

# ECO-Farming

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# Structure

- ECO- farming – What does it mean?
- Why do we need to change agricultural practices?
- GHG emissions in agriculture
- Soil management practices
- Nutrient management
- ECO-farming means
- Benefits
- Global food loss and waste
- Excursion

# ECO-farming – What does it mean?

E – Ecological farming (less tillage)

C – continuous living cover

O – other best management practices

- Economical for farmer
- Ecological viable
- Environmentally sound

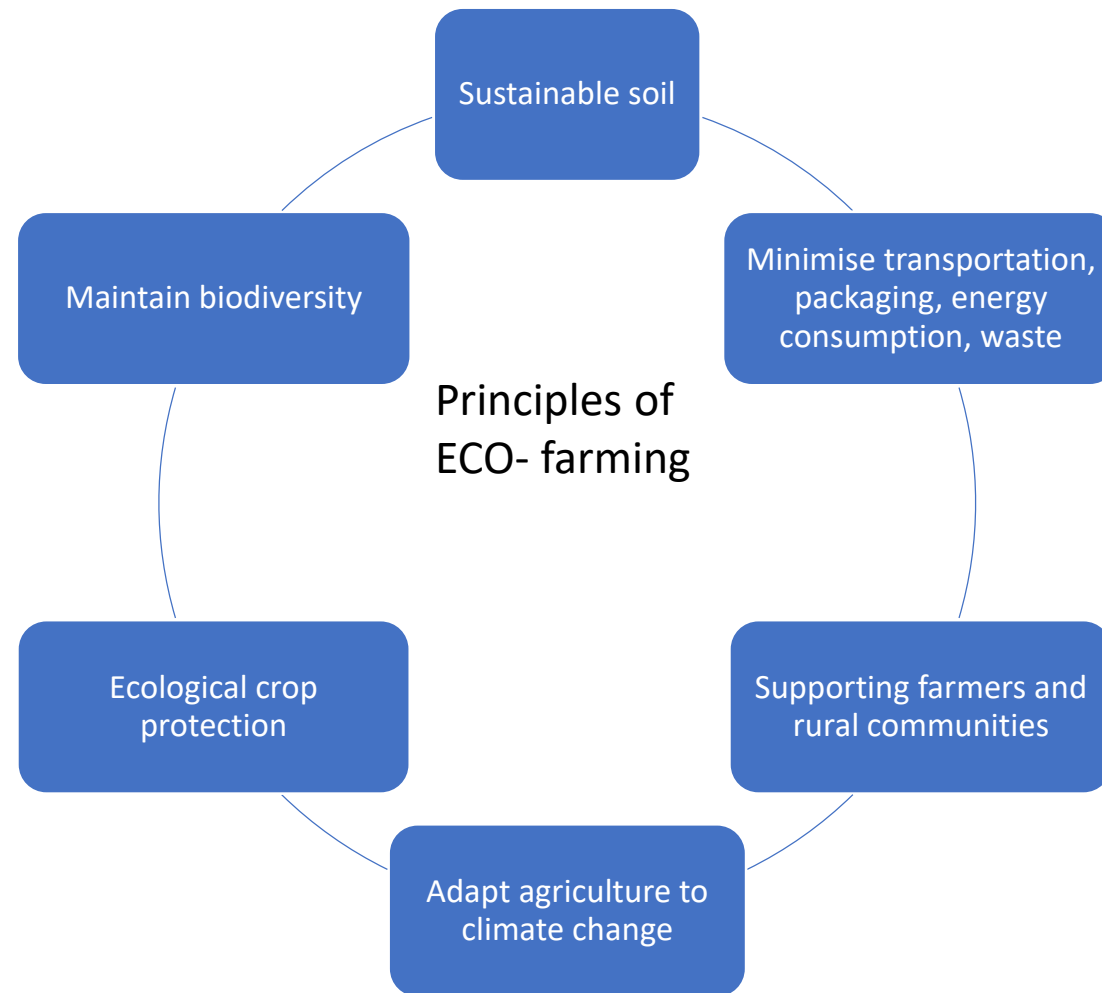
ECO Farming enhances natural cycles!

