Conservation Agriculture& other agr. practices

Objectives:

Participants can explain and differentiate between the following approaches /techniques:

- Conservation agriculture
- Till and no till
- Cover crop
- Mulching
- Single cropping/ Multiple cropping

Conventional tillage

Source: USDA - Natural Resources Conservation Service, http://www.epa.gov/agriculture/images/diskharro1.jpg

Mechanized systems

Source: Plowing tabacco, The CIGAR Wiki: http://www.cigar-wiki.com/images/3/36/Tabak_Pfluegen.jpg.

Animal traction

Source: Radio Kantu, http://servindi.org/actualidad/111829

Manual labour

What is Conservation Agriculture?

To conserve, improve and make more efficient use of natural resources through integrated management of available soil, water and biological resources combined with external inputs. (FAO 2015)

Source: FAO http://www.fao.org/fileadmin/user_upload/faoweb/images/Fight_Hunger/CA-overview-Infographic-steps-en.jpg

How does CA work?

© Tim McCabe / Photo courtesy of USDA Natural Resources Conservation Service. Online: https://commons.wikimedia.org/wiki/File:Cotton_Production_in_the_North_Carolina_Coastal_Plain.jpg

Philosophy of CA

- Tillage is not necessary for crop production
- Permanent all year round soil cover is essential
- Control and promotion of natural biological soil process through rotation
- Soil degradation and erosion is a symptom of an unsuitable farming system

Knowledge-intensive nature of implementing CA

- "Full" CA systems require major simultaneous changes in soil/crop management
- CA requires significant capacity building (farmers, extension, research)
- As a results-adoption is unlikely to be "immediate"

© World Agroforestry Center/ Craig Jamieson

Source: Antônio Cruz/ABr https://upload.wikimedia.org/wikipedia/commons/c/c2/Abr_horta_Antonio_Cruz.jpg

Area under CA per continent

Continents	CA Area (ha)	% of global total CA	% of toal arable crop land
South America	55,630,000	47.6	57.5
North America	39,981,000	34.1	15.4
Australia & NZ	17,162,000	14.7	69.0
Asia	2,630,000	2.2	0.5
Europe	1,150,900	1	0.4
Africa	368,000	0.3	0.1
World total	**116,921,000**	**100**	**8.5**

Source: Friedrich et al 2009.- http://aciar.gov.au/files/node/13993/global_overview_of_the_spread_of_conservation_agri_71883.pdf

Opportunities

- Reduction in soil erosion
- Increased water holding capacity
- Improvement of soil structure
- Biodiversity increase
- Carbon sequestration
- Organic matter increase

→ Higher yields in the long term

Source: FAO
http://www.fao.org/fileadmin/user_upload/emergencies/img/ph-zim-907-ec.jpg

Limitations

- No blueprint available, all agro-ecosystems are different
- Depends greatly on the flexibility and creativity
- Increase herbicide use →Experience has shown that herbicide use tends to decline over time as the soil cover practices prevent weed emergence
- Some land preparation is necessary in areas with heavy, poorly drained soils
- Requires new machinery with new technology → input capital may cause financial strain on farmers
- Increased reliance on herbicides; water contamination may occur
- competition about biomass (animal feed, energy, etc.)

'No-one has ever advanced a scientific reason for plowing'
Edward Faulkner. 1943. Plowman's Folly

Other agricultural practices for soil protection

Mulching / Cover crops
Mixed cropping / intercropping
Conventional Tillage / no tillage or conservation tillage


