MITIGATION & ADAPTATION TO CLIMATE CHANGE

2. MITIGATION PRACTICES

BCI Better Cotton Initiative
www.bettercotton.org

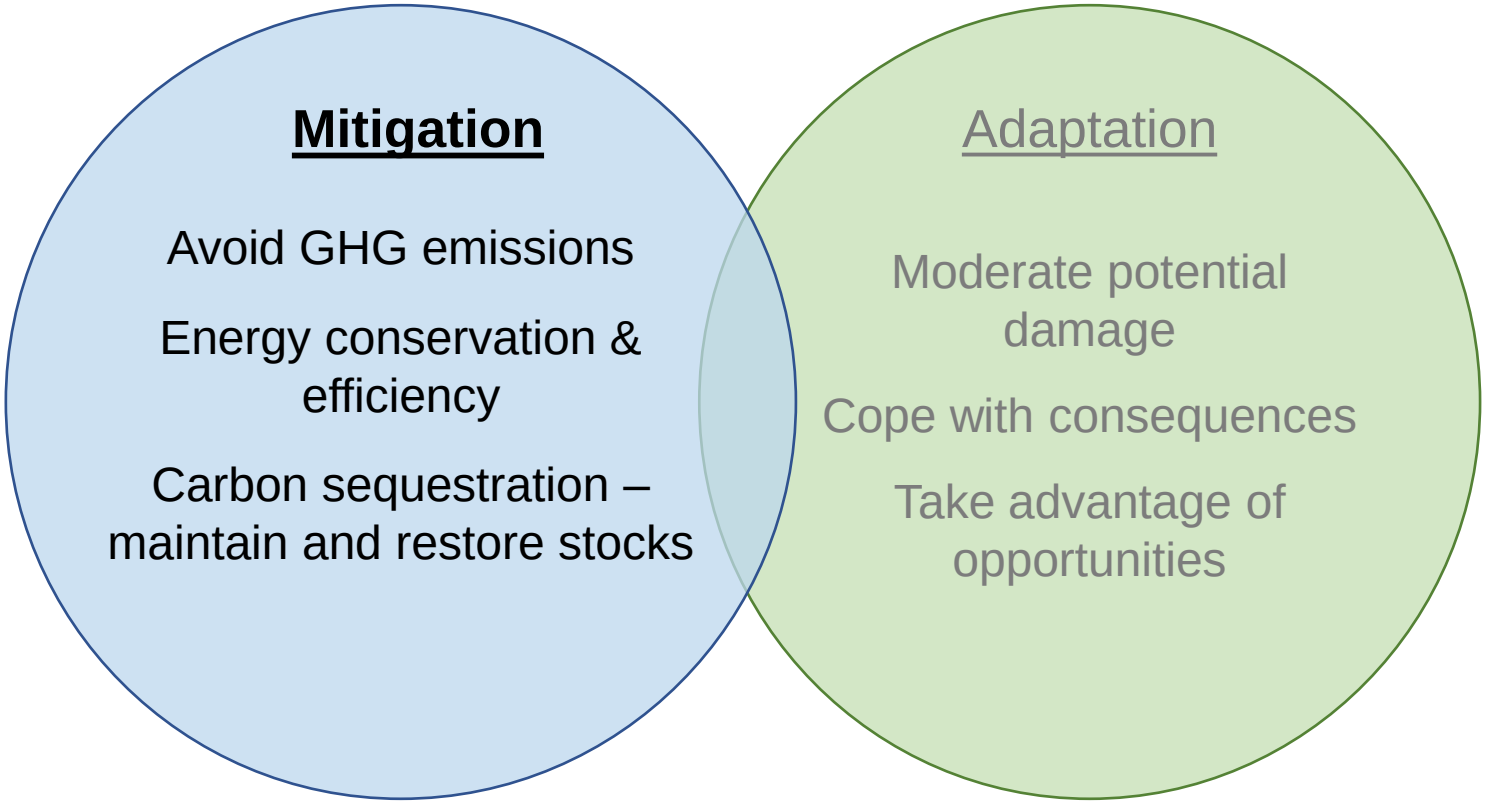
TRAINING OVERVIEW

- You are in the 2nd step of your training
- **Learning outcomes**
  - What is Climate Change Mitigation
  - Which key practices can cotton producers adopt