# ECO-farming – What does it mean?

Ecological farming ≠ Organic farming

- Organic farming: relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs
- ECO-farming is a holistic production management system
- Ecological farming includes all methods (incl. organic farming) which promote and enhance the ecosystem. It is based on protecting nature and minimizing the use of external inputs, such as synthetic fertilizers and pesticides
- Techniques used: no till, multispecies cover crops, strip cropping, terrace cultivation, shelter belts, pasture cropping.

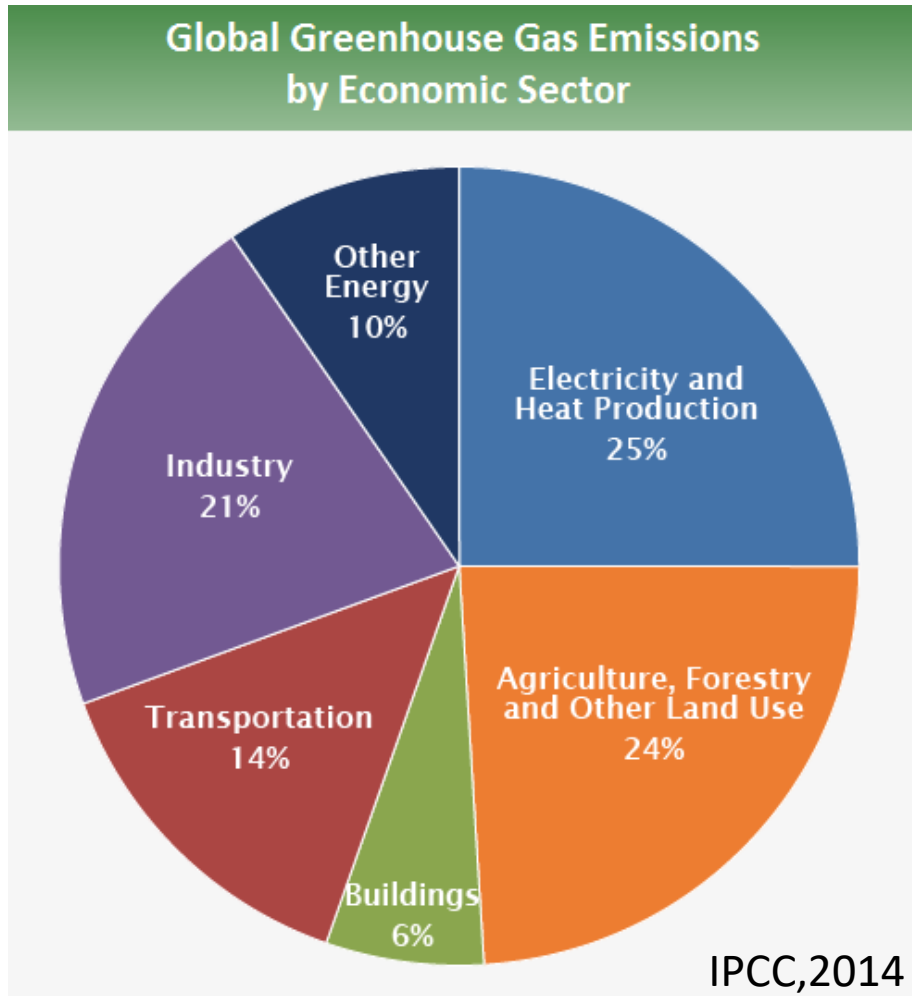
# ECO-farming – What does it mean?



