/or control weeds/pests:

- Should not compete (for nutrients, space and time) with the main crops.
- Involve minimal or no cash costs (produce their own seed material for their future use).
- When intercropped, cover crops should be able to shade out weeds, control pests.
- Provide physical soil protection (prevent/minimize soil erosion, water evaporation and high soil temperature) and good pest control.
- Produce a positive residual fertilizer effect on following market crops. The production of above- and below-ground biomass in situ recycles nutrients, feeds soil life, improves soil structure and, over time, accumulates soil organic matter.

Annual Cover Crops

Examples of common cover-crops

Common Bean, Cowpea (Vigna unguiculata), Dolicos Lablab, Desmodium etc.

Cow pea

- drought tolerant
- It is deep-rooted
- fix nitrogen
- grows even in very poor soils.
- Can be used as food and feed

Bean - Maize sequence

- In a velvet bean–corn sequence, the cover crop provides a thick mulch layer and reseeds itself after the corn crop.
- Sweet clover requires a soil pH near neutrality and a high calcium level;
- it does poorly in wet, clayey soils.
- White clover does not grow very tall and is able to tolerate shading
- it is useful in orchard-floor covers or as a living mulch. It is also a common component of intensively managed pastures.

Grass cover crops

- Includes the annual cereals (rye, wheat, barley, oats),
- Annual or perennial forage grasses such as ryegrass
- Warm-season grasses such as sorghum-sudan grass.
- Grasses tend to have extensive root systems, reduce erosion
- Can produce large amounts of residue and, therefore, can help add organic matter to the soil.
- They also can help suppress weed germination and growth

Plant certain types of cover crops based on your goals

Grasses

Annual ryegrass: nitrogen scavenger, erosion prevention, weed suppression

Legumes

Crimson clover: nitrogen source, erosion prevention

Brassicas

Forage radish: erosion prevention, weed suppression, soil compaction reduction

Attitude

Why?

Soil Cover

- Protects the soil from wind and water erosion
- Improves the infiltration of rain and irrigation water by maintaining a good soil structure: no crust is formed
- Keeping the soil moist by reducing evaporation:
- Feeds and protects soil organisms: organic mulch material is an excellent food for soil organisms , provides nutrient while decomposing part of the mulch material transforms into humus.
- Suppresses weed growth: with a sufficient mulch layer, weeds will find it difficult to grow through it.
   Increasing the content of soil organic matter:

Design the covering

- Cropping systems should be designed in such a way that the soil is almost permanently covered with plant canopy. In arable crops, careful timing of sowing and planting can help to avoid uncovered soil being washed away during the rainy season. After the main crop is harvested, a green manure crop may be sown utilizing residual moisture.

Soil stabilization, increases in rooting depth

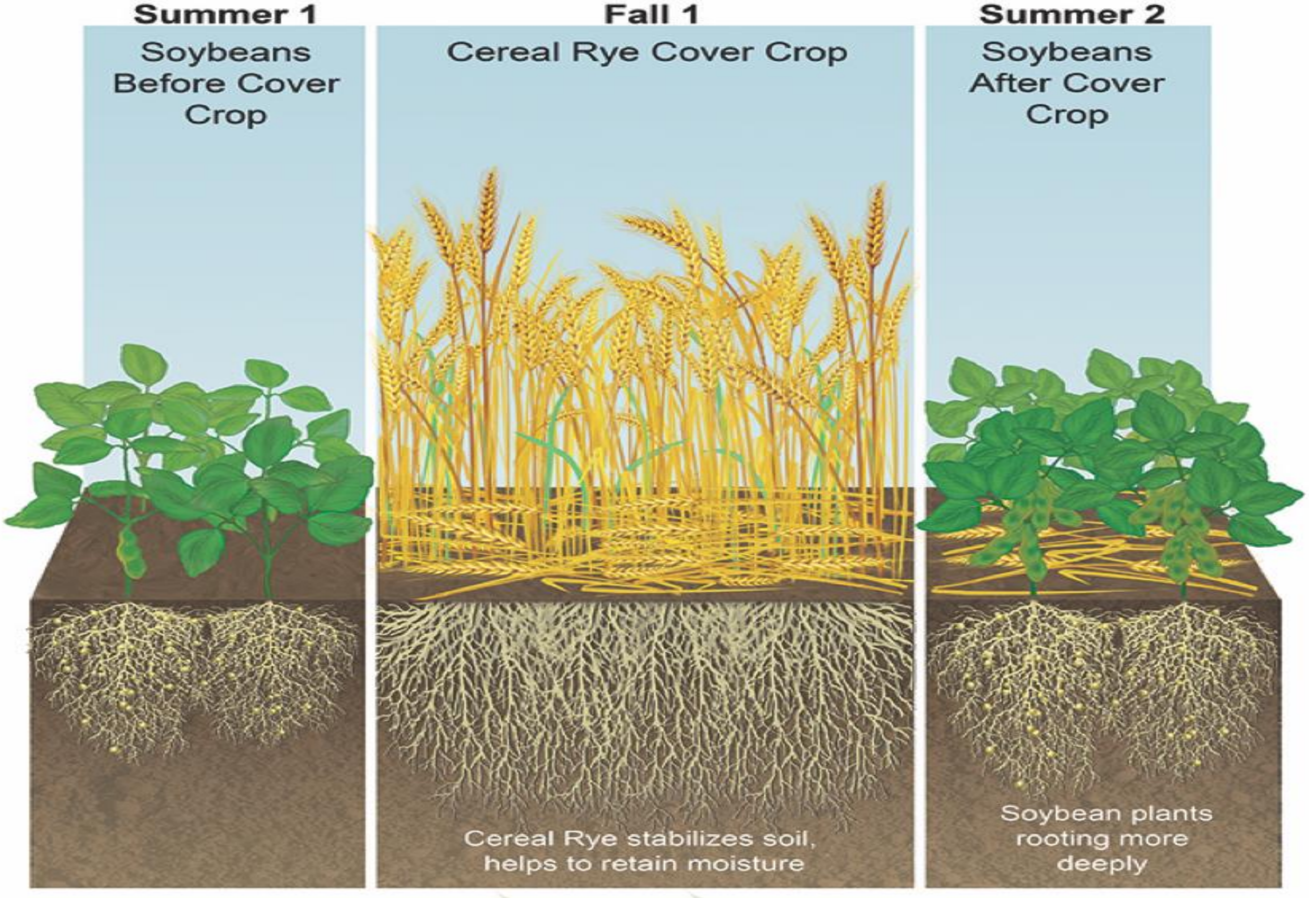
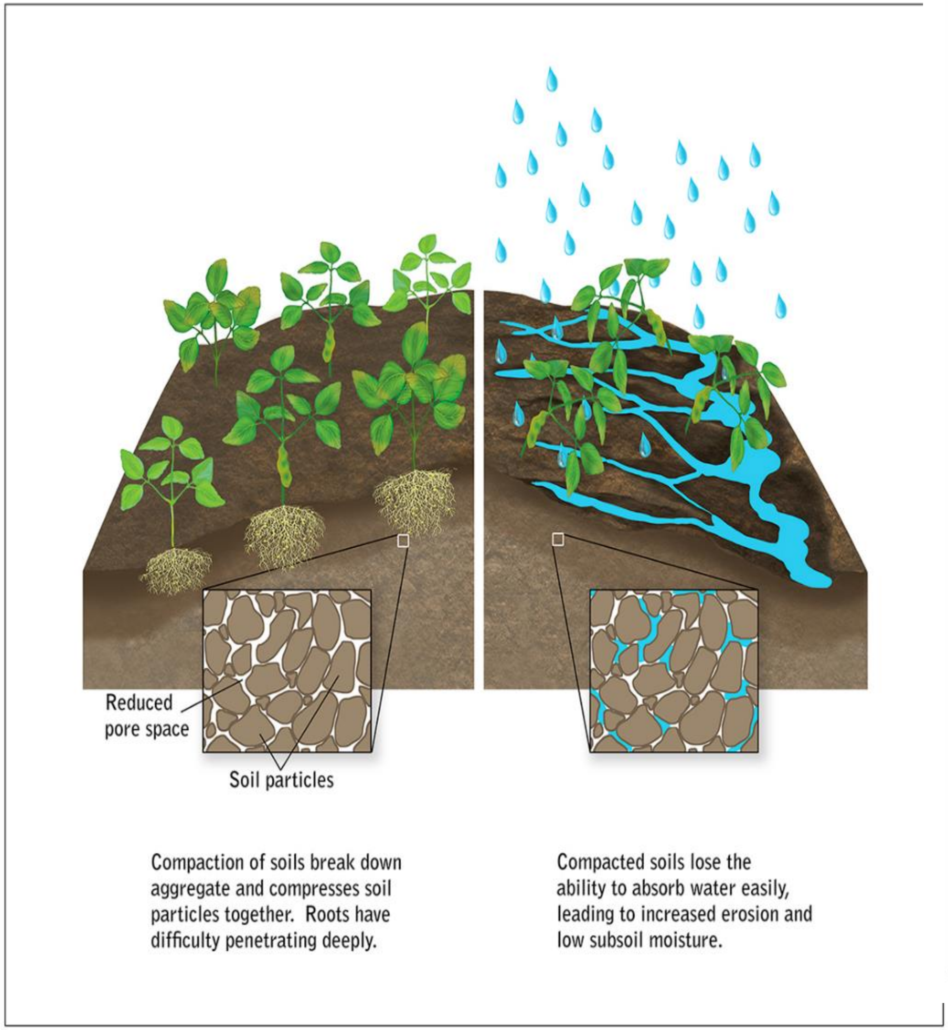


Illustration by Carlyn Iverson

Cover crops reduce soil compaction



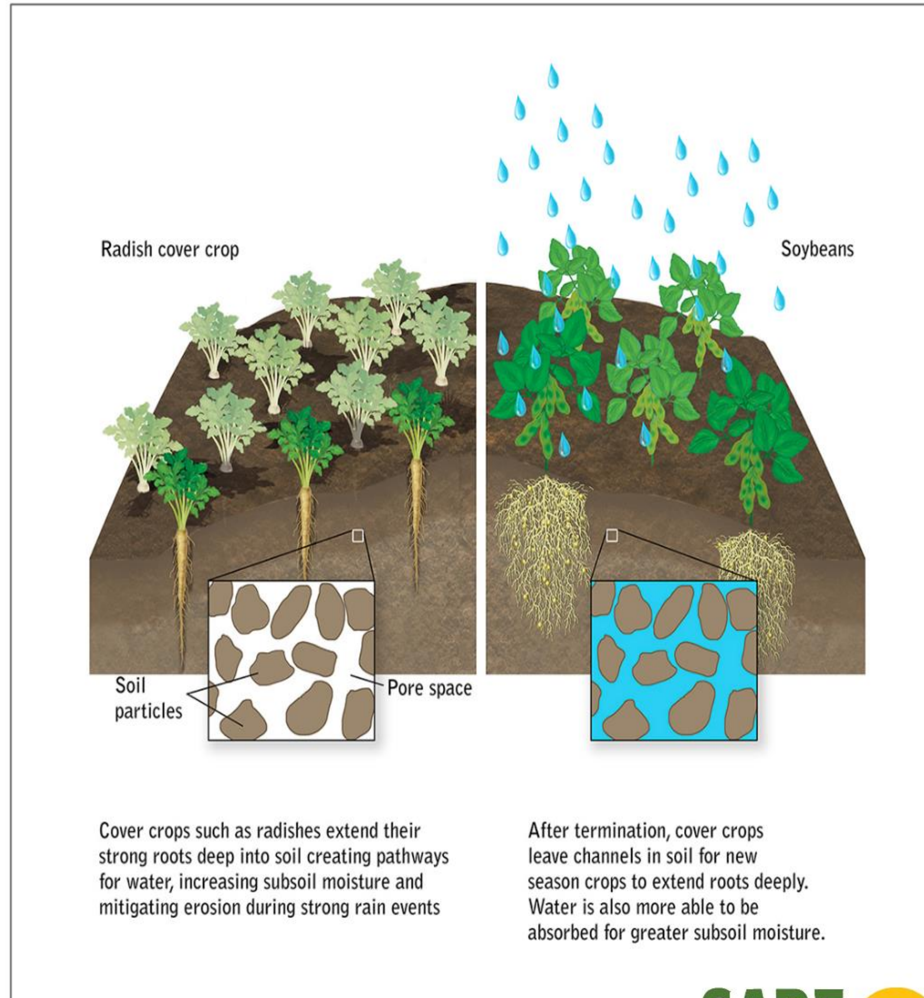


Illustration by Carlyn Iverson

SARE
Sustainable Agriculture Research & Education

Some properties of good soil

Box 1. Some properties of soil

Soil bulk density and root growth limiting conditions under different soils			
Soil texture	Ideal	Affect root growth	May restrict root growth
Sand-loamy soil	<1.60	1.6-1.8	> 1.80
Sandy loam-silty clay loam	<1.40	1.40-1.75	>1.75
Sandy clay-clay	<1.10	1.1-1.60	>1.60
Soil pH			
Acidic	<7	Reduces bacterial activity and therefore decomposition and nutrient release	
Neutral	7	Ideal range for most activities	
Alkaline	7-9	Suppressed biological activity, risk of soil crusting, salinity;	

Intercropping

- Intercropping gives higher income per unit area than sole cropping.
- It acts as an insurance against failure of crop in abnormal year.
- Intercrops maintain soil fertility as different nutrients are up taken
- Reduces soil runoff.

Cover crops can save money by reducing reliance on fertilizer and pesticides.

Sustainable Agriculture Research & Education

Practice
(The How)

Crop residue management:

- To assert a CA practice at least 30% of the soil surface need to be covered with crop residue
- To monitor the crop residue effect one can use a meter tape and insure there is at least crop residue at three nodes per ten meter length of tape
- Next year's crop depends on this year's harvest and during harvesting one should seriously think of a means to spread the crop residue evenly on the surface of the field (fig 7).
- Farmers experience and nearby research centers should be consulted to identify the kind of live and cut cover crops compatible with the kind of crops to be grown in the vicinity.
- A roller-crimper to flatten and kill cover crops and leave the plant residues on the soil surface could be used for cover crop management and contributes greatly to reducing herbicide rates in the no-till system (Figure 2)

Grass crop with heavy mulch

Legume Crop planted with mulch as cover and

Maize Crop planted with a healthy Cover-Crop

Roller crimper

- Usually consist of a round drum with equally spaced blunt blades around the drum
- Blunt blades are preferable to sharp blades that would cut the cover crop and dislodge residue that might interfere with seed soil contact at planting
- Crimping aids in cover crop desiccation
- The crops is rolled down parallel to the direction of planting
- Helps direct planting and helps in early weed control
- Rolling and planting can be done in one operation by using a front-mounted roller and rear-mounted drill, saving time and energy

Roller crimper

- Advances using the roller-crimper for organic no-till in Wisconsin.mp4

  https://youtu.be/Aiocr_icrfw

Social Safe Guard

- Gender sensitive
- Access to mulch material
- Ease of mulching and access to technology
- Youth
- Creating job opportunity (provision of mulching service)

Measuring degree of mulching

- Spread the mulch
- Use a meter tape and measure the mulched spot per 10 meter along the field .
- Take as many measurements as possible in the field
- Take the average
- Make sure you get at least 30% mulch coverage in the field

Fig 7. Harvester with a crop residue distribution system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Module 3

How to Integrate Crops and Livestock in CA Practice

Learning Outcomes

At the end of this Module, the User will be able to:

- Explain the status of livestock rearing in Ethiopia.
- Create linkages between traditional practice and the urgency towards modern approaches to integrating crops and livestock for workable CA practice.
- Explain the attributes of mixed farming, parameters and innovative actions needed to make them work in CA practice.
- Relate to the steps necessary in the journey towards responsible, workable and sustainable crop- livestock integrating farming systems.