Chapters	Time
1. Mitigating Climate Change effects	5mins
2. At territorial level: Controlling Land-Use	10mins
3. At field level: Managing Soil Organic Matter	10mins
Assessment	10mins
Total time: 35mins	

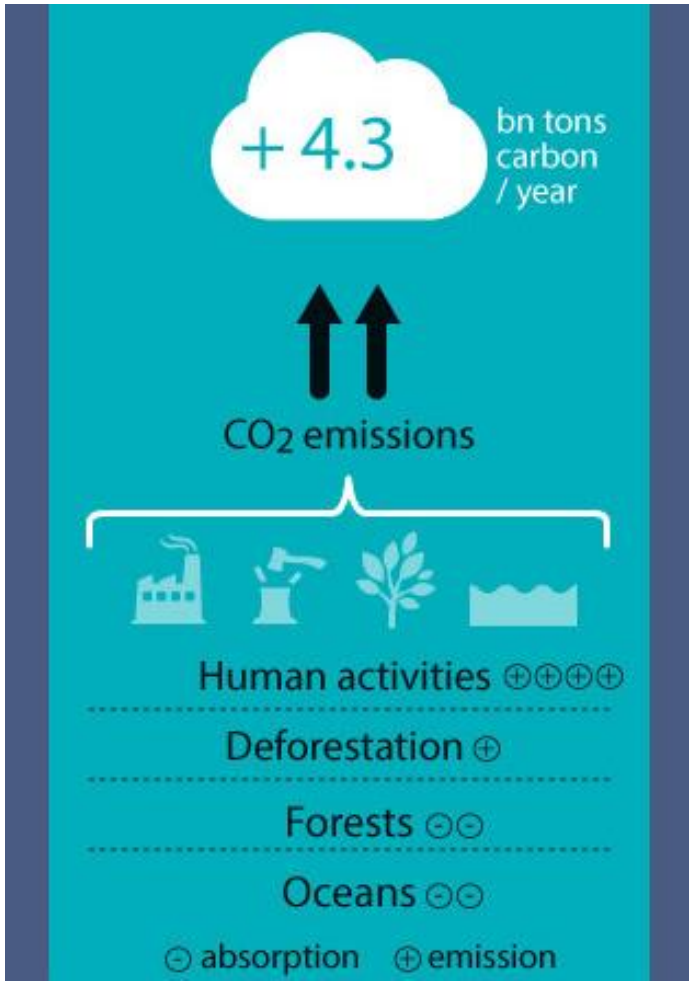
1. MITIGATING CLIMATE CHANGE EFFECTS: THE IMPORTANCE OF CARBON IN SOILS

MITIGATION IN CLIMATE CHANGE RESILIENCE



Mitigation to climate change is a human intervention to reduce the sources and/or enhance the sinks of greenhouse gases