# Why do we need to change agricultural practices?

- A lot of food is being produced but many people around the world are hungry and malnourished
- Ecological (soil erosion, water pollution, routine use of antibiotics leading to antibiotic resistency) & sociological problems of agriculture
- Specialised farms in different geographic areas
- Loss of crop diversity due to monocultures
- Extreme dependency on fossil fuels, (production of pesticides & mineral fertilizer)
- GHG emissions

# GHG EMISSIONS IN Agriculture



Where do they come from?

# GHG emissions in Agriculture

Sources of GHG emissions:

- CO<sub>2</sub> emissions  
→ livestock and crop production
- N<sub>2</sub>O emissions  
→ livestock, nutrient management, tillage, crop production
- CH<sub>4</sub> emissions  
→ livestock production



# Soil Management practices

## Conventional Tillage

- Plants out for 4 months a year
- Loss of nutrients (N,P) and CO<sub>2</sub>
- Nutrients lost to air because no plant roots to absorb nutrients

## No Till + cover crops (ECO- farming)

- Plants out for 12 months of the year
- Nutrients (CO<sub>2</sub>, N, P) tied up in plants
- Nutrients recycled in winter and spring and forward to next crop

# Soil Management practices

## Soil Organic matter (SOM) consist of:

- Living organisms (roots, bacteria, micorrhizae)
- Crop residues, dead plants, microbial biomass, animal residues
- Humus, stabilized organic matter

→no- till and crop rotation is a technique that improves SOM (C)

# Soil Management practices

Management	Soil health	Air/ Water quality and Productivity
reduced tillage, cover crops, prescribed grazing, high biomass rotations, manure management	organic matter, water holding capacity, soil organisms, soil structure, infiltration, nutrients	fewer pollutants, less dust, less sediment, drought and disease resistance

# Soil Management practices - summary

- Organic input is important to keep soil healthy!
- Managing soil organic matter is the key to air and water quality!
- Management of soil impacts soil nutrient recycling and nutrient availability
- Reducing tillage is a important step for healthy soils. Cover crops is the second step
- Eco- farming activity enhance natural process and restore soil health

# Ecological weed management

- Problem of less tillage: weed control!

Benefit of soil turning: ecological weed management

- Cultural weed control:

Plant competitive crops or cover crops

- Mechanical weed control:

Cultivation or mowing before developing of weed seeds

Using a harrow to pull out the weed



# Nutrient management



- GHG emissions from livestock production through storage and application of manure
- Agriculture activities account for 90% of ammonia emissions to the air



Source: European Commission, 2017

# Nutrient management –storage & recycling

- Not crushing natural crust of cow manure
- Covering storage tanks (expensive)
- Anaerobic digestion

# Nutrient management – Anaerobic digestion

- Nutrient recycling → organic fertilizer
- Opportunity for liquid and solid separation
- Lower odour and pathogens compared to manure
- Reducing of GHG emissions (in-field & storage)

--> Good digestate management will further enhance GHG reduction benefits!



# Nutrient management - Application

- Perfect timing for the plants to absorb nutrients
- Good weather conditions (heat/ heavy rainfalls)
- Quantify nutrient requirement (residues left on field)
- Technics (reduction of ammonia emissions 30-70%)

Injection, trailing shoe, trailing hose

# Eco-farming means:

- Minimize input from off-farms (fertilizer, seeds, fuel, machinery, pesticides, animal feeds)
- Local sale of products (direct contact to customers)
- Maximize use of local nutrients (nutrient recycling, efficiency)
- Minimize losses that impact off-farm resources (nutrient run-off or pesticide leaching)
- Mix animal and crop production if possible