Knowledge

(The WHAT)

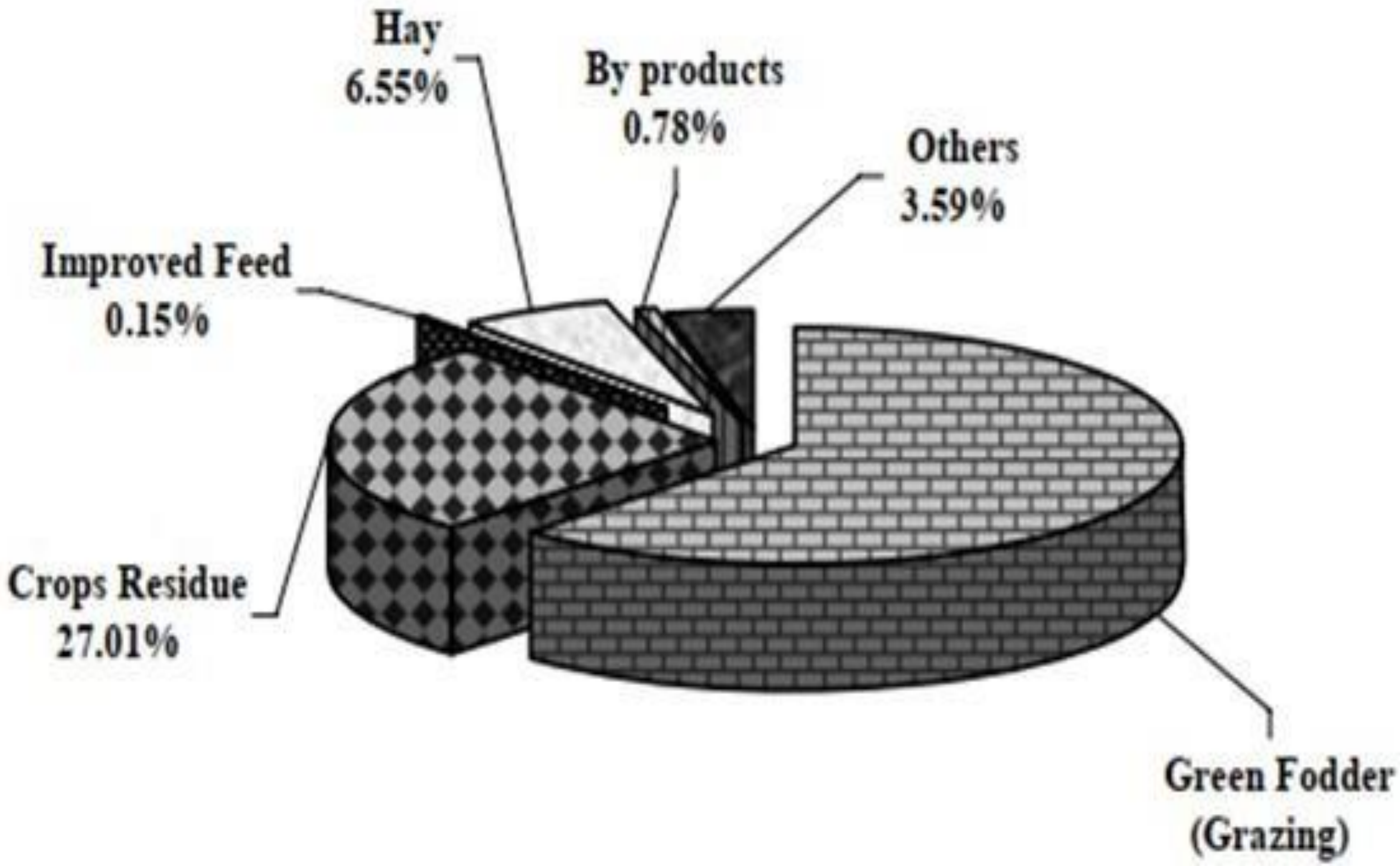
Status of Livestock in Ethiopia

Livestock is regarded highly in Ethiopia due to the following:

- It accounts for 40% of the GDP
- Mixed crop-livestock systems account for more than 80% of the population
- Draught power is the main use of livestock in Ethiopia, hence households doing crop farming must have livestock
- Livestock products have been increasing in demand
- There is no control in stocking. The more livestock one has, the richer they are assumed to be.
- Much of the livestock is reared in free grazing system

Free Grazing of Livestock in Ethiopia

Sources of Livestock feed in Ethiopia



Attitude

(The WHY)

Gaps to be addressed in Crop-Livestock Systems

The following gaps exist in crop-livestock systems in Ethiopia.

- Degradation of land due to overgrazing
- Feed shortage due to overstocking
- Poorly developed livestock feed systems
- High dependence on animal power
- High dependence on traditional livestock management systems despite changing socioeconomic and cultural settings.

Land degradation due to overstocking

From Hiwot Desta

Gaps to be addressed in Crop-Livestock Systems

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Crop-Livestock Systems Gaps in Mainstreaming CA

- Reliance on crop residues to feed livestock
- Weak fodder development programmes
- Free grazing leading affecting mulch retention
- Low application of targeted agroforestry practices that deliberately integrate livestock in crops and trees

Practice

(The HOW)

Development of Brachiaria Fodder

Facts on Brachiaria

- Brachiaria grass is native to Sub-Saharan Africa with capacity to adapt in a wide range of agro-ecological zones from Zone I (Humid Zone) to Zone IV (Semi-Arid Zone)
- Brachiaria has a high crude protein content of more than 15%. Unlike other forages, this crude protein stays stable for over 4 months after harvesting making Brachiaria a suitable dry season storage fodder. It can be baled and stored for use.
- The leaves, which form a greater proportion of the plant, are also more palatable and easily digestible by livestock.
- Brachiaria grass has a high carbon sequestration capacity due to its large leaf and root biomass
- Dairy farmers that are using it in Kenya are realizing an increase of between USD 2 to USD 5 in milk revenue per cow per day. Beef farmers are also realizing an increase of over 30 kilos per cow, translating to an increased revenue of USD 120 per cow.

Establishment of Brachiaria using Rootsplits (Spacing of 50cm between rows & 25cm within rows)

Harvesting and yield

- It can be both manual and mechanized for baling
- The first crop is ready for cutting at 4-5 months
- Subsequent cutting takes 3-4 months depending on moisture
- 2-3 harvests are done annually
- Rootstocks are left at 15 cm from the soil providing soil cover for CA.
- Yield is 500 bales per acre per harvest
- At a minimum selling price of USD 3 per bale, returns are between USD 3,000 and 4,500 per acre per year.

Baling of Brachiria fodder

Management Feeding of livestock using forage

Integrating forage development in Agroforestry Practice

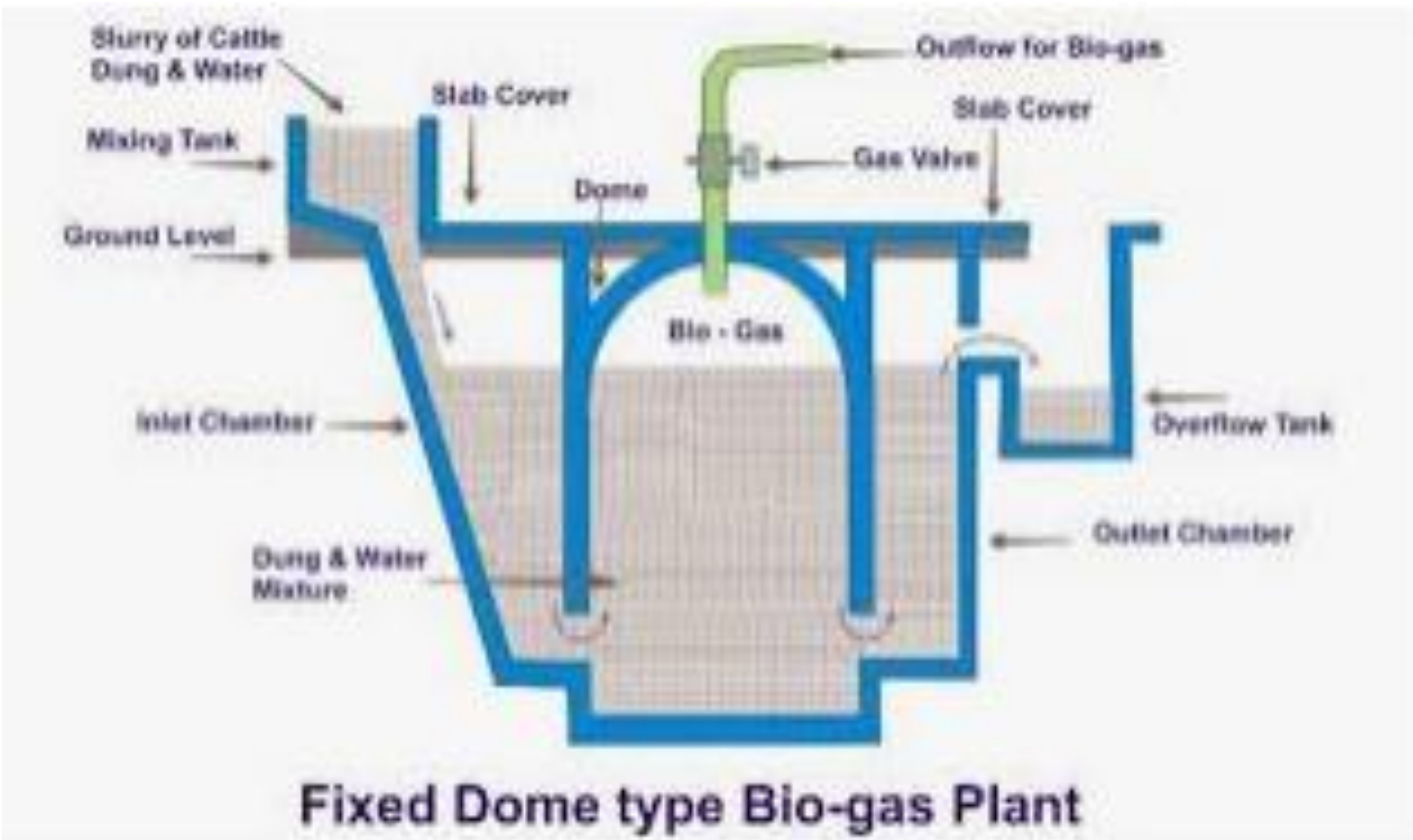
- Agroforestry entails the deliberate growing of woody perennials (trees and shrubs) with crops and rearing of livestock in a setting that allows for both temporal (time) and special (in space) interactions between the components.
- Collection of agroforestry trees and shrubs (Attached)
- Agroforestry systems – silvopastural (trees and livestock), silvocultural (trees and crops), agrosilvopastural (crops, trees and livestock/pasture).
- Tree nurseries established at community and farm level

Integrating forage development in Agroforestry Practice

Agroforestry species by ecological zone

Species	Climate	Other uses
Acacia tortillis	semiarid tropics	fuelwood
Albizia lebbek	humid tropics, semiarid tropics	fuelwood, timber
Calliandra calothyrsus	humid tropics	lumber, fuelwood
Dalbergia sissoo	semiarid tropics	timber, fuelwood
Gliricidia sepium	humid tropics	food, fuelwood, poles
Leucaena leucocephala	humid subtropics, humid tropics	fuelwood, poles, crop shade, timber
Prosopis cineraria	semiarid tropics, arid tropics	windbreak
Sesbania grandiflora	humid tropics	fuelwood, food
Ziziphus mauritiana	semiarid tropics, subhumid tropics	food, shade

Biogas plant to replace use of dried dung for cooking



Use of living fences to control livestock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Module 4

How to prove profitability of CA practices

Learning Outcomes

At the end of this Module, the User will be able to:

1. Cite Research proving CA is more profitable than Conventional Agriculture and express why farmers should adopt CA from an economics point of view.
2. Track profitability from farming activities and maintain historical net margin records by season.
3. Train on how a farmer can earn income from enrolling their farm in a national or regional Payment for Environmental Services Program (PESP)
4. Train farmers how to manage their profits (Cash Management), Create savings, Investments and banking to secure the best use money.

Knowledge

(The WHAT)

What is Profitability?

What is Profitability?

Profitability is simply defined as the money gained after a farmer has sold a crop or livestock product and paid for all the expenses needed to grow, harvest, process and sell agricultural or livestock products

"The surplus of income over expenses is also called Net Earnings, Net Margin or Net Proceeds. "

Profitability produces "Disposable Income" . This is income available to the farmer after he has paid all debts associated with growing the product and selling at the market. This is also the income available to the farmer to spend readily on Essential as well as Non-Essential Needs. (Covered Later under Cash management education)

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“The surplus of income over expenses is also called Net Earnings, Net Margin or Net Proceeds. ”

Attitude

(The WHY)

Why is CA Practice more Profitable Compared to Conventional Farming.

A big reason for embracing Conservation Agriculture practices

"CA Practice and CSA have many benefits which also turn into profitability in the short and long-run."

Understanding Profitability and Benefits

Benefits should not be confused with profitability.

Understanding
Profitability
and

Profitability is measured in monetary terms while benefits of CA can be intangible . But later translate to profitability as yield increase is sold or savings are achieved through Inputs and labour

Benefits should not be confused

Understanding

Profitability

and

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“CA intangible benefits convert to Profitability as the soil health improves production and brings more income per acre of crop planted”

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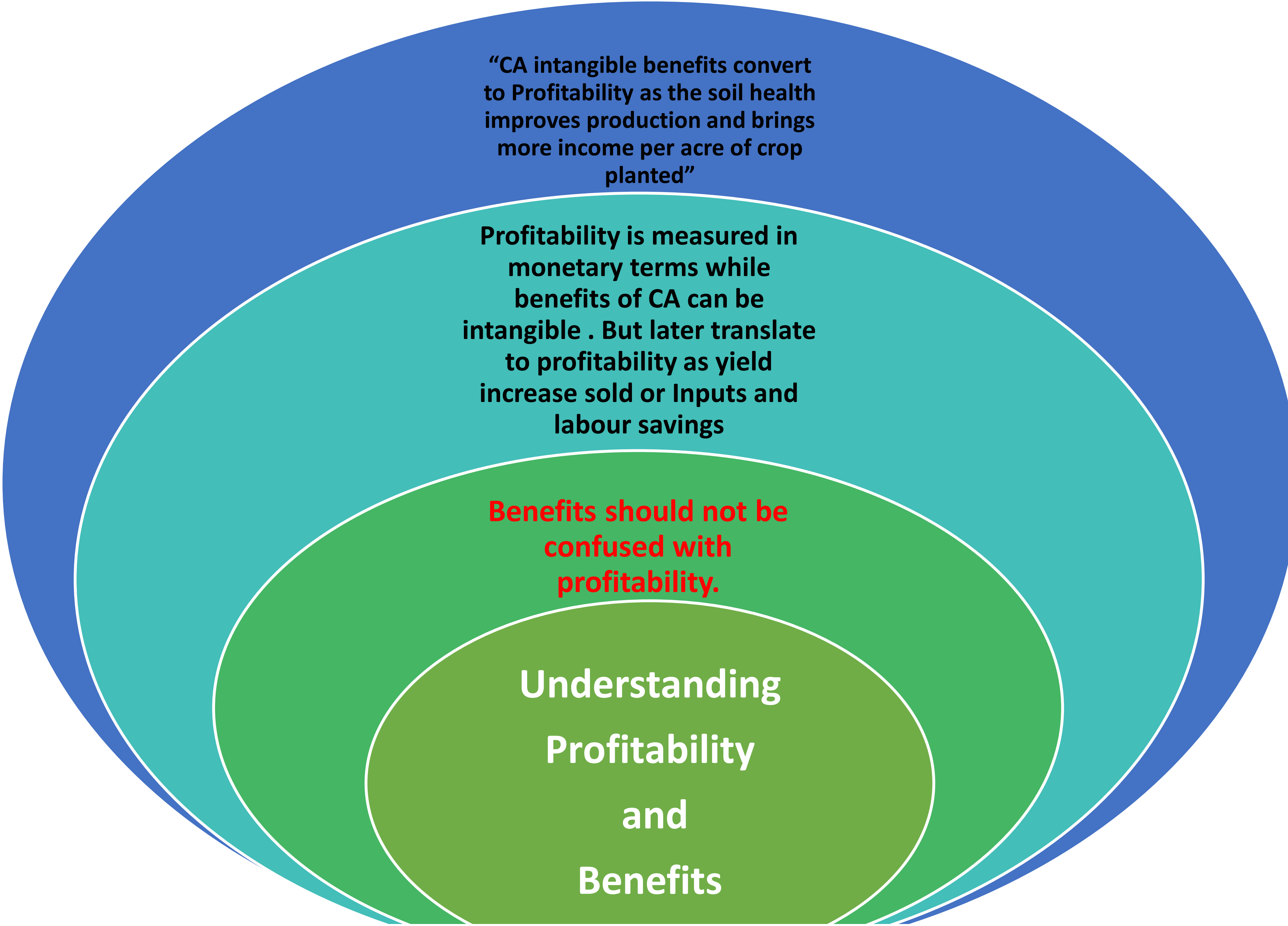
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Understanding Profitability and Benefits

Case Study - Conservation Agriculture in King'ori Division, Meru District, Tanzania

	Farmers Harvest
In 2004, Conservation Agriculture was introduced	3 bags of maize per acre and 1 to 2 bags of beans.
By the third year (2007).	Yields increased from about 15 bags to 25 bags of maize
By the 6th year (2010).	Yields stabilized at about 30 bags of maize per acre and about 10 bags of beans.