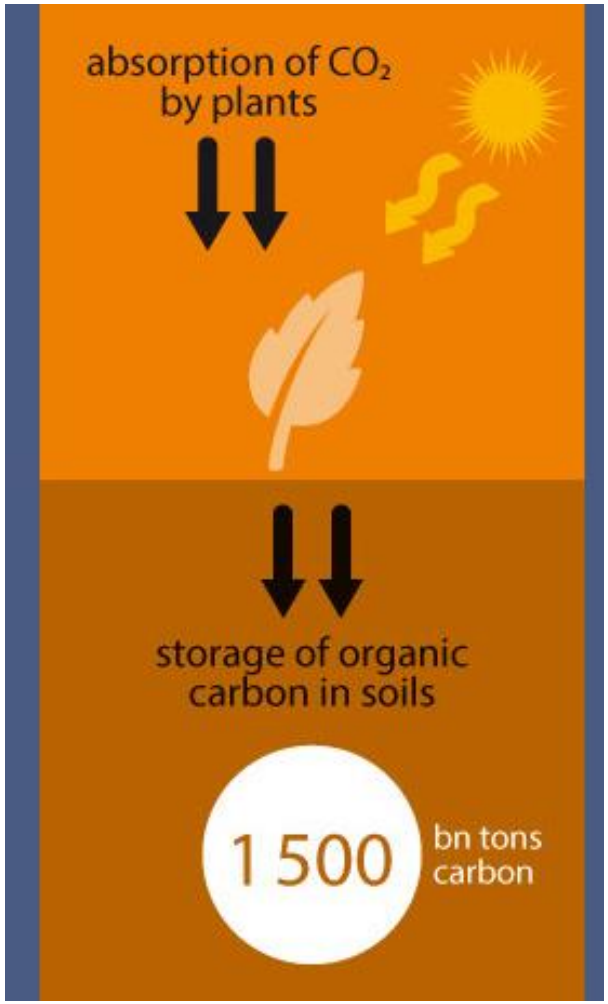
CARBON IN THE ATMOSPHERE



- The quantity of carbon in the atmosphere increases by 4.3 billion tons every year

- This is mainly due to:
  - Human activities
  - Deforestation
  - Rise of the oceans' temperatures