# Ecological benefits

Reducing usage  
of pesticides,  
mineral fertilizer

Reducing GHG  
emissions

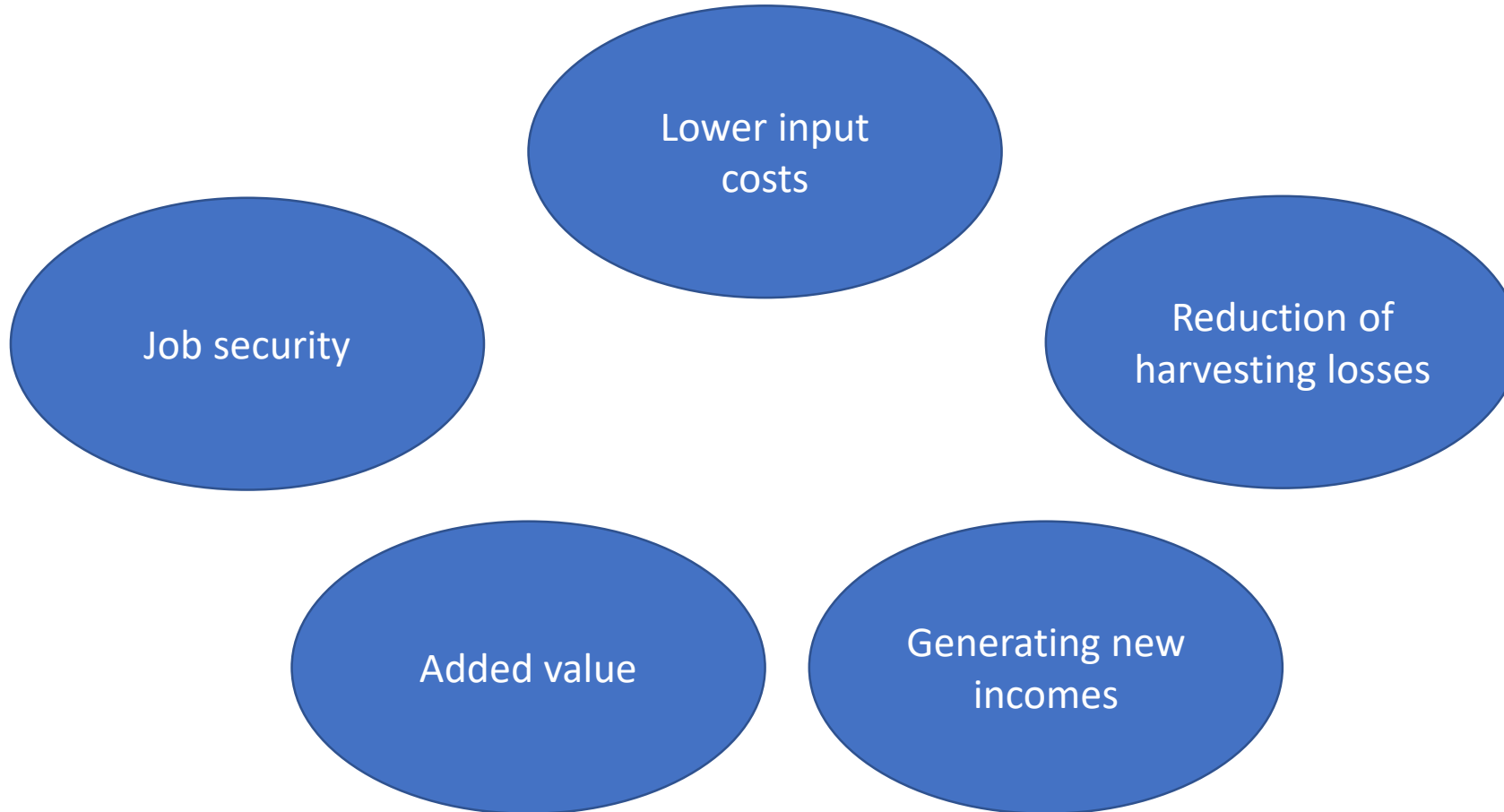
Healthy soils  
with controlled  
erosion

Encouraging  
biodiversity

Supporting  
water health

Supporting  
animal health

# Economic benefits



# What else? Problems of the food system

## Share of global greenhouse gas (GHG)

- Aviation 1.4 %
- Iron and steel 3.3 %
- Food loss and waste 8.2%
- Road transport 10 %