Comparing Conventional Farming

Vs

Conservation Agriculture

Operation	Conventional Agriculture	Conservation Agriculture
Tillage	As many as 5 to 7 times for Teff with Maresha	Minimum tillage and direct-seeding on un-ploughed land saves power time and money.
Seeding	Non Precise and Broadcasting	Direct Seeding and Precision planting with credible savings in seed amounts needed.
Mulching	Not emphasized as a pillar of practice.	Mulching is a pivotal part of the operations, to protect land erosion, evapotranspiration and to maintain lower soil temperatures.
Use of Crop Residue	Burning of Crop residue is prevalent leaving little or no carbon from previous crop.	Incorporates crop residue into the new planting season, saving on inputs and improving soil health overall.
Cropping	Mono-cropping is a major occurrence in conventional agriculture	Crop rotation and intercropping emphasized. Use of Green manure and fallowing is incorporated to improve soil structure and vitality, livestock feed supply etc.
Harvesting	Permanent removal of whole crop at harvest is the norm.	In harvesting under CA the farmer leaves over 70% of the stubble and stalks to restore most of the carbon back to the soil.
Weeding	Use of mechanical means of weed removal.	Mulching, shallow weeding, application of safe herbicides etc. generate huge savings in labour for tedious weeding.

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Operation	Conventional Agriculture	Conservation Agriculture
Tillage	As many as 5 to 7 times for Teff with Maresha	Minimum tillage and direct-seeding on un-ploughed land saves power time and money.
Seeding	Non Precise and Broadcasting	Direct Seeding and Precision planting with credible savings in seed amounts needed.
Mulching	Not emphasized as a pillar of practice.	Mulching is a pivotal part of the operations, to protect land erosion, evapotranspiration and to maintain lower soil temperatures.
Use of Crop Residue	Burning of Crop residue is prevalent leaving little or no carbon from previous crop.	Incorporates crop residue into the new planting season, saving on inputs and improving soil health overall.
Cropping	Mono-cropping is a major occurrence in conventional agriculture	Crop rotation and intercropping emphasized. Use of Green manure and fallowing is incorporated to improve soil structure and vitality, livestock feed supply etc.
Harvesting	Permanent removal of whole crop at harvest is the norm.	In harvesting under CA the farmer leaves over 70% of the stubble and stalks to restore most of the carbon back to the soil.
Weeding	Use of mechanical means of weed removal.	Mulching, shallow weeding, application of safe herbicides etc. generate huge savings in labour for tedious weeding.

Other CA Benefits

CA Benefits to Land

- Greater livestock and human carrying capacity.
- Lower impact of climate change, enhanced capacity to adapt and mitigate (Climate Smart Agriculture).
- Improved Soil Health and Lower environmental cost (water, infrastructure).
- Rehabilitation of degraded lands and ecosystem services.

CA Benefits to Crops

- Increase and stable yields, productivity and profitability.
- Reduced fertilizer use by 50% and less.
- Reduced pesticides use by upto 50%.
- Reduced machinery power, increased work-rates and upto 90% labour savings.
- Reduced irrigation and rain-water needs by upto 40 %.

CA Benefits to Livestock

- Adequate, quality and diverse fodder supply.
- Milk and meat production increase and consistency.
- Improved herd management & Zero Grazing workability.
- Feed preservation and conservation, hence more draught power.
- Enhanced soil health through increased organic matter and manure.
- Reduced food production costs.

Figure 4-3 : Economic basis of Realizing Bigger Profits from CA Practice

Adopted from ACT, 2019

CA Benefits to Land

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Profits from CA Practice Adopted from ACT, 2019

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Figure 4-3 : Economic basis of Realizing Bigger Profits from CA Practice Adopted from ACT, 2019

Results

From This...	To This...

From This...	To This...
	
	

Practice

(The HOW)

How to track the profitability of your CA farm

A farmers profitability is a series of small wins, which means that season to season activity has to be profitable for the famer to be incentivized to continue farming.
Even at subsistence level the farmer will need to make a profit to afford to pay for the next seasons inputs and labour needed.

This brings in the importance of learning how to track the profitability of your CA farm through recordkeeping and Net margin analysis

How to track the profitability of your CA farm

This brings in the importance of learning how to track the profitability of your CA farm through recordkeeping and Net margin analysis

How to track Short-Run benefits /Season profits

How do you track your profit from your farming activities

Tracking your expenses and income exercise by using pebbles or a record book for all expenses and farm income then storing this record to monitor your farming profitability progress

How to track Short-Run benefits /Season profits

Record Books for your farming activities

Expenditure /Production and Marketing Costs - Money out

Please enter the amount of money spent to perform the farm activities Listed - Costs of inputs + Cost of Labour+ marketing costs

This table should be filled from the beginning of the season and costs recorded when you spend until the end of season for all expenses paid.

Crop Planted	
Land Size (Acres)	
Season eg 1st season, 2nd Etc	

Date	Activities/Particulars	Unit of Measure eg Ltr/Kg	Quantity	Price Per Unit Acre/KG /Ltr/work done (Birr)	Amount= Qty *Price(Birr)	Total Spent so far (Birr

How to track Short-Run benefits /Season profits

Record Books for your farming activities

HARVEST Records : Quantification of total harvest including internal consumption or Donations						
Crop Harvested						
Land Size (Acres)						
Season eg 1st season, 2nd Etc						
Date	**Activities/Particulars**	**Unit of Measure eg Ltr/Kg**	**Total Quantity Harvested**	**Quantity sold**	**Quantity Consumed at Home**	**Quantity Given to friends**

How to track Short-Run benefits /Season profits

Record Books for your farming activities

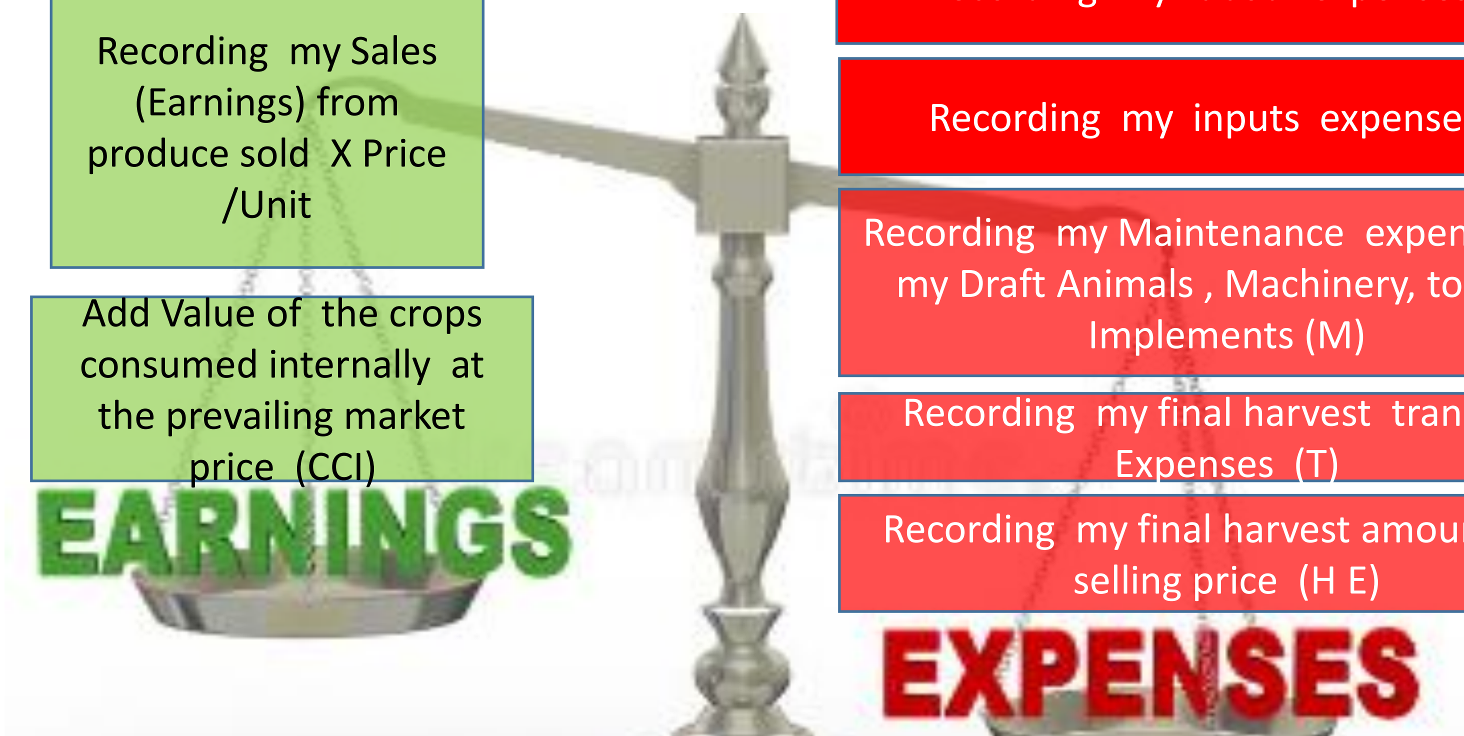
Sales or income records - money in

Crop Harvested	
Land Size (Acres)	
Season eg 1st season, 2nd Etc	

Date	Unit of Measure eg Ltr/Kg	Total Quantity sold	Price per unit (Birr)	Total Amount received so far

The quantity sold consists of the actual sold but to compute profitability correctly please add back the foregone income for the unsold Produce given to others or consumed by self

How to track Short-Run benefits /Season profits



Recording my Sales (Earnings) from produce sold X Price /Unit

Add Value of the crops consumed internally at the prevailing market price (CCI)

Recording my Labour expenses (L)

Recording my inputs expenses (I)

Recording my Maintenance expenses For my Draft Animals , Machinery, tools or Implements (M)

Recording my final harvest transport Expenses (T)

Recording my final harvest amount and selling price (H E)

The positive difference between the earnings from the crops sold including crops consumed internally and total expenses is your Profit or Net Margin

Long -Run benefits /Profit

How can you profit from enrolling your farm in A Carbon funding CSA program

Ethiopia has a Carbon resilience Green Economy Policy and a climate resilience policy.
This means farmers can benefit from

1. Reducing Carbon Emissions by engaging in CA practice
2. Reduce Carbon Emissions by introducing Livestock control measures
3. Reduce Carbon through Carbon sequestration through planting Trees and mitigating reduction of forest cover through excessive cutting of trees

Benefit to the farmer can be in the form of Cash through

1. Reducing Carbon Emissions by engaging in CA practice
2. Reduce Carbon Emissions by introducing Livestock control measures
3. Reduce Carbon through Carbon sequestration through planting Trees and mitigating reduction of forest cover through excessive cutting of trees

Long -Run benefits /Profit

How can you profit from enrolling your farm in A Carbon funding CSA program

The World Bank promotes and rewards reduction in greenhouse gas (GHG) emissions and increased sequestration through better land management, climate-smart agriculture, and smarter land use planning and policies.

The World Bank has a 3-phase business model which includes:

1) Enabling Environment (policy and strategy; capacity building; social inclusion; consultations)
2) Development Action (investment in low carbon development; sustainable management of forests; climate-smart agriculture)
3) Low-Carbon Development Benefits (poverty alleviation; shared prosperity; climate change mitigation and adaptation).

You can profit from enrolling your farm in a Carbon funding rewards program such as below

Under This Bio Carbon fund Initiative the WB ISFL fund works with the Regional state of Oromia on an area covering 32Million Ha with many potential monetary benefits to farmers. Other programs are REDD+ programs by UNEP

Short-Run Benefits

How to track my Short Term Farm Benefits

- Tracking my Labour expenses (L)
- Tracking my inputs expenses (I)
- Tracking my Maintenance expenses For my Draft Animals , Machinery, tools or Implements (M)
- Tracking my final harvest transport Expenses (T)
- Tracking my final harvest amount and selling price (H E)
- Value the crops consumed internally at the prevailing market price (CCI)
- The difference between the earnings from the crops sold including crops consumed internally and total expenses is your Profit
- Planting Soil enriching trees like Sesbania while attracting PES from the same trees
- Planting commercially viable trees eg Gum Arabic trees, Nut Trees eg Macadamia, Cashew Nuts or fruit trees in

Long-Run Benefits

PAYMENT FOR ENVIRONMENTAL SERVICES

How to receive Carbon Funding payments

Farmer

- Increasing forest cover and other live cover on my land trough CA practice to attract Yearly payments
- Enrolling in your community Reducing Emissions from Deforestation and Forest Degradation or ISFL group

MOA/Regional

- Seeking Membership in an ISFL initiative fund which looks at forest land, cropland, grassland, wetlands, settlement and other land inventories for PES funding
- The MOA in collaboration with learning Institutions can create policy and build capacity for data collection of IPCC Standard TIER 1 , 2 and 3 data for regional accounting
- Initiating a center for carbon sequestration Measurements /Accounting at regional level
- Yearly reporting of sustained growth of forest cover through tools such as Google Earth Engine supported mapping tools for ISFL Accounting
- Conducting regional Tree planting drives to Increase tree cover for carbon funding

Cash Management lessons for the farmer

As the farmer becomes profitable s/he needs to learn basic money management skills.

He needs to know :

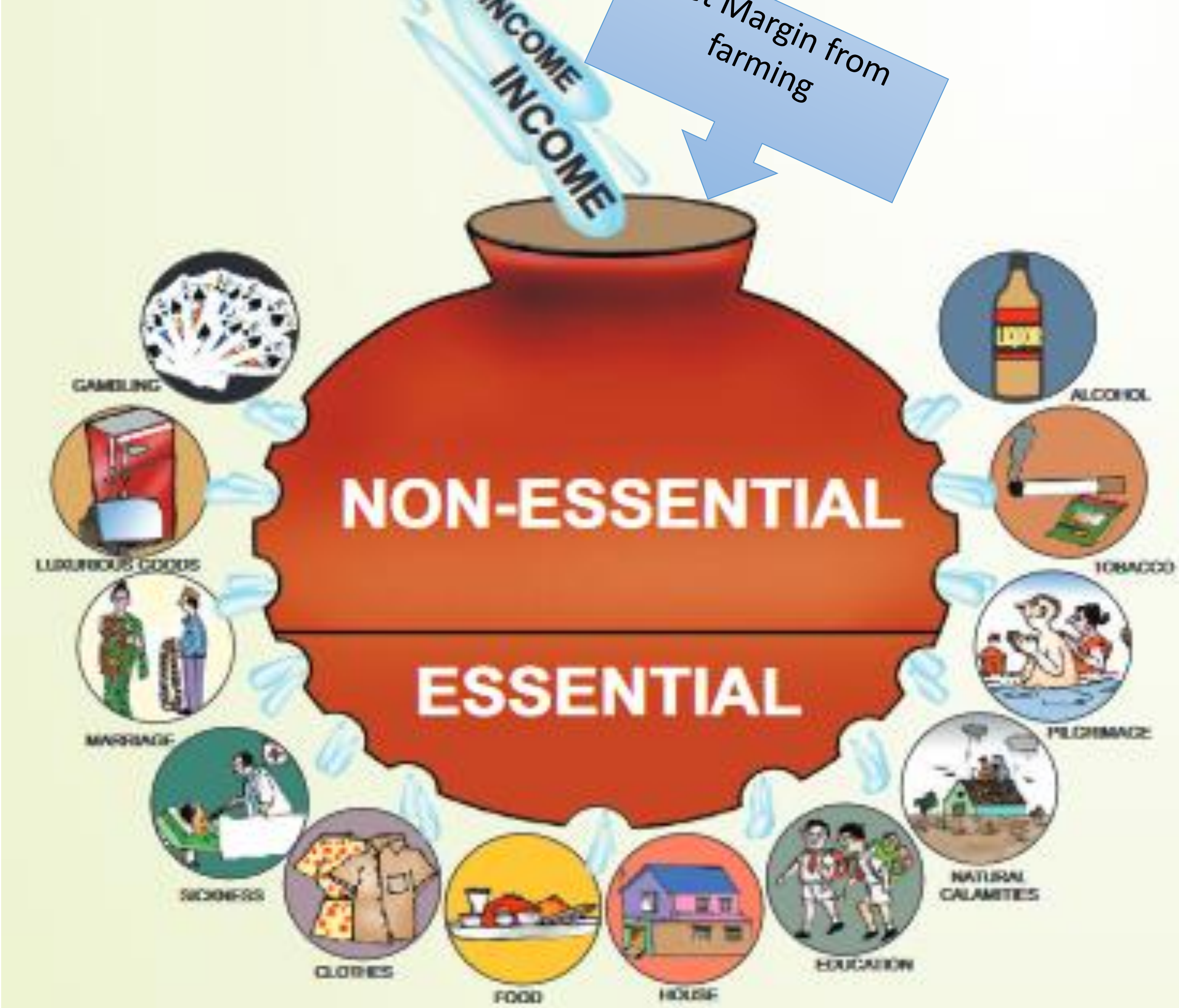
1. How to prioritize his needs and expenses
2. How to save , invest (create multiple sources of income)
3. How to Budget/ plan his future expenses

Under the objective of cash management , the farmer will identify the concept of classification of needs and the 3 major components of his expenses which many times are in competition for the limited income and have to be consciously chosen and controlled according to a realistic criteria.