CARBON SEQUESTRATION IN SOILS: A KEY FACTOR TO MITIGATE CLIMATE CHANGE

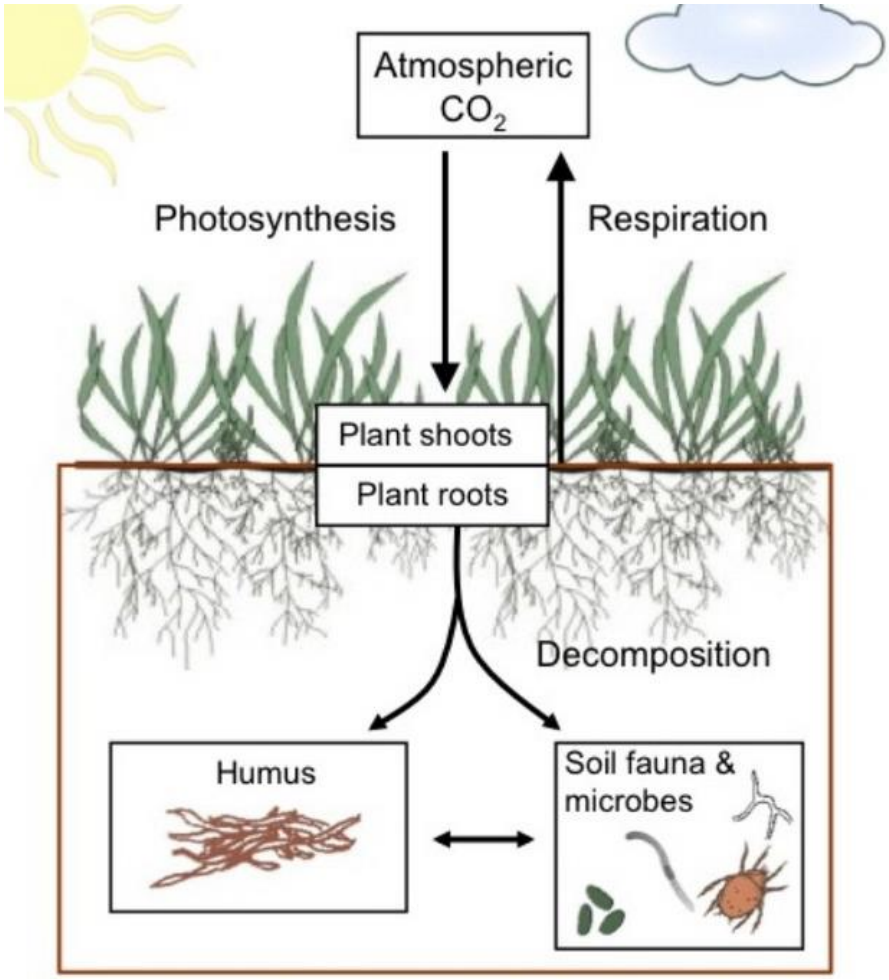


- The world's soils contain 1500 billion tons of carbon in the form of organic material
- **The 4 per 1000 initiative**: Increasing the sequestration of carbon in soils by 0.4% per year could help capture the human-caused emissions of CO2 in the atmosphere
- This can be done by:
  1. Managing lands and forests to protect carbon-rich soils and restore degraded areas
  2. Increasing carbon content in soils

THE CARBON CYCLE

- Carbon balance within the soil is controlled by carbon inputs from:
  - photosynthesis
  - carbon losses by respiration

- Decomposition of roots and root products by soil fauna and microbes produces humus, a long-lived store of SOC (Soil Organic Carbon)



CONCRETE MITIGATION MEASURES FOR COTTON FARMERS

- Cotton is produced in a wide range of areas differently affected by climate change
- Adaptative solutions must be found following common principles
- Cotton producers can make significant contribution to the global mitigation efforts by:

At **territorial level**, Managing Land-Use by:

1. Enhancing vegetation cover to promote Soil Organic Carbon (SOC)
2. The Control of Land-Use change by protecting high carbon territories

At **field level**, Enhancing Soil Health by:

1. Monitoring fertiliser application techniques
2. Improve nitrogen management
3. Building up SOC
4. Promoting intermediate crops, intercropping & grass strips
5. Promoting perennial crops
6. No-till & covering crops
7. Limiting residue burning