IEA, 2014

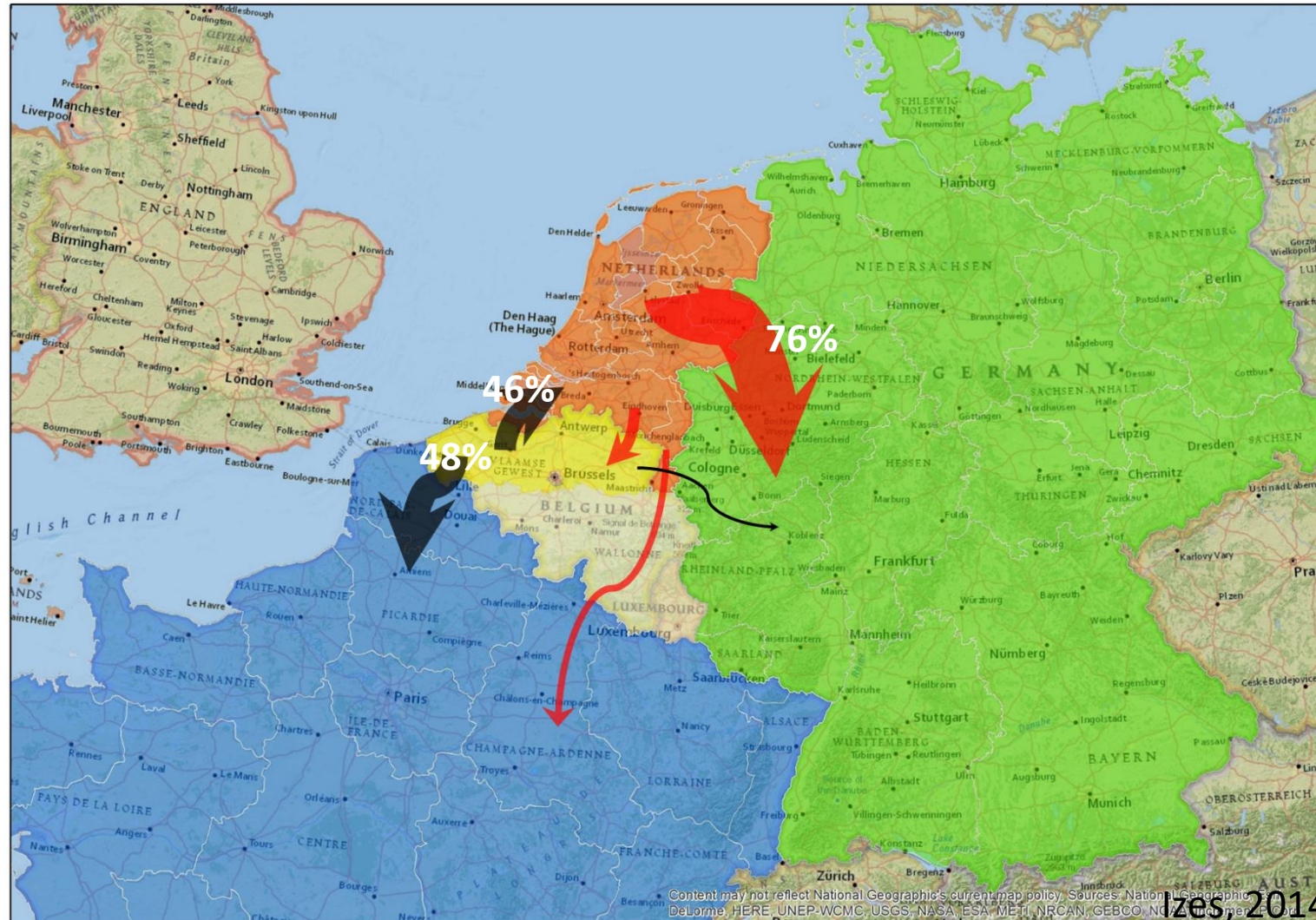
# Summary

- Agriculture positively and negatively affects climate and the other way around!
- Everyone can influence the impact made by agriculture!
- There are a lot of small measurements available but in total many small steps can have big results!