Cash Management lessons for the farmer

1. **How to prioritize your daily needs :**

Identify Essential and Non-Essential Needs for the Farmer


Margin from farming
INCOME
INCOME
NON-ESSENTIAL
ESSENTIAL
GAMBLING
LUXURIOUS GOODS
MARRIAGE
SICKNESS
CLOTHES
FOOD
HOUSE
EDUCATION
NATURAL CALAMITIES
PILGRIMAGE
TOBACCO
ALCOHOL
LIQUOR

Cash Management lessons for the farmer

To prioritize needs the farmer should ask himself the following objective question .

“If I had the last 100 Birr to spend on my family what would I spend it on first before any other?”

Cash Management lessons for the farmer

How to choose among needs and wants :

a. Needs - Needs are necessities of life and always take first priority.

b. Wants - Not a necessity of life but important for emotional, social and psychological adjustment, comfort and healthy well being.

c. VICES - Farmers will identify items in this category which should be avoided at all costs . These are mostly considered taboo and even addictive. These should be avoided as they interfere with availability of funds for the most important items for the farmer and can even cause death or disease.

Cash Management lessons for the farmer

1. Learn how to prioritize his spending from day to day and for Long Term needs

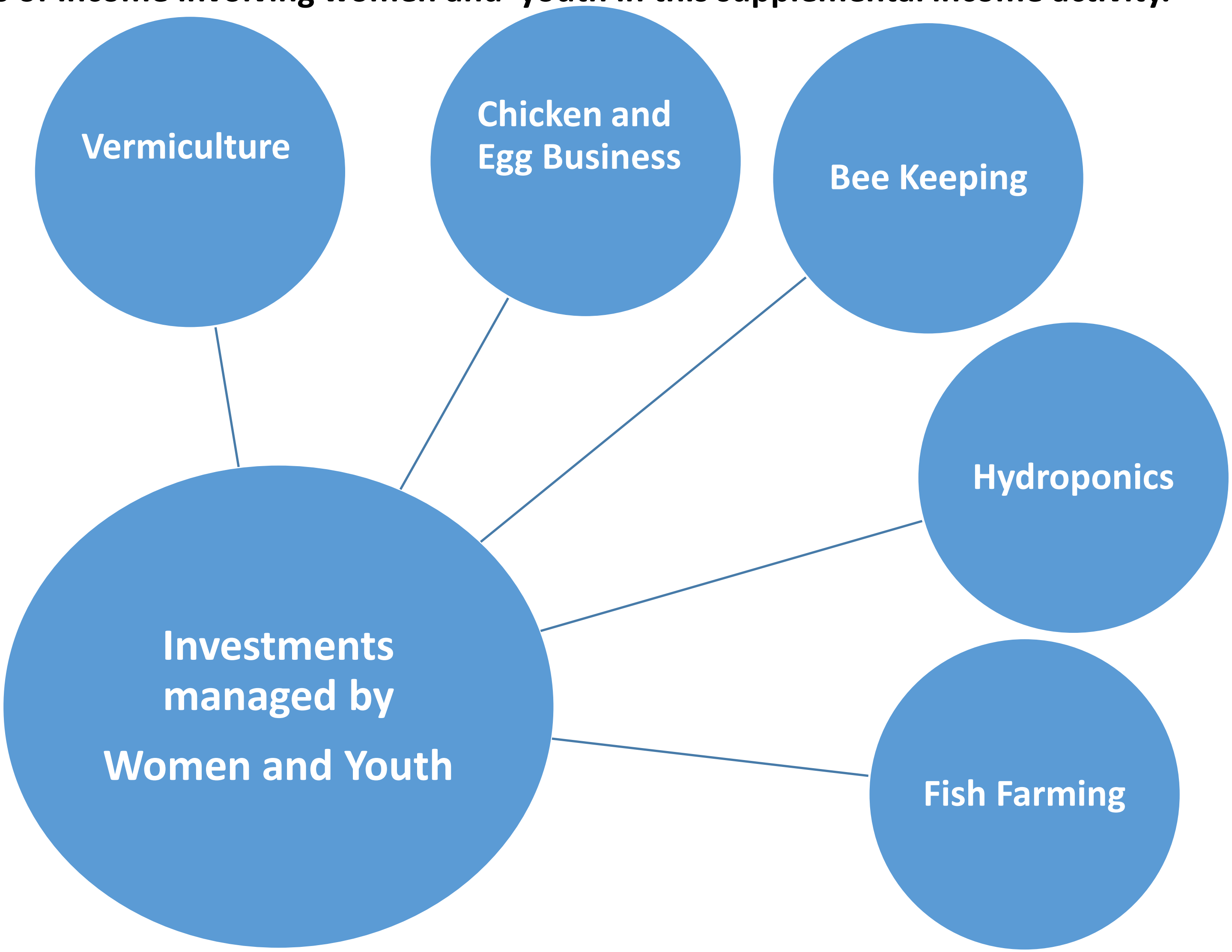
From Savings to Investments

Once the needs are prioritized the farmer can move to Savings and Investments in multiple streams of Income and involve the youth and Women in running these subsidiary income streams.

From savings the farmer should seek to create Supplementary Income by investing in other non-season farm agribusiness activities eg Hydroponics ,Chicken and egg farming, Fish Farming, Vegetable farming, Vermiculture

GENDER AND YOUTH INVOLVEMENT

Once the needs are prioritized the farmer can move to Savings then Investments in multiple streams of Income involving women and youth in this supplemental income activity.



GENDER AND YOUTH INVOLVEMENT

The farmer should also learn to keep his savings in banking systems that ensures protection from loss of his funds and which can assist in borrowing (Loans) as urgent need arises eg Access to loans and credit through having a consistent banking record locally.

The farmer needs ways to preserve savings through banking , SACCOS, Women Groups , Merry-Go-Rounds to provide rainy day funds for improvement of living standards

Insurance and Investments

Insurance is the payment of a premium, a small monetary instalments on regular intervals to secure the principal (Insured) from catastrophic loss of investment

The farmer is advised on how to harness Insurance products to secure himself ;assets , investments, farming Inputs and Crop yields. Crop insurance currently exists in Kenya in various value chains eg Potato, Cattle etc.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AGRA Growing Africa's Agriculture

ግብርና ሚኒስቴር MINISTRY OF AGRICULTURE

IFAD Investing in rural people

Module 5

How to be an Active Member of a CA Landscape and Community

Learning Outcomes

At the end of this Module, the User will be able to:

- Understand the linkages between land productivity, landscape and community approach to sustainable conservation efforts and CA Practice.
- Guide the development of holistic conservation and CA interventions at landscape, catchment and community levels.
- Guide the generation of policy, institutional and governance support to value-chain based interventions that enhance sustainable CA Practice.
- Understand how to generate a market-linked landscape level productivity and community development business model to drive sustained CA practice

Knowledge

(The WHAT)

Massive Soil Loss in Ethiopia

Ethiopia looses an estimated 200,000 ha of land annually due to erosion.

The figure below shows extensive farming in the highland area with a rolling topography.

Extensive Farming in Highlands

Bare hills with scanty vegetation

Landcare Programme Activities

The following activities have been undertaken under the Landcare program:

- Participatory gully rehabilitation
- Niche compatible afforestation: *C. palmensis*, *A. decurrensis* and *H. Abyssinica* were planted for soil fertility at different niches.
- Introduction of improved crop varieties such as potatoes, barely, linseed, triticale, apple and forage crop varieties.
- Landscape level soil conservation: 35 ha has been protected with soil bund since 2007, and planted with multi-purpose trees and grasses to stabilize them
- Composting for application to high value crops.
- Introduction of legume forage plants for improved productivity of fallow land.
- Participatory runoff assessment to illustrate to farmers the value of conservation structures.
- Characterization of local plant species for soil fertility management

Benefits of the Landcare Programme

- Introduction of crop varieties improved cash generation and food availability.
- Farmers developed confidence and courage to practice sustainable water management options.
- Involvement of local administrators in land management increased awareness on land management issues that need policy interventions.
- Land Management and development agenda can be implemented when supported by immediate benefits to communities.
- Linking high value crops to markets benefits communities and encourages their participation in land management

Attitude

(The WHY)

Consequences of poor land conservation

- Rapid loss of vegetation cover that was used for catchment conservation in the highlands.
- Increased erosion by multiple tillage in rolling topographies
- Increased siltation of water courses and dams leading to massive costs in their maintenance
- Pollution of water bodies risking lives of humans, livestock and aquatic life.
- Biodiversity loss occasioned by clearing of mixed species in the highlands and replacing with pure crop stands

Consequences of poor land conservation:

Consequences of poor land conservation

Invasion of degraded land by toxic *Callotropis procera*

Landslide due to poor tree cover

Low stream-flow due to poor catchment conservation

Practice

(The HOW)

General Approach for CA

- Adoption of a value chain approach that optimizes on the landscape approach to improve segments of the value chains managed by the community.
- Adoption of a collaborative approach to mainstreaming CA at farm, community and landscape level. The process of developing the CA manual has brought farmers, researchers, development actors, private sector and the Government to a mutually supportive framework that has all actors owning the process and outcome.
- Introduction of conservation activities that start at farm level and move to a landscape level to make farmers active members of a landscape. This was initiated in the PASIDP II project and this manual provides approaches that strengthen it, including having communal tree nurseries, joining in vegetation regeneration in degraded sites and undertaking community soil conservation practices such as building of gabions.

Participatory Approach in CA

Nursery Activities at group level

•

Making of gabions by Community

Soil Conservation at CA Landscape Level

Participatory Irrigation Downstream:

Payment for Ecosystem Services:

- Link on payment of ecosystem services
- Video on rangeland carbon farming from Australia
- Landscape level carbon sequestration
- Resource Mobilization (proposal writing) for CBOs and other groups


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Module 6

How Institutions Collaborate in Advancement of CA

Learning Outcomes

At the end of this Module, the User will be able to:

- Explain the reasons for collaboration.
- Define common terms used in intuitional collaboration.
- Identify the major stake holders in their sites of responsibility.
- Identify the shared tasks of CA affiliated stakeholders
- Describe factors enhancing and hindering impact of partnership.
- Formulate, and schedule the mode of collaboration for CA advancement in their respective areas of responsibility.
- Evaluate and fine tune the mode of collaboration as deemed necessary during operation.

Knowledge

(The WHAT)

Institutional Partnership

Collaboration among institutions is essential to address challenges extending beyond the capacity of any one institute.

Extending CA technology to the end user and establishing a viable system requires collaboration among stakeholders.

Definition

- **Partnership**: Two or more organizations with complimentary areas of expertise committing resources and working together to achieve a mutual beneficial outcome that would have been difficult for each to reach alone.
- **Collaboration** : A statuary association among institutions working on CA technology development, extension, manufacturing, production and marketing for realizing the CA system as the farming order of the day. Partnership and collaboration may be used interchangeably in the document
- **Stakeholders**: these are actors of the CA system, which are active, influential and may have conflict of interest, who need to work together for a win win end for all.
- **Inputs supply**: The groups and the system responsible for input delivery (seeds, fertilizer, forage, farm implements, weed and pest control chemicals, knowledge and skill).

Types of partnerships

- **Networks:** which is less formal and is meant for information exchange.
- **Coordination:** closely linked relation beyond information exchange.
- **Collaboration:** Relations among members are strong with functional more broad ranging areas defined for joint activities. In case of CA collaboration is the choice from the above context.

Possible partnerships focus

- ***Operational:*** focusing on well defined problems and establish collaborative frameworks to address them.

- ***Policy and strategy type:*** where issues that cut across the public, private and civil society sectors are at times the subject of upstream policy or strategy partnership.

- ***Advocacy:*** where lack of awareness and political will are barriers to social change.

Attitude

(The WHY)

Promotion of CA in Ethiopia

- Mainly promoted by NGOs and the private sector with the support of agricultural offices at different levels.

- Could not take off in a big way due to lack of common understanding of environmental and social issues like open grazing and complete removal of crop residues (Melkau et al. 2016)

Past efforts to disseminate agricultural technology

- The Training and Visit system

- Public and private Advisory Services

- Farming systems research

- Farmers Field Schools (FFS) are some among many.

- Despite the different efforts, the adoption of technologies by the end users have not been satisfactory.

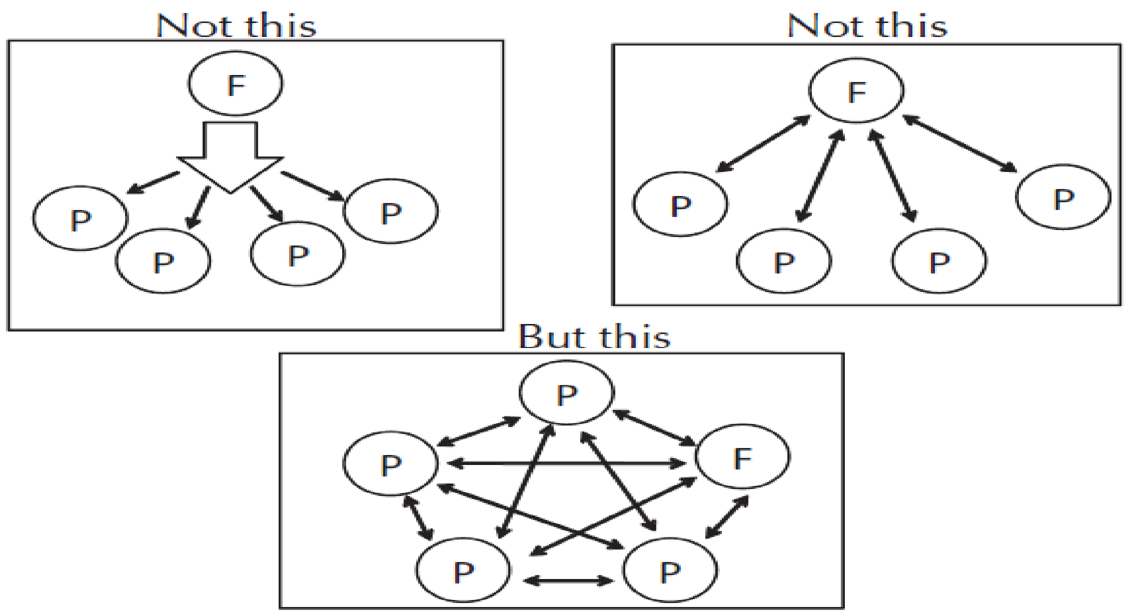
Why partnerships for CA Advancement?

- The extension should demonstrate to farmers reduced yield is not always the case, difficult unless a general agreement is reached and solution is sought collectively even on issues like stocking rate.

- The input delivery, marketing and finance availability requires a coordinated and system for CA to flourish.

Why partnerships for CA Advancement?

- It requires the collaboration of many institutions, regulatory, user groups and input service delivery units, collaboration is a must, but not an option.
- The research should deliver enough technologies, to implement CA in its full package as well.