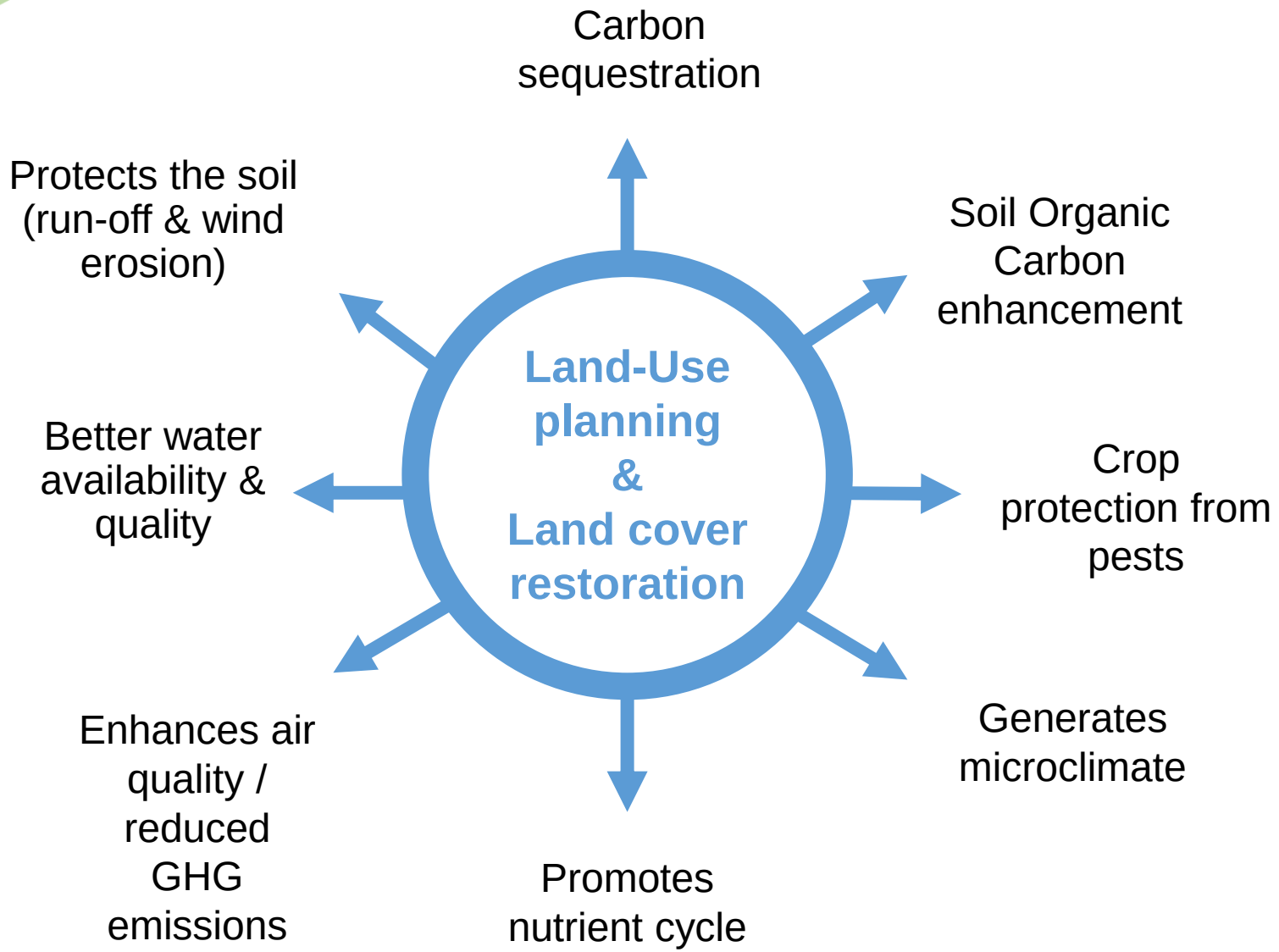
2. AT TERRITORIAL LEVEL: MANAGING LAND USE

ENHANCING / RESTORING CARBON STOCKS AT TERRITORIAL LEVEL

- At territorial level, farmers can enhance or restore carbon-stock non-agricultural lands, which also promotes vegetal cover to protect soil organic content (SOC)
- The more soil is covered, the richer it will be in organic material, and therefore in carbon

Those practices include:

OVERVIEW


Carbon sequestration
Soil Organic Carbon enhancement
Crop protection from pests
Generates microclimate
Promotes nutrient cycle
Enhances air quality / reduced GHG emissions
Better water availability & quality
Protects the soil (run-off & wind erosion)
Land-Use planning & Land cover restoration