2 permanent soil cover:
crop residue or live mulch

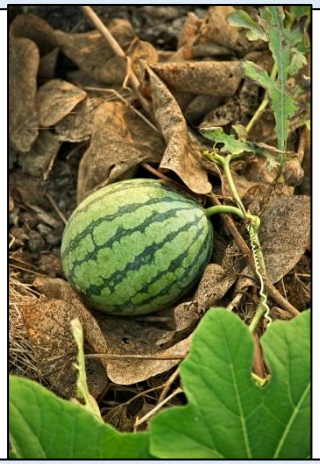
The use of mulching

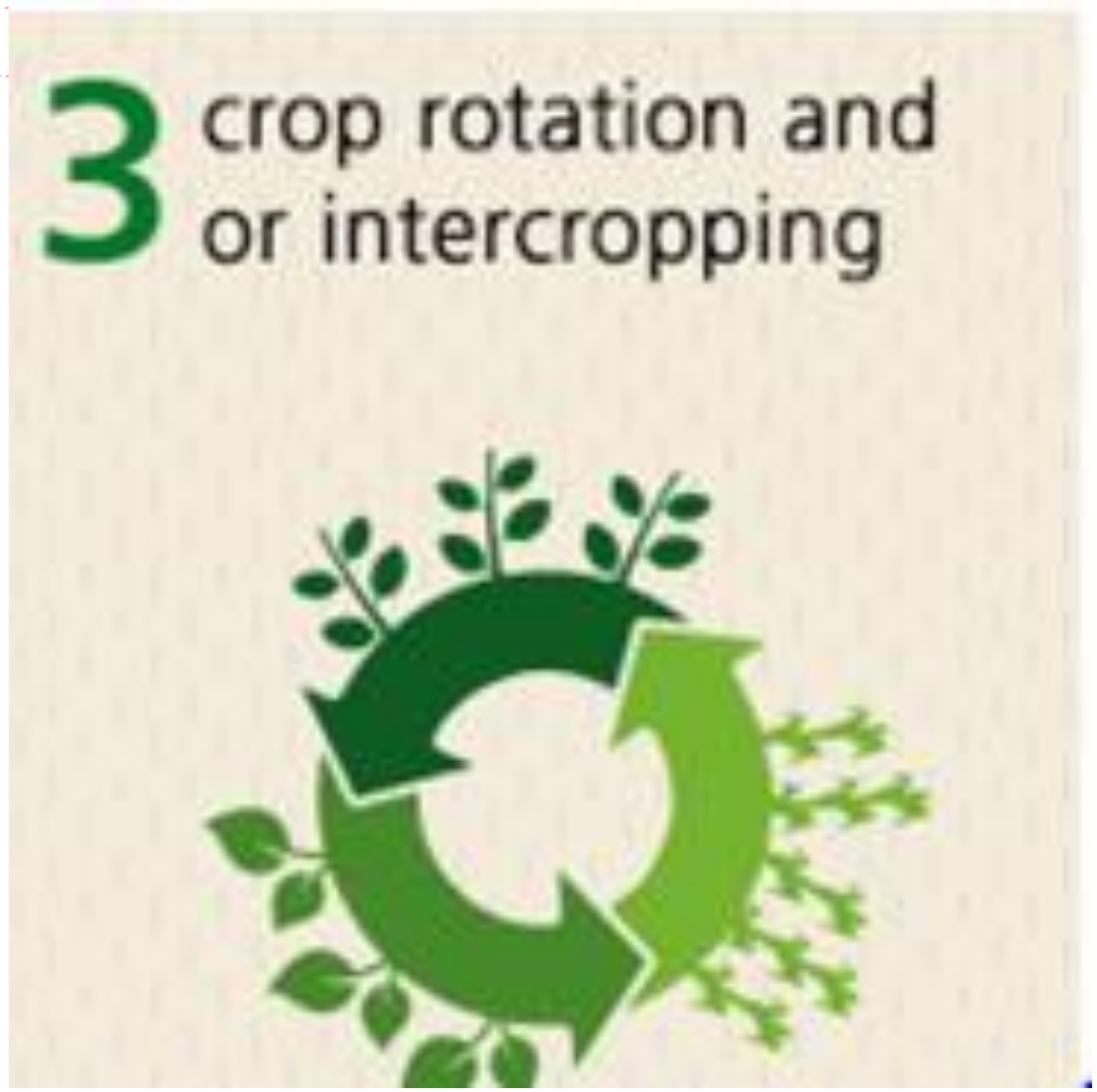
Mulching ….

- Reduces erosion
- Maintains soil structure
- Reduces evaporation
- Encourages soil fauna
- Suppresses weeds
- Reduces soil overheating

Leaf litter of Pigeon pea forms a mulching layer

Cover crops

Legumes:	Grasses:	Other cover crops:
 Source: „Medicago sativa - harilik lutsern Keilas“ von Ivar Leidus, Wikipedia	 Source: "Crotalaria juncea Da220020" by A16898, Wikipedia	 Source: "Pumpkin flower" by Vishalsh521, Wikipedia
Alfalfa (*Medicago sativa*)	**Sunn hemp (*Crotalaria juncea*)**	**Pumpkin (*Cucurbita* spp.)**
 Source: "Cowpea flower" by Abhay iarii, Wikipedia	 Source "Grain millet, early grain fill, Tifton, 7-3-02" Wikipedia	 Source: "Taiwan 2009 Tainan City Organic Farm Watermelon FRD 7962" by Fred Hsu Wikipedia.
Cowpea (*Vigna unguiculata*)	**Pearl millet (*Pennisetum glaucum*)**	**Watermelon (*Citrullus lunatus*)**


3 crop rotation and
or intercropping

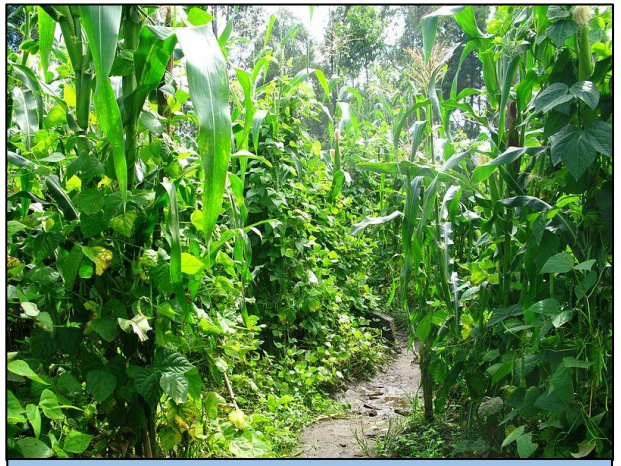
Single cropping

Source: "Field, corn, Liechtenstein, Mountains, Alps, Vaduz, sky, clouds, landscape" by Paranoid, Wikipedia

vs.

Mixed cropping

Source: "Papaya chilipepper poly Pj DSC 0857" by Kembangraps – Karya, Wikipedia



Intercropping/ mixed cropping

Source: "Intercropping maize and beans" by AnnaJB, Wikipedia

Intercropping/ Mixed cropping

Source: "Organic-vegetable-cultivation" by Hajhouse, Wikipedia

Benefits of multiple cropping

Economic benefits	Agronomic benefits	Environmental benefits
Greater yield on a given piece of land	Organic matter increase	Promotion of biodiversity
Insurance against crop failure or against unstable market prices	Improves soil fertility through biological nitrogen fixation (legumes)	Increases soil conservation through ground cover
Financial stability	Reduction of pest and disease incidence	Carbon sequestration
Lower inputs through reduced fertilizer and pesticide requirements	Restoring on-farm biodiversity	
Improvement of forage quality		

Source: https://commons.wikimedia.org/wiki/File:Intercropping_maize_and_beans.jpg

Thank you!

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On behalf of

Federal Ministry for Economic Cooperation and Development

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for Economic Cooperation
and Development