# Excursion: Environmental problems of agriculture in Germany

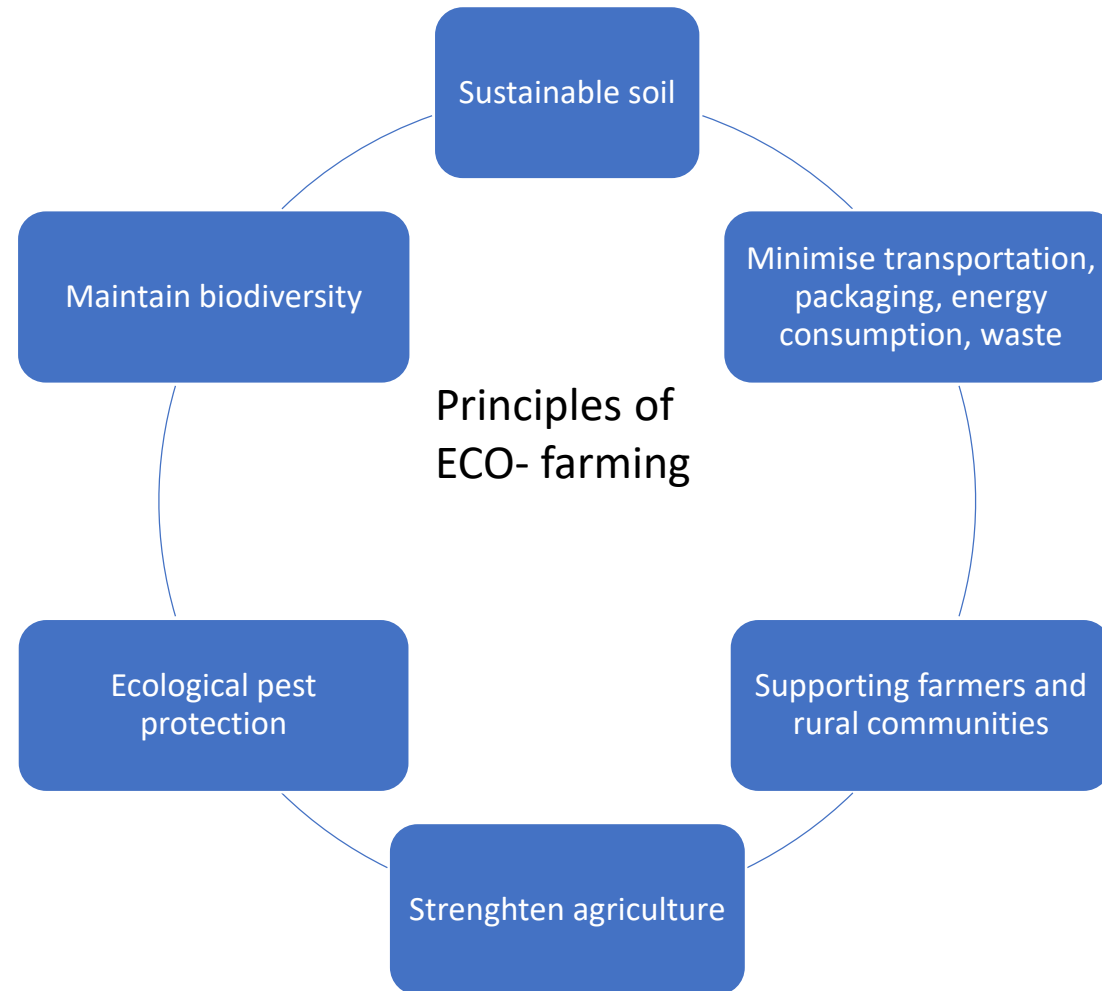


# Manure transport





# ECO-farming – What does it mean?



# Biodiversity

**What is biodiversity**

**and**

**how can we integrate it within the agricultural sector?**

# Structure

- What is biodiversity?
- Types of biodiversity
- Type of ecosystems
- Importance of biodiversity
- Threats of biodiversity
- How agriculture affects biodiversity
- How can agriculture support biodiversity