Practice

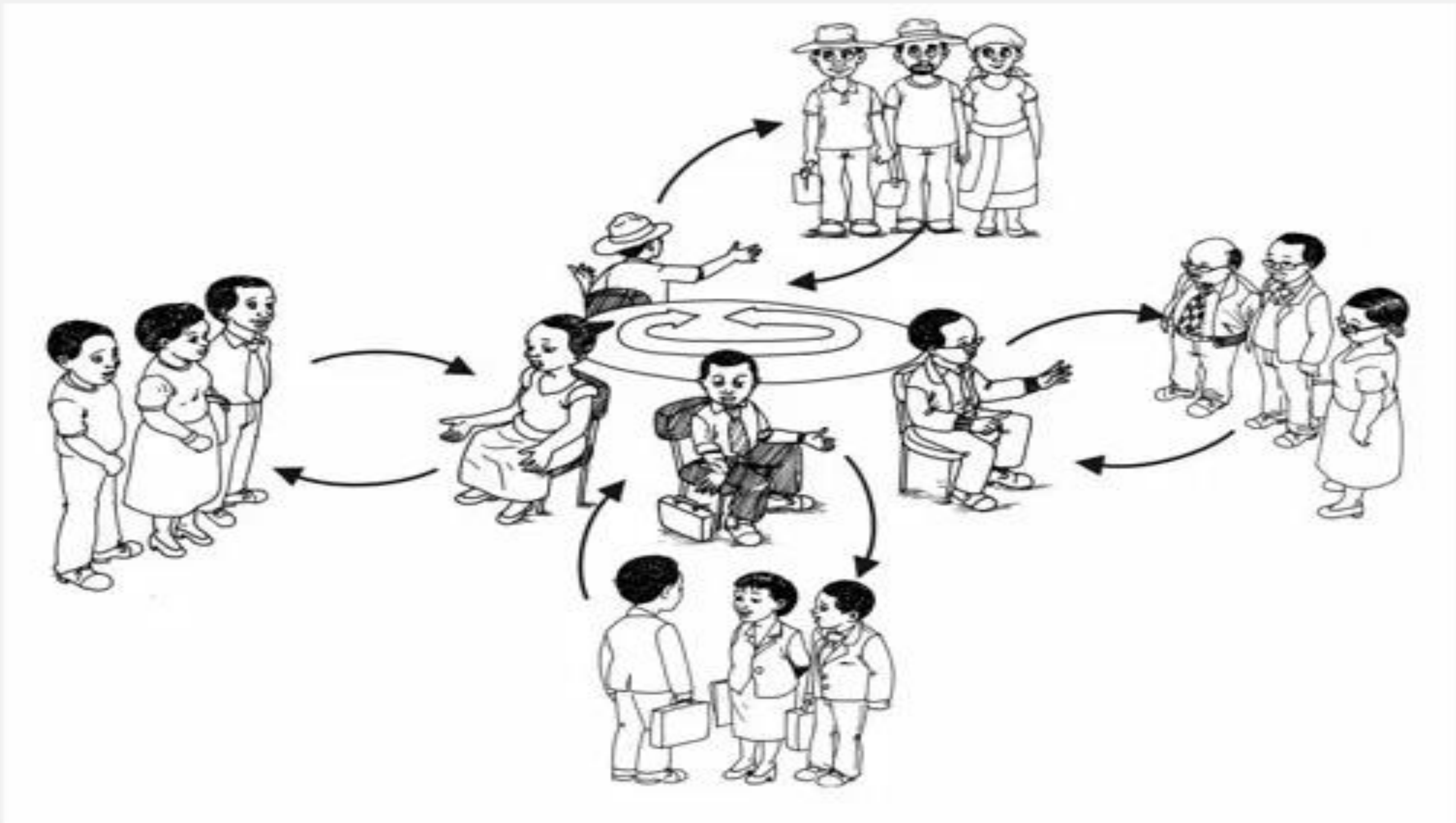
(The HOW)

Innovation Platform

- A network of organizations, enterprises, and individuals.
- Focuses on bringing new products, new processes, and new forms of organization into economic use.
- Joining forces in innovation platforms, stakeholders are better able to face challenges and to make better use of emerging opportunities.

A platform of diverse groups to address a common objective

Innovation Platform (Actors and Stakeholders)



Innovation platform actors and stakeholders.

Potential platform members along the value chain

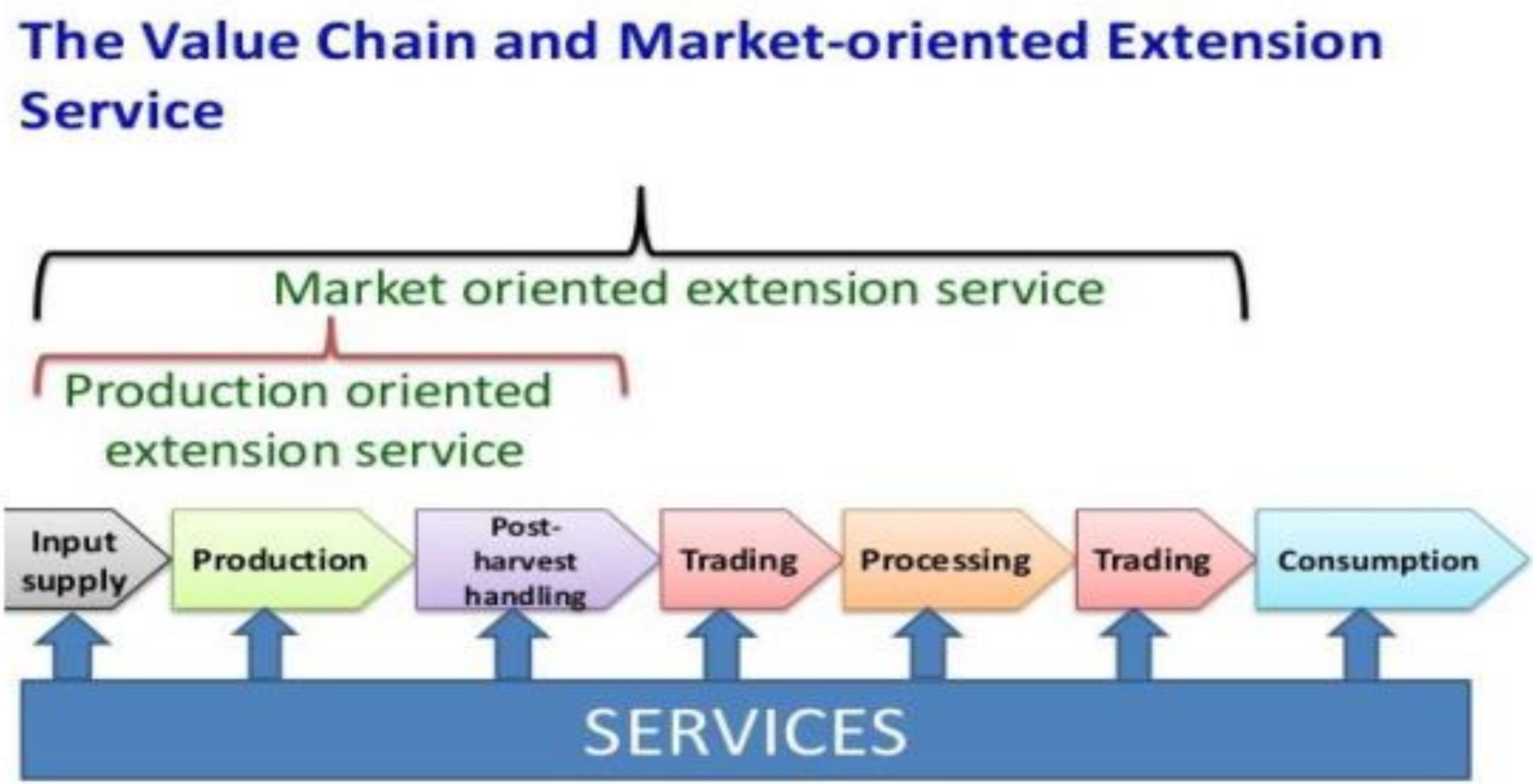


Figure 6-2: Wholeness of Extension Service orientation and analysis guide.

From Gebremedhin et al. 2015

<u>Innovation platform</u> Contd

- *Focus on innovation rather than production:* the application of knowledge (of all types) to achieve desired social or economic outcomes.

- *Interaction and learning (*Can be)
  Roles change, evolve as circumstances change and actors learn.

- *Attitudes, practices and interaction of behavioral patterns determine the propensity to innovate*.

Innovation Platform Contd

- *Policies are important in innovation* sensitive to a wide range of policies and seek ways to coordinate them.
- *The demand side must be included in the innovation process*.
- *Changing to cope with change*. when faced with external shocks, is to reconfigure linkages or networks of partners

Innovation Platform Contd

The steps necessary to create a collaboration platform for CA:

1. Design phase
2. Implementation
3. Adopt and scale up

The 8-Step Framework for Action (WEF)

Design

1 Engage

Identify and engage influential Champions across stakeholder groups, including government, private sector, civil society and farmers' organizations

2 Align

Develop a shared partnership agenda, including high-level goals and key opportunities which can be achieved through multistakeholder collaboration

3 Structure

Establish the partnership structure to drive ongoing collaboration among organizations

Implement

4 Plan

Define specific goals and action plans to deliver impact on the ground, including framework to measure progress against goals

5 Implement

Implement action plans on a project-by-project basis by experimenting with new collaboration models, building business cases to align funding, and engaging local actors and experts

6 Advance

Leverage milestones to drive progress, including high-level global leadership convenings and in-country partnership meetings

Adapt and Scale

7 Scale

Scale and institutionalize proven models, adapting lessons and innovations developed in-country or through global/regional partnership exchanges and networks

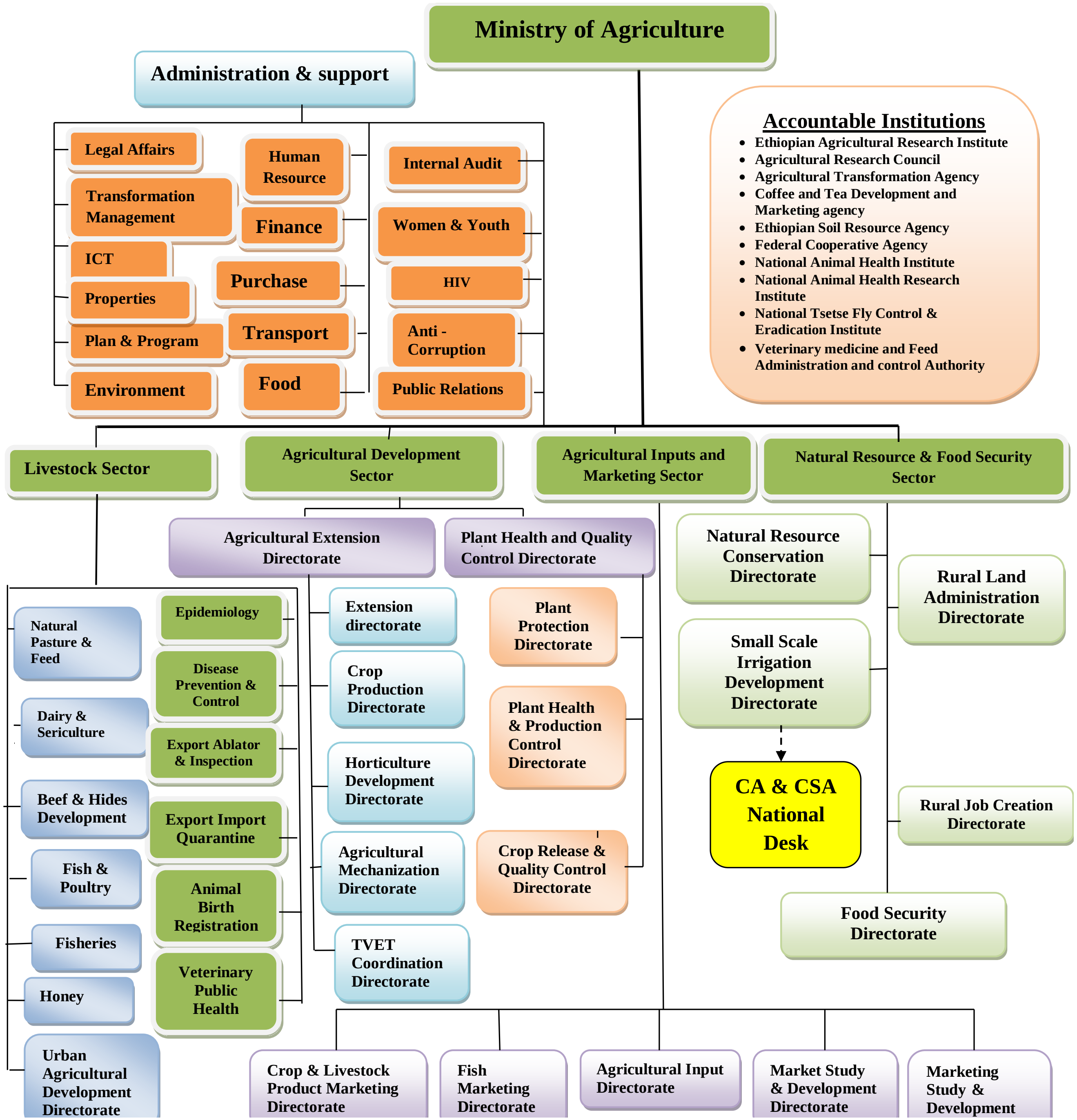
8 Review

Review the partnership strategy and structures as needed to seize new opportunities over time

Establishment of the CA platform (*Federal Level*)

- Initiator: The Federal Agricultural Bureau.
- Embodied in the extension system.
- Branches at the Regional, Zonal and Woreda bureau level.
- Helps establish the CA innovation platform at the different administrative levels.

NB: See Suggested CA National Desk



Working modalities:

- The PASDIP II at MoA in association with the Regional PASSIDPII representatives, livestock, soil fertility, crop and mechanization departments ,local farmers forms the platform.

- Local input supply and marketing departments should be brought on.

- Serves as the secretariat office. It convenes meetings, set the ground rules, set programs and plans for execution.

Meetings and secretarial work

- The platform meetings take place at least three times in a year.
- The first meeting is a planning meeting.
- Second and other meetings are for progress monitoring and fine tuning sessions.
-
- It needs to have a government budget for its activities.
- The secretariat prepares proposals annual budget plan.

Capacity building

- Necessary trainings for the platform members will be identified and planned.
- Scheduled trainings will be given accordingly.
- Transfer the knowledge to the respective zonal and woreda administrative level.

Establishment of the CA platform (Regional Level)

- Responsible the regional Agricultural Bureau.

- Embodied in the region extension system.

- Branches at the Zonal/Woreda (if more than one CA Woredas are found in the zone) Woreda bureaux level.

- Helps establish the CA innovation platform at the different Zonal and Woreda BoA levels.

Working modalities

- The PASDIP II at the region in association with the Zones/Woreda PASSIDPII representatives, livestock, soil fertility, crop and mechanization departments ,local farmers forms the platform.
- Local input supply and marketing departments should be brought on.
- Serves as the secretariat office. It convenes meetings, set the ground rules, set programs and plans for execution at the regional level.

Meetings and secretarial work

- The platform meetings take place at least three times in a year.
- The first meeting is a planning meeting.
- Second and other meetings are for progress monitoring and fine tuning sessions.
- It needs to have a government budget for its activities.
- The secretariat prepares proposals annual budget plan.

Capacity building:

- Necessary trainings for the platform members will be identified and planned.
- Scheduled trainings will be given accordingly.
- Transfer the knowledge to the respective zonal and Woreda administrative / implementing groups.

Testing and refining solutions

- Recommended innovations be monitored along the value chain.
- Performance level, gaps and problems encountered must be documented and presented to the periodic forum to refine and take ameliorating steps.
- Performance must be monitored at each nodal points along the value chain.
- Adjustment and necessary fine tuning will be done accordingly.