1

Enhancing vegetation cover

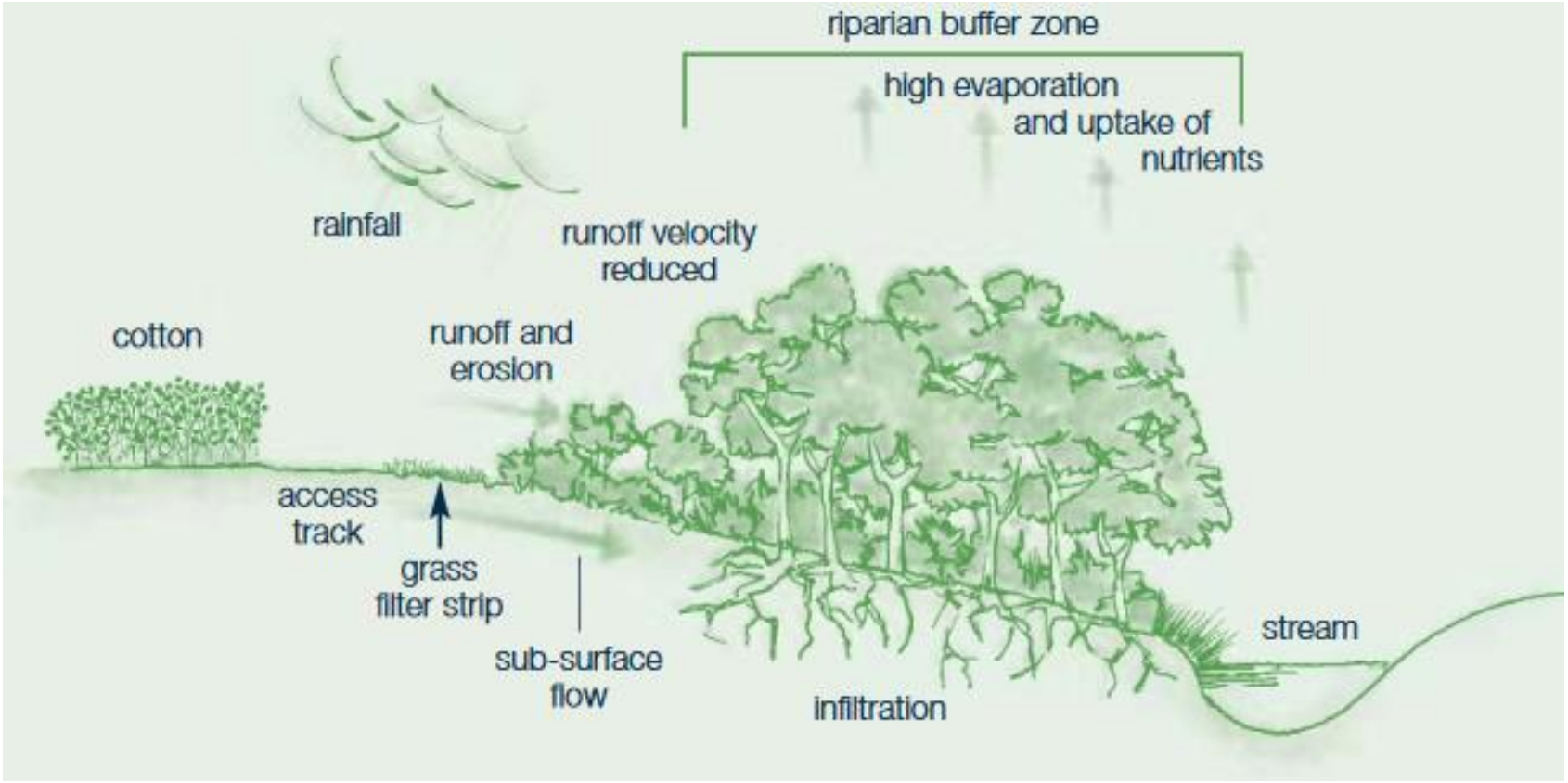
ENHANCING VEGETATION COVER

- BCI farmers can participate in restoring lands in poor conditions, such as arid and semi-arid regions
- This can be done by:
  - Protecting and restoring riparian areas
  - Introducing trees in cotton cropping systems
  - Other?

Refer to the Biodiversity module (Restoring degraded areas)

ENHANCING VEGETATION COVER IN RIPARIAN AREAS

- Protecting and restoring **riparian areas** (near streams or water storage)



INTRODUCING TREES IN COTTON CROPPING SYSTEMS

- Farmers can increase the number of trees surrounding their cotton plots
- **Golden rule: always prefer adapted local species!**
- Agroforestry systems: some studies have been conducted and show medium- and long-term benefits

Indian gooseberry trees bordering cotton crops

CONTROLLING LAND-USE CHANGE

2 The Control of Land-Use change by protecting high carbon territories

Refer to the HCV module

- Protecting high carbon territories
- Favoring the establishment of new crops on already open/degraded land

Potential High Carbon Stock Areas				Degraded lands	
High Density Forest	Medium Density Forest	Low Density Forest	