# What is biodiversity ?

**BIO** = Life

&

**DIVERSITY** = Variety

Biodiversity is the variety of life forms on earth and the essential interdependence of all living things

# What is biodiversity ?

Biodiversity is the variety of plant and animal species on Earth.  
Biodiversity makes our planet special.

# Different types of biodiversity

- Biodiversity of species – variety of species  
over 375,000 known species of plants that produce flowers and 15,000 known species of birds
- Biodiversity of genes – genetic diversity is at the individual level and makes everyone unique
- Biodiversity of ecosystems – natural place where species live

# Types of ecosystems – Semi arid

- Low rainfall, high daytime temperatures and low night temperatures
- Plants species have to be drought tolerant and adapted to poor soil and drainage
  
- Example: Mexico

# Types of ecosystems – Grassland

- Grassy ecosystems are dominated by native grass and native wildflowers
- Widely spaced tree cover or shrubs, creating grassy woodland
- All continents except Antarctica



# Types of ecosystems – Wetland

- Temporary or permanently covered by saline water
- Wetlands include river, streams, creeks, lakes, swamps
- All continents except Antarctica
- Largest wetland area: Amazonas River basin

# Types of ecosystems – Woodland/ Forest

- Areas with trees, shrubs and grassy area
- Approximately 30% of the worlds land area is forest

# Types of ecosystems – Alpine

- Altitudes over 1800 m
- Snow covers the ground for substantial part of the year
- Too cold for trees to grow
- Example : German alps

# Types of ecosystems – Rainforest

- High rainfall
- High soil moisture content
- Closed canopy with interlocking branches which completely shade the forest ground

# Types of ecosystems – Coastal

- The sea meets the land
- Involves sand dunes, sandy beaches, rocky shores,
- Influenced by tides, waves and wind

# Types of ecosystem

- What type of ecosystem exists in your region?

# Importance of biodiversity

- ensures clean air, water and fertile soils
- Provides opportunities for recreation, tourism, research and education
- Foundation of healthy functioning ecosystem upon which all life depends
- The more biodiversity, the stronger an ecosystem is because small changes will have less of an effect on its stability
- With decreasing biodiversity these systems break down

# Threats to biodiversity

- Hunting: over-hunting, reduces numbers and endangers their species
- Habitat loss: habitats are demolished e.g. for construction of roads, buildings
- Invasion of foreign species: Introduction of non-native species
- Pollution: pollution contaminates natural ecosystems
- Climate change: differing temperatures, amounts of snowfall, rainfall, variety of other symptoms of climate change

**What about agriculture? Can farming affect biodiversity?**



# How agriculture affects biodiversity?

- Drainage: for the creation of farmland, decreasing wetlands  
→ Direct decline of species (plant, birds, insects)
- Land reclamation: removal of habitats such as trees, dry stone-walls, hedges, woodland  
→ Direct decline of native biodiversity in areas
- Reduction of crop rotation and intensified farming  
→ Increased amount of nutrients added to the land (water pollution)
- Overgrassing of marginal land → destruction of peatlands
- Increased fertilizer use/ stocking densities  
→ water pollution and loss of biodiversity in rivers

# How can agriculture support biodiversity?

- Increased use of mixtures ( intercropping, crop-livestock system, agroforestry)
- Develop sustainable management practices
  - Less tillage increases earthworm activity
  - Avoid contamination of water courses
  - Substitution mineral fertilizer
- Shifting time of harvesting ( e.g. grass)
- Reinduce local plant species
- Boost number of pollinating insects
  - Provide food sources for birds
  - Beekeeping

Thank you for your attention!