The design implementation and adaptation framework for CA platform

Design Phase:

- Initiation by the participatory small scale irrigation/natural resource group
- Select influential departments/personnel from federal/ regional/ district agricultural bureau
- Select and invite pertinent research institutes
- Select champion farmers
- Invite pertinent NGOs
- Develop a shared agenda on CA

Implementation Phase:

- Set specific goals and action plan to address the CA issues in the target area
- Set the logistics and financial plan for implementation
- Set the milestone
- Implement according to plan
- Monitor progress and fine-tune accordingly

Adaptation and scaling out Phase:

- Review and select best practice
- Arrange field days and experience sharing forum
- Fine tune the partnership pattern
- Set the scaling out strategy
- Scale out

CA innovation platform LGF

	Narrative summary	Objectively Verifiable Indicator	Means of Verification	Timeline
Goal	Sustainable agricultural intensification			
Objective	Establishment of CA practicing farmers at the target Woredas	Number of farmers" groups in the target Woredas	Monitoring Report	1 year after training
Output	Establishment of effective CA platform at federal, regional, zonal level	Number and kind of CA platform established at different levels	Monitoring Report and field visits	2 months after training
Activities	Initiation by MoA PSSIDPII	Report	Review	15 days after training
	Selection of pertinent departments/ personnel from the federal MoA	List of selected groups	Review	20 days after training
	Establishment of the Core CA platform at MoA	Report	Review	30 days after
	Establishment of the Core CA at regional/zonal level	Report	Review & visits	40 days after
	Initiation of CA platform at Woreda level	Report	Review	50 days after
	Selection of champions at the Woreda level	CVs or list of selected personnel	Report Review	50 days
	Establishment of the Woreda core CA platform	Report	Report review	55 days
	Establishing the goals, objectives and guiding principles	Document	Report review	60 days
	Setting the action plan Implementation	Report	Review and field visits	
	Establishment of Core CA group at federal level	Monitoring		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Module 7

How Public Private Partnerships Work for Advancement of CA Practice

Learning Outcomes

At the end of this Module, the User will be able to:

- Understand what Public Private Partnerships (PPPs) are and how to utilize them for cooperation and development.
- View in perspective the place and the roles of various farmer-support organizations, agribusiness and trade institutions along the value-chains.
- Relate to *The What, The Need* and *The How* of making value-chains and their supporting institutions work with each other and in partnership with Government.
- Learn how to be part and play individual and institutional roles at Local, Regional and Federal Government levels, in harmony with private sector members.
- Understand the framework, ingredients and steps needed in establishing successful PPPs in Conservation Agriculture and Climate Smart Agriculture.

Knowledge

(The WHAT)

What is a Public-Private-Partnership?

Box 7-1:

A PPP can be an **informal** Government and Private entity work and delivery relationship or a **formal**

"long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance"

(World Bank Group)

PPPs are also defined as:

A framework – that, while engaging the private sector – acknowledges and structures the role for Government in ensuring that social obligations are met and successful sector reforms and public sector investments are achieved

(Asian Development Bank)

New Vision for Agriculture (NVA)

Over 870 million people, many of them small farmers, remain chronically hungry and undernourished. In response to this challenge, the World Economic Forum (McKinsey and Company, 2013) developed the New Vision for Agriculture (NVA). The Vision calls for a new approach to agriculture that will deliver **Food Security, Environmental Sustainability and Economic Opportunity.**

Food Security

Environmental Sustainability

Economic Opportunity

Figure 7-1

New Vision for Agriculture: Six key Elements for Agricultural Transformation that Justify PPPs

1. Leadership and alignment: *a common vision must be developed among leaders, to agree to a long-term view and inclusivity.*
2. Strategy and priorities: *Champions representing various interests must be appointed, to agree on a common journey.*
3. Investment and entrepreneurship pipeline: *include & identify individual & institutional capacities to invest (skills, money, organization etc.) & apply entrepreneurial skills*.
4. Finance and risk management: *pay or reward parties driving and sustaining the movement according to their contributions & ability to take-on & carry the risks involved.*
5. Hard and soft infrastructure: *Partners like Government will want to ensure (hard) infrastructure like roads, electricity, storage etc. are in place. Others like Mechanization Service Providers (MSPs) may provide services managed under a Software platform, among other application like Mobile Apps.*
6. Delivery and implementation mechanisms: Have an Admin & Management team, guided by an agreed plan and deliverables, backed by an agreed way of working (mechanism), inclusive of role and opinions of all parties involved.

Stages in the Journey of Forming Strong PPPs

Figure 7-2

Stage 1: Goals and alignment
- Defining the partnership vision and roadmap
- Engaging stakeholders around shared priorities, linked to the national agenda

Stage 2: Proof of concept
- Activating processes for investment prioritization
- Piloting scalable activities on the ground

Stage 3: Embedding new models
- Establishing a Partnership Secretariat or other structure for long-term coordination.
- Scaling impact and reforming policy to achieve sector transformation

Champions appointed to make the PPP journey successful will have a long-term view, set Goals, prove the partnership concept at the Woreda level, (with a national view-point). They will scale impact having learnt partnership mistakes and clarified roles at Woreda level, in preparation to grow a *National CA Movement*.

Participants of this Manual's Write-Shop explained their understanding of Barriers and Associated Drivers of PPPs:

The Participants highlighted Barriers and Drivers for workable PPPs in CA advancement in Ethiopia (Table 7.1):

Barriers	Drivers
Government is dominating Extension Services and curtailing private sector performance	Build a strong extension service, calling in for private sector partners
Weak participation and voice of private-sector in regulatory enforcement, to seal paths that bring in substandard inputs.	A well trained and present regulatory body to control the standards of quality of inputs among others at all levels, farm to market.
Poor access to finance by private sector entities.	Support and empower MFIs to enable access to inputs, machinery and other finance, protected under Credit Guarantees
VAT imposed on agricultural machinery and inputs, while some foreign based entities may be favoured with VAT Exemption	Create an equal playing field for local manufacturers and their competing importers an consider incentives to encourage local manufacture and sale of such items.
Extension services are strong but mostly in the production segment of value-chains, not for harvest, post-harvest and value-addition stages.	Holistic and focused extension services for crops as well as livestock value-chains and environmental protection, in financial literacy, capital-build-up, social welfare etc.

Participants of this Manual's Write-Shop explained their understanding of Government-Assisted PPPs:

- Government to take its primary policy-setting, coordination and regulation roles & structure an efficient private-sector attractive agribusiness sector.
- Government to make land-use consolidation possible, so that services along value-chains can become sizeable and attractive to investors.
- Government to assemble agribusiness stakeholders to contribute towards formation of agribusiness Centres of Excellence where information-sharing and networking can become routine and purposeful.
- Stakeholders to generate crop and livestock value-chain business models that will sustainably support CA and CSA, driven at the level of farmer cooperatives

Attitude

(The WHY)

i.e. Justification of Having PPPs

Participants of this Manual's Write-Shop felt PPPs are necessary because The Government needs to:

- Encourage and ***support farmers to have a voice***, to choose the right technologies, value-chain partners and markets, to contribute towards sustainable projects and general development.
- Facilitate easier and wider door-step ***access to inputs***, wider options of agro-services, technology & finance by farmers and other end-users.
- Support ***closer linkages between value-chain players*** and enhance efficiency of farming activities while encouraging and teaming with private sector (other than competing with them) to take the load off Government services and workers.
- Support private sector initiatives and practitioners with ***regulations and policy*** that recognize their efforts and products, including patenting services.
- Help coordinate CA initiatives and practice through ***larger scale and linked Model Farms and Centres of Excellence*** from where PPPs can be centred and technologies practiced, demonstrated and coordinated.
- Create links for Government to work with private sector providers to ***train and support*** the performance of both ***Government and private extension agents.***
- Work systems and processes that will ***avail finance and foreign exchange*** to private practitioners, to access foreign technologies, materials and services that will build a strong industrial manufacturing and a foreign trading sector.

Why do we need Agro-PPPs?

- PPPs in Agriculture are needed, to help ***modernize*** the agriculture sector and ***deliver multiple benefits*** that can contribute towards ***sustainable agricultural development*** that is inclusive of ***smallholder farmers*****.**
- The major ***goal of integrating PPPs*** in the development ***strategy and policy*** of developing countries is to build a society that improves the attainment of the 4 values: ***efficiency, equity, sustainability and security*** (*Urio, 2010*).
- PPPs are needed especially to address the complex and multi-faceted, multi-sectoral problems inhibiting productivity gains, such as ***pest and disease outbreaks, climate change impacts, commercialization and adoption of mechanization (among other inputs), post-harvest losses, poor product quality and food safety.***

PPPs in Climate-Smart Agriculture are needed because of *Comparative Advantages* as well as the *Weaknesses* of Partners involved:

- **Private business entities** are profit driven and tend to employ innovative platforms, lean management and profit maximization strategies within their management approaches.
- **Government agencies** suffer from high budget spending. Without the efficient project oversight, their commercial social-service facilities usually cripple and shut down when external funding dwindles.
- **Smallholder farmers** work well, curtailed by harsh & low-external-input environments. On their own, they do not generate adequate business to know about and fund expensive inputs like Organic Fertilizers & CA mechanization.

Agro-PPPs appeal to policy-makers and practitioners of agricultural development for 4 main reasons:

1. **Potential to leverage financing**: PPPs help Governments mobilize additional resources from the private sector. High levels of investment are required to unleash the potential of agriculture for sustainable development and poverty reduction
2. **Risk sharing**: Government lowers the risk (of working with many disjointed smallholders ,who have low-returns and high transaction costs) through market incentives, institutional mechanisms and an enabling regulatory environment.
3. **Innovation and market access**: emanates from tapping into the powerful innovation and efficiency of the private sector, while promoting the pursuit of sustainable agricultural policy objectives.
4. **Food security and inclusion:** Mega-PPPs are global multi-stakeholder partnership platforms that promote large-scale investments in agriculture with a view to fostering smallholder inclusion & food security in limited-income economies.

Practice

(The HOW)

i.e. Recommended Practice or PPPs

Participants of this Manual's Write-Shop suggested ways of making PPPs workable and effective in Ethiopia's CA advancement venture:

- ***Government role be policy-setting, coordination and regulation*** towards an efficient agribusiness sector, attractive to private-sector practitioners.
- Government to make ***land-use consolidation*** possible, so that services along value-chains can become sizeable, coordinated and economical
- Government to ***assemble agribusiness stakeholders to dialogue*** over formation of agribusiness Centres of Excellence in offices and in the field, hence, routine information-sharing, dynamism and commonness of purpose among stakeholders.
- Stakeholders to generate crop and livestock value-chain ***CA and CSA business models***, built around the ***genderlized and age-differentiated*** **knowledge and skills of farmers**' cooperatives and service providers.
- ***Government to intentionally build hard and soft infrastructure*** - from roads and storage to ICT – Software platforms (databases and information access Apps)
- Stakeholders ***to learn from elsewhere, to modernise their value-chains*** and that which supports their integration in support to CA principles.
- Stakeholders to strive to understand the guidance of the Africa Union & FAO *led* ***Sustainable Agricultural Mechanization for Africa (SAMA) movement*** and from models like the Agrimech Africa Ltd Mechanization Hubs, to make mechanization efforts workable.

Strategies in achieving workable PPPs…

- ***Privatization*** and removal of barriers to private investment in key sectors.
- ***Promoting gender equality*** in order to realize and yield large economic benefits over time by closing gender gaps in educational attainment, formal labour force participation rates, and access to quality land among other resources.
- Reviewing the strategy and financial model of the Government’s development lending agency, ***The Development Bank of Ethiopia***.
- Putting in place a more ***flexible system for the exchange rate*** *is also needed to* ***increase foreign exchange reserves****, improve* ***external competitiveness***, and increase the availability of foreign exchange
- ***Establish The PPP Directorate:*** to promote PPPs, conceptualize, identify and categorize projects, make recommendations, establish policy guidelines, coordinate activities and ensure compliance.

Ethiopia formed a PPP Directorate in 2018

Aim of the Directorate: Develop an open and inclusive economy where PPPs play an important role in strengthening growth by promoting private sector development and the provision of public services, while reducing government costs.

A PPP Board was setup to including:

- The Ministry of Finance and Economic Co-operation (Chairing),
- The National Bank of Ethiopia,
- The Ministry of Water, Irrigation and Electricity,
- The Ministry of Transport,
- The Ministry of Public Enterprises,
- The National Planning Commission,
- The Ministry of Federal and Pastoralist Affairs and
- Two members from institutions representing the private sector.

The *Agricultural Transformation Agency (ATA)* is an important body in the Ethiopia PPP Process: *(Box 7-1)*

ATA Vision: Commercialised smallholder farmers with greater incomes, inclusiveness, resilience, and sustainability, contributing to Ethiopia's achievement of middle-income country status by 2025.

ATA Mission: Address system constraints and develop sustainable value chains, to catalyze the transformation of the agriculture sector.

ATA Goals are to:

1. To ***conduct studies*** to identify systemic constraints of agricultural development & make recommendations towards sustainability and structural transformation.
2. To ***support implementation*** of recommended solutions.
3. To support the establishment of ***strong linkages among agricultural projects and related institutions*** in order to ensure the effectiveness of agricultural development activities.
4. To ***manage and lead the implementation*** of specific solutions as projects.

ATA Approach

Support partners to identify and address systemic bottlenecks within an ***Agricultural Transformation Agenda.***

Support partners to integrate solutions to systemic bottlenecks in specific crop commodity value chains and geographies through the ***Agricultural Commercialization Clusters (ACC) Initiative***.

Support the Ministry of Agriculture and Livestock Resources (MoALR) on specific pre-defined aspects of livestock commodity value chains components in the ***Livestock and Fisheries Sector Development Project (LFSDP).***

Exploit its capabilities and strengths, and learning through performance and impact evaluation to support and ***Enhance Impact.***

How ATA Works

Fig 7-4

ATA Leadership:
Mandated by National and Regional Governments

ATA Approach

1. Agricultural Transformation Agenda
2. Agricultural Commercialization Clusters (ACC) Initiative.
3. Livestock and Fisheries Sector Development Project (LFSDP).
4. Enhancing Impact

Production and Productivity Projects

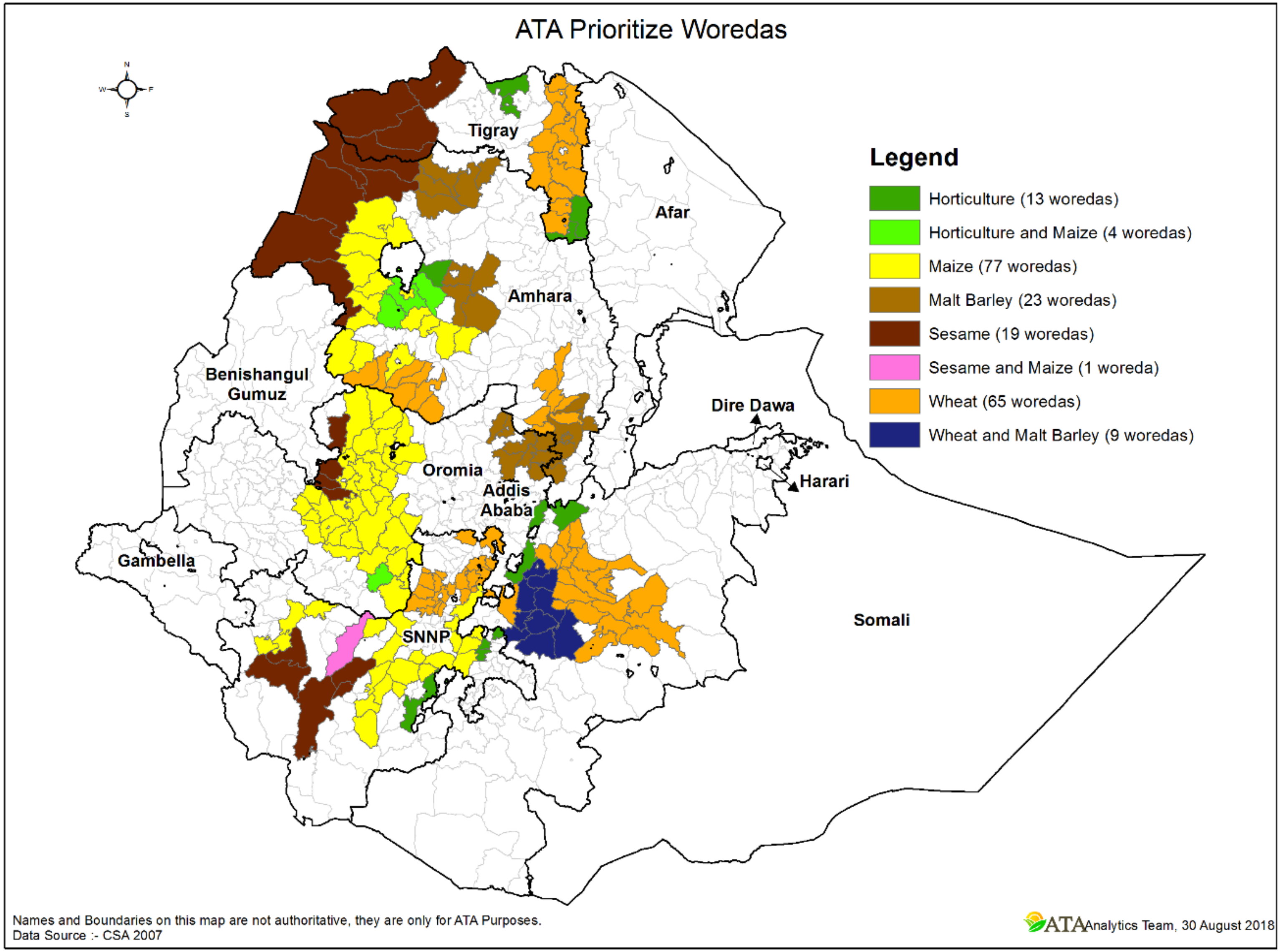
- Inputs Projects
- Soil Health & Fertility Projects
- Irrigation & Drainage Projects
- Research & Extension Projects
- Mechanization Projects
- Livestock Projects

Agribusiness and Markets Projects

- Rural Financial Services Projects
- Private Sector Development in Agriculture Projects
- ICT for Agricultural Services Projects
- Market Infrastructure Projects

ATA Priority Woredas:

Fig 7-3



ATA works through Project Implementation…

Some projects are exploration of new ideas whereas others are the full national scale-up. Projects that the ATA is asked to lead are directly identified by the Government and have the full support of the Agricultural Transformation Council, the Ministry of Agriculture and Livestock Resources and the Regional Governments where these activities are being undertaken.

ATA Projects fall under 2 Broad Categories:

1. **Production and Productivity Projects** and

2. **Agribusiness and Markets Projects**

Production and Productivity Projects

Production and Productivity Projects

The ATA is implementing 15 projects geared towards rapidly improving the production and productivity of crop and livestock commodities. Projects range across **six programmatic areas:**

1. Inputs Projects
2. Soil Health & Fertility Projects
3. Irrigation & Drainage Projects
4. Research & Extension Projects
5. Mechanization Projects
6. Livestock Projects

Input Projects:

1. *Commercial Farm Service Centers*
2. *Cooperative Based Seed Production*
3. *Direct Seed Marketing*
4. *Agricultural One Stop Shop*

Soil Health & Fertility Projects

To digitally map Ethiopian soil resources and establish a soil information system to be used by smallholder farmers and policy makers for accurate decision-making on fertilizer use in the country and to provide evidence to address problematic soils.

Irrigation & Drainage Projects

Integrated Shallow Groundwater Irrigation Development:

To enhance access of smallholder farmers to groundwater-based irrigation practices to increase production and productivity of vegetables, field crops, and fodder.

To enable smallholder farmers to adapt to climate change by reducing dependence on increasingly erratic rainfall:

- shallow groundwater mapping,
- promotion of business groups around shallow groundwater development,
- promotion of irrigation equipment supply chains and retailing,
- promotion of high value and nutrition dense crop production and marketing, and capacity building.

Research and Extension Projects

Agro-meteorology: Development of climate change resilient smallholder farming, enhancing agricultural productivity through the use of real-time and user-tailored weather and climate information.

Climate Smart Innovation at Farmer Training Centres: Increased agricultural productivity through demonstration of climate-smart agriculture and gender sensitive practices at targeted FTCs, towards a Green Economy.

Tef Improvement Project: Food and nutrition security: develop improved high yielding teff varieties that perform well in adverse environmental conditions

Innovation Validation: Transformation of smallholder agriculture through innovative technologies that impact production and productivity, market-pull of identified ACC commodities and agro industrial parks (IAIPS)

Accelerated Full Package Scale-Up Pilot (AFPS): To promote application of the full research-recommended package at an accelerated rate by smallholder farmers.

Business Training at Farmer Training Centres Pilot: Business training for farmers to intensify production and diversify enterprises to improve their livelihoods.

Mechanization Projects

Teff Row-Planter: Identify and procure tractor mounted row planters for teff, potentially applicable to other crops such as wheat and sesame, for demonstration to smallholder farmers.

Mechanization Service Center Pilot: To improve the access of smallholder farmers to mechanization services through Mechanization Service Centres (MSC) in selected high-potential areas. Cooperative and non-Cooperative actors to own and run the MSCs and deliver mechanization services.

Livestock Projects

Apiculture Value Chain Development with 3 main business opportunities:

1) Growing demand in the domestic and export markets, to expand production and processing opportunities;
2) Niche market buyers to pay higher prices for improved quality and differentiated products and byproducts
3) Scaling up for organized women and youth groups and entrepreneurs engaged in honey production and marketing.

Agribusiness and Markets Projects

Agribusiness and Markets Projects

Projects geared towards rapidly developing the agribusiness and agricultural marketing sub-sectors. Four programmatic areas:

1. Rural Financial Services Projects
2. Private Sector Development in Agriculture Projects
3. ICT for Agricultural Services Projects
4. Market Infrastructure Projects

1. Rural Financial Services Projects

- *Input Voucher Sales System*
- *RuSACCO Capacity Building*

2. Private Sector Development in Agriculture Projects

- *Ethiopian Agribusiness Acceleration Platform*
- *Ethiopian Investment Commission Support*
- *Agriculture Trade and Investment Promotion*

3. ICT for Agricultural Services Projects:

- *8028 Farmer Hotline (IVR/SMS)*
- *Agricultural Investment Mapping using ETH-AIM tool*

4. Market Infrastructure

- *Cooperative Storage Pilot*
- *National Market Information System*
- *Market Centre Development Project*

As ATA leads the Agribusiness Value-Chains and CA/CSA Efforts in Ethiopia: *Key areas of further improvement are:*

- ***Empowering farmer and consumer organizations, women and youth:*** Collective actions by farmers and consumers are key to driving transformational change in food systems - to create enabling environments that encourage producers, business owners, researchers, investors and policy makers to innovate in ways that promote gender equality and opportunities for youth.
- ***Digitally enabled climate-informed services:*** Agriculture is behind many sectors in the application of information and communication tools including disruptive technologies and big data, in extension, early response systems and adaptive safety nets.

As ATA leads the Agribusiness Value-Chains and CA/CSA Efforts in Ethiopia: *Key areas of further improvement are:*

- ***Climate-resilient and low-emission practices and technologies:*** To enhance resilience and enable farmers to take low emissions development pathways are crucial.
- ***Innovative finance to leverage public and private sector investments*****:** Mobilizing the finance needed to drive a food systems transformation, identifying financial mechanisms to de-risk private capital.
- ***Reshaping supply chains, food retail, marketing and procurement*****:** Reshaping supply chains from farm to fork, new models of business-to-business coordination, new diets and consumer choices conscious of eliminating food loss and waste.

Making PPPs work for Ethiopia: *Transforming food systems under a changing climate:* *Fig 7-5*

As ATA leads the Agribusiness Value-Chains and CA/CSA Efforts in Ethiopia: *Key areas of further improvement are:*

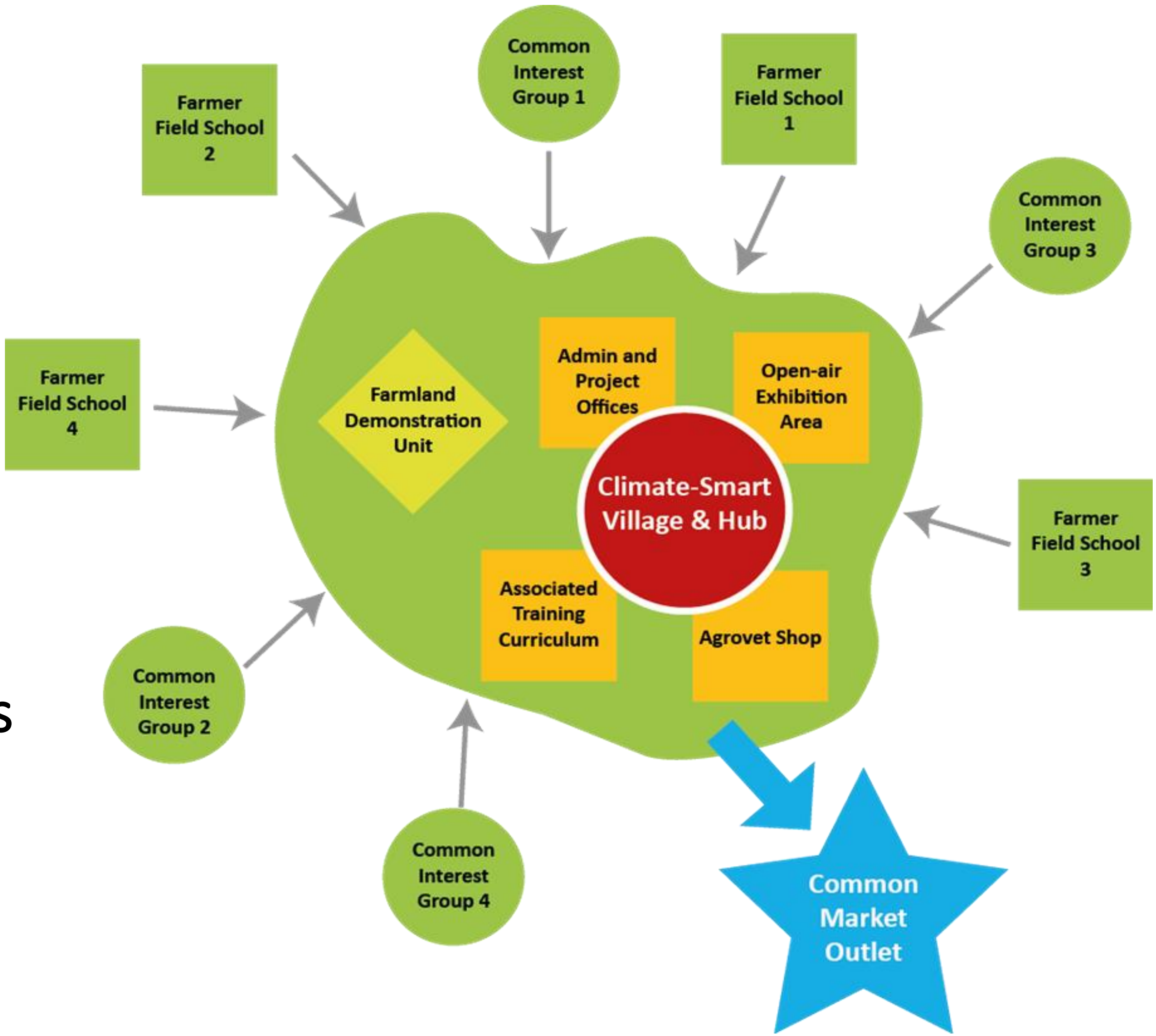
- Learning from the Continental ***Sustainable Agricultural Mechanization for Africa (SAMA)*** Movement: *The Private sector led framework and solution for mechanizing CA Efforts in order to make rapid progress in CA/CSA adoption by farmers.*
- Learn from the ***Agrimech award winning Agricultural Mechanization Service Hub (AMSH)*** to strengthen and progress her Mechanization Service Centres (MSCs) and Farmer Service Centres models faster and more inclusively of the private sector.
- Progress towards formation of Communities of Practice in the form of ***Market-Linked Climate Smart Villages as Centres of Excellence***, composed of Farmer Field Schools and Common Interest Groups, connected to privately run Model Farms under Stakeholder Climate Smart Village Committees which collect self-supporting management revenues form ongoing Hub services.

ATA Mission Exemplified

Fig 7-6: Strategic Partnerships that close value-chain gaps

Figure 7-7:

ATA Mission Exemplified (Working through Agribusiness & Mechanization Service Hubs and Farmer Service Centres Under a Climate Smart Village Committee of Stakeholders

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Module 8

How to Monitor and Evaluate CA Advancement

Learning Outcomes

At the end of this Module the User will be able to:

- Define what Monitoring and Evaluation (M&E) is;
- Describe how CA implementation will improve as a result of using M&E;
- Specify the scope and scale of applying M&E for CA advancement;
- List the main performance questions that will be investigated in applying M&E for CA advancement;
- Develop generic M&E plans for the promotion of CA;
- Describe how to use the M&E plan.

Motivational note!

- ✓If you do not measure results, you cannot tell success from failure;
- ✓If you cannot see success, you cannot reward it;
- ✓If you cannot reward success, you are probably rewarding failure;
- ✓If you cannot see success, you cannot learn from it;
- ✓If you cannot recognize failure, you cannot correct it; and
- ✓If you can demonstrate results, you can win support from Bank, government , farmers etc.

Knowledge

(The WHAT)

Monitoring and Evaluation:

Is a pillar that helps to improve performance and achieve impact

- Is a management tool
- was initially introduced to **prove to tax payers** that the money collected is not wasted
- However, it has now become key part of project implementation

Group exercise: *Do it individually and in trio.*

- What is Monitoring for you ?
- What is evaluation for you ?
- What is the status of M&E implementation in your organization ?

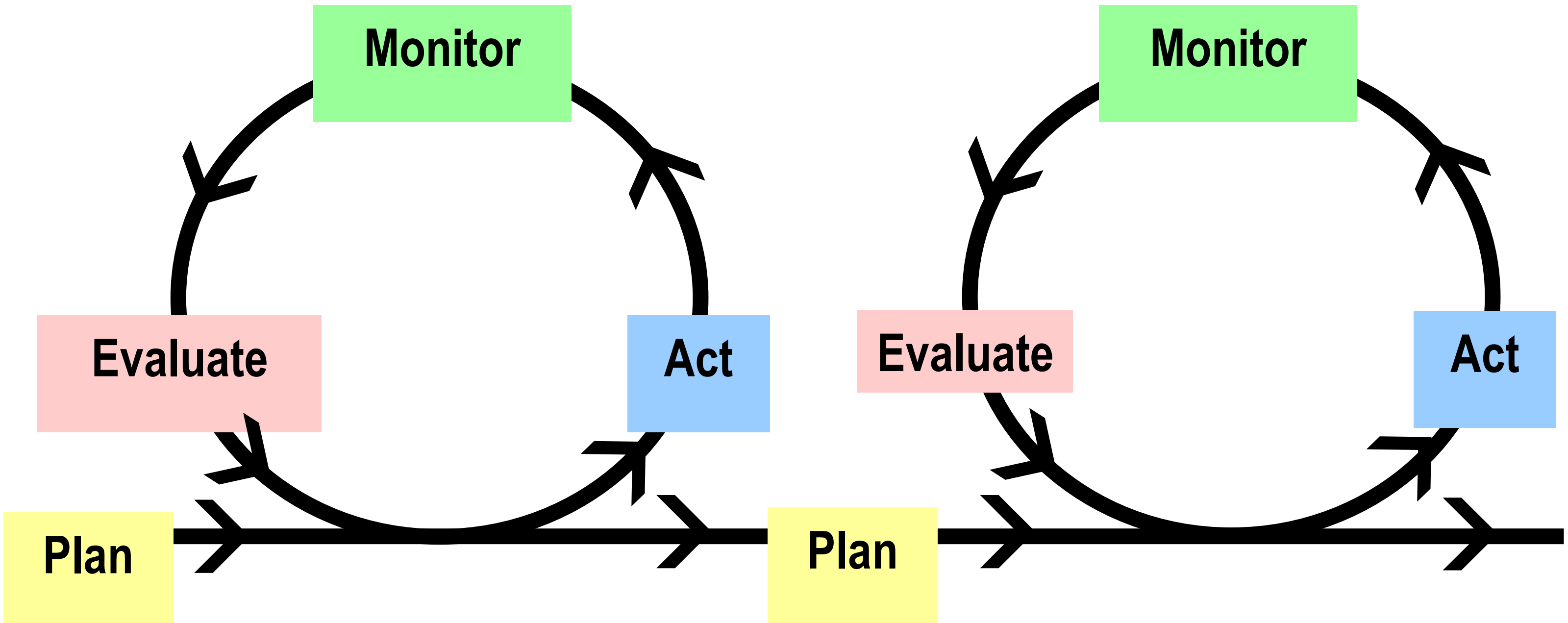
What is Monitoring and Evaluation?

Monitoring and evaluation (M&E) are two complementary but when seen from the way data is collected and used they could be considered as distinct processes (World Bank, 2002)

- *Monitoring*
  - tracking of inputs, activities and outputs as stated in the project plan. Occasionally it (monitoring) includes the monitoring of outcomes and other aspects of the project like impact, on a pre-identified time frame during the project implementation period.
- *Evaluation*
  - periodic activity to measure the results of interventions, which include the outcomes and impacts.

What is Monitoring and Evaluation?

- An <u>integrated</u> process of <u>continual</u> gathering and assessing information to;
  - Make judgments about progress towards particular goals & objectives
  - Identify unintended positive/negative consequences of action & insights into *why*



Similarities and differences between monitoring and evaluation

Monitoring	Evaluation
• **Continuous** data collection based on agreed frequency and set indicators • Tracks and analyse progress and attainment of objects **mainly in activities and outputs** • Mainly conducted by internal person using **in-house** data collection tools • Helps to refine and **adjust operations**	• **Periodic** data collection on set indicators and some times without • Measures progress and performance **mainly in outcome and goal/impact** • Carries a thorough analysis of linkages and **attributions through set criteria** • Mainly conducted **by external person** using tailor made data collection tools • Helps to refine and adjust **the project Table of Contents**

Attitude

(The WHY)

Why M&E?

We have implemented but shouldn't we know what is happening including from our stakeholders

Source: inProgress

Why M&E?

Contexts & other things change through time. Therefore, we cannot ignore this & continue to implement. We need to monitor & evaluate this.

Why do we need M&E in CA Advancement?

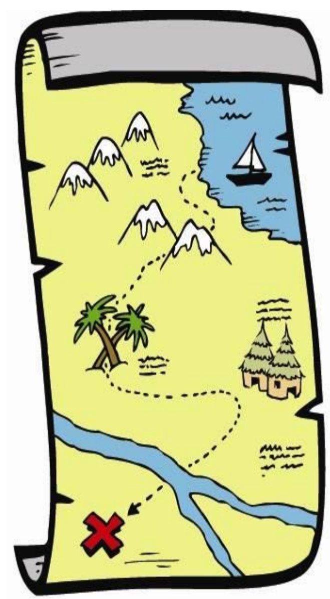
A well planned and managed M&E plan will guide:

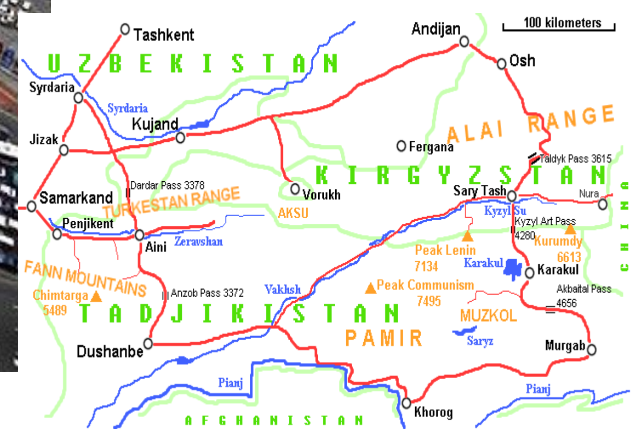
- The assessment of what is achieved against what was planned, while reflecting on why or why not, including what could have been done differently;

- The tracking of the progress that has been made in CA advancement at individual, community, regions and national level, including the reasons ; and

- To stimulate informed decision-making and ultimately improved program implementation by all stakeholders through establishing an in-built mechanism to stimulate critical questioning and learning.

M&E helps in staying orientated: Where are we, how are we doing, what's happening around us and in what direction are we heading?





Practice

(The HOW)

Setting up the M&E system for CA advancement

Questions that need to be answered in designing and carrying out M&E

- Why do we want the M&E system?
- Who will we use the results?
- What will be the unit of scale and the scope of the evaluation?
- What information needs to be collected?
- What tools should be used to collect and analyze information?
- How should the M&E results be utilized?

M&E plans can be organized to fulfill two complementary objectives:

- Proving: Reporting what has happened as well as what has resulted because of the CA interventions to different stakeholders (mainly for accountability and operational management).

- Improving: Organizing the data mainly to improve implementation of the CA endorsement (mainly for learning and strategic management)

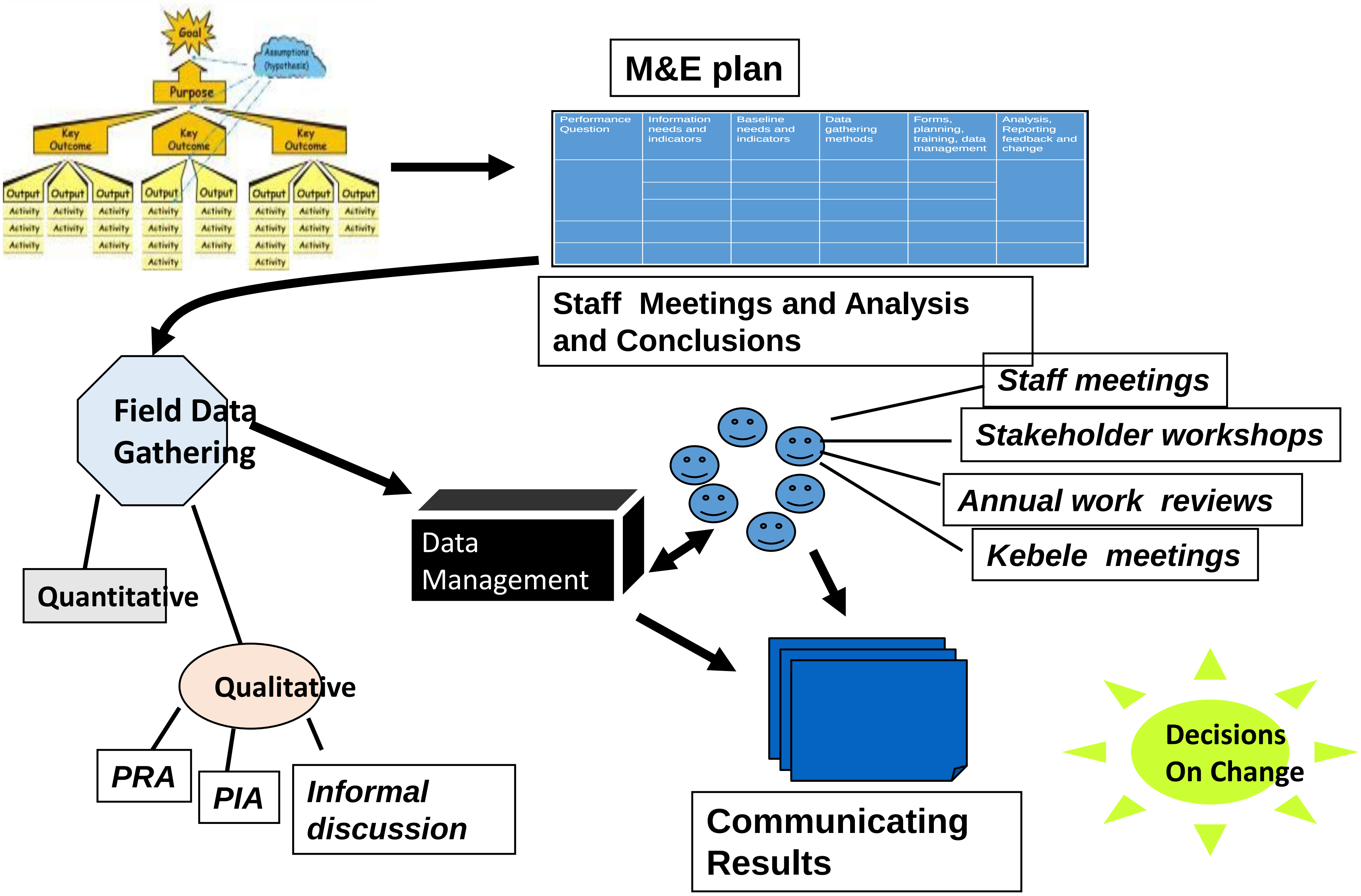
The main focus of this module is using M&E for learning and strategic management.

How to organize a useful M&E in CA advancement?

Three key stages:

1. Identifying the performance questions that will guide the whole data collection process;
2. The data collection process; and
3. The utilization of the findings from the data, referred to as “knowledge management”.

Data Journey for CA advancement



How to measure performance in M&E ?

Performance can be related to 6 main evaluation criteria (OECD/DAC criteria):

- Coherence
  - *How well does the intervention fit?*
- Effectiveness
  - *Is the intervention achieving its objectives?*
- Efficiency
  - How well are resources being used?
- Relevance
  - *Was it the right thing to do?*
- Impact
  - *What difference will it make to the lives of the people?*
- Sustainability ?
  - *Will the benefit go beyond the life of the intervention?*

Possible CA Performance Questions

- What is the status of CA implementation at individual, community regional and federal levels?

- What are the users' perceptions about the different aspects or practices of CA? Why?

- What are users' perceptions about the productivity and profitability of the results of CA? Why?

- What are the challenges of CA advancement at individual, community, regional and federal level?

Data collection tools and methods

Plenary exercise

- What kind of data have you collected?

- What kind of data collection tool you used for that?

- Analyze why you selected the specific tool?

Process: participants reflect individually then share to the plenary

Methods for data collection

Could be:

1. Qualitative or quantitative (or mixed)
2. Individual or group based
3. Participatory or non-participatory

When selecting information data collection methods:

- Be clear about the data to collect, collate, analyze or feedback
- Check other sources of collecting data e.g. secondary sources – possibility to get some from Ministry of Agriculture
- Ensure that the methods of information gathering are in line with the purpose and scope of the M&E
- Decide frequency
  - Immediately after the action (e.g training on CA); weekly, monthly, quarterly , bi-annual, annual, at the end of the program.

Data collection methods used for different purposes and information needs

- **Group discussion**
  - E. g Focus group discussions (FGD), *etc.*

- **Spatially-distributed information**
  - E.g. GIS Mapping of a farm , *etc.*

- **Time-based patterns of change**
  - E.g. Historical Trends and Timelines, *etc.*

Data collection methods used for different purposes and information needs

- **Ranking and Prioritizing**
  - e. g. Ranking and Pocket Charts, etc.

- **Widely used**
  - e.g. questionnaire surveys, etc.

Our information needs in CA advancement and possible data collection tools

Perception of farmers on APPLICATION OF THE CA TECHNOLOGIES introduced in the farmers training sessions.

FGD based data collection tool prepared and used at different administrative level of Ministry of Agriculture.

The tools give the following choices:

i. I tried what we were taught on my farm WITH NO PROBLEMS.
ii. I tried what we were taught on my farm WITH PROBLEMS.
iii. I did not try what we were taught on my farm.

Our information needs in CA advancement and possible data collection tools

Usefulness of the CA technologies introduced in the farmer training sessions

- For each of the following parameters, beneficiaries will be asked how they would rate CA?
  i. Easiness to understand;
  ii. Easiness to use/apply;
  iii. Easiness to get required inputs;
  iv. Labour requirements;
  v. Quantity/ produced;
  vi. Overall Profitability; and
  vii. Overall satisfaction with CA technology.

Utilization of M&E information

Requirement for effective utilization of the M&E information:

- Clear vision, strategy and plan – e.g. CA innovation platforms at Woreda level with collaborative links to Federal, Regional & Zonal levels

- Inclusion of the M&E process in CA projects cutting across above levels

Possible uses of the M&E findings

1. Report preparation:
   - Regular, quarterly, bi-annual and annual; and
   - Therefore, the regular M&E template should be adapted to include the CA advancement indicators.

2. Critical reflection for decision making and learning processes:
   - Data and information collected must go beyond reporting and accountability;
   - Be utilizable for interpreting experiences and create new insights to lead new actions; and
   - Generate project developmental & impact-adjustment details.

Possible uses of the M&E findings

Critical reflection discussion questions could be :

- "Why is it happening?"
- "What are the implications for the CA advancement?"
- “What to do next?"

Possible uses of the M&E findings

The critical reflection process can have three interdependent levels:

- Supporting internal learning within *Kebeles* and *Woredas;*
- Supporting cross-learning at the level of the organization level. For example, ministry of agriculture at all levels; and
- Supporting learning at the national level with all stakeholders engaged in CA advancement.

Information flow between three interdependent administrative levels

- ***Kebeles* and *Woredas***
  - Compiled monitoring data from each *Kebele*
  - Suggestions on corrective measures that can be taken
  - Analyzed monitoring information for Woreda
- **Sectoral level (Zones, regions, Federal)**
  - Sectorally synthesized monitoring information from each Woreda
  - Reflection results of each region and the Ministry
  - Suggestions and decision on corrective measures
- **National level with all stakeholders**
  - Suggestions and decision on corrective measures
  - National learning and decisions for way forward

Guiding questions for critical learning meetings

1. What do you feel are the main **successes** in relation to the CA advancement issue being monitored and evaluated during the last half year or so & why do you think so?

2. What do you feel are the main **challenge**s in relation to the CA advancement issue being monitored and evaluated during the last half year?

3. What do you feel should be **done differently** in the future by:
   - You as a stakeholder group or institution? and
   - The Government as a whole?

Guiding questions for critical learning meetings Contd

4. From **the lessons** you have learnt, what advice would you give to someone else trying to advance CA in another and different area;

5. To what extent have the **interventions** you have witnessed addressed the important concerns regarding:
   - Internal learning within Kebeles and Woredas?
   - Cross-learning between levels from Kebele-Woreda level to Zonal, Regional and Federal levels?
   - Supporting learning at the Federal level with all Innovation Platform stakeholders engaged in the CA advancement Movement?

Knowledge Management and Products

Knowledge Management:

- is part and parcel of the M&E process;
- involves people, processes and enabling technologies to create, capture, manage and share data and information;
- leverages know-how across organizations to improve decision making, innovations, partnerships and overall organizational results; and
- ensures full utilization of organizational knowledge such as valuable lessons and best practice.

The Knowledge Management Cycle Learning (AGRA 2019)

CA Advancement KM activities:

- Documents from various level stakeholder gatherings, both internal and external;
- Documents from various level stakeholder events or undertakings like Field-Days and Exhibitions, access to technologies or practices like new fertilizer, new mechanization arrangement, new App etc;
- Synthesis of Lessons Learnt by various parties at various levels, Workshops and Write- Shops; and
- Recording of various level collations of learning in books, documentaries and blogs.

Documentations from stakeholder engagements from Woreda to Federal level

- Policy and research briefs.
- Technical notes and national learning synthesis documents from various level reflection and learning events at all levels among all stakeholders.
- Farmer video clips: targeting farmers for enhancing the learning, adoption and scaling up.
- Extension leaflets.
- Periodic Progress Reports (quarterly, annually etc.)
- Development Impact stories and Success Case Studies
- Short stories to be placed on extension pamphlets, YouTube and WhatsApp clips, Website blogs etc.

Overview of The Knowledge Products

No	KM product	Brief description	Length	Contributes to…
1	Compiled M&E results of *Kebele* and *Woreda*	**Show data on outputs and outcomes for each area and CA components**	**Can be 6- 8 pages from each *Woreda***	**Reports progress and achievements for internal learning, organizational level and national level learning**
2	**Good practice reports**	**Describe a specific area/type of intervention and present how to implement them successfully**	**2-4 pages**	**Internal and external learning**
3	**Success stories**	**Show case individuals, communities and groups where interventions have successfully contributed to intended outcomes**	**2- 3 pages**	**Communicating successes**
4	**National learning synthesis document**	**Integrates the learning from the different learning and reflection events and good**	**15 – 20 pages**	**Internal and external learning**

Conditions and capacities for success for using M&E for CA advancement

Element	Description
Leadership	Leadership must prioritise M&E/KM, communicate its importance across the organisation and create the space and opportunity for it to be done well
Champions	Identify individuals who are passionate about learning at different levels and find ways of engaging them/enabling them to contribute
Incentives	Identify appropriate opportunities for rewarding good M&E/KM practices and learning
Compliance	Identify most critical tools and practices and build them into contracts and reporting templates, e.g. introduce concept of 'accountability for learning'
Human resources	Allocate human resources to support M&E/KM activities

Conclusion

- This module is the M&E implementation guideline, which describes how the M&E for CA advancement is to be operationalized;

- Therefore, read through the implementation guidelines and utilize the module to empower, learn and make strategic decisions that will contribute to the realization of positive change in the advancement of CA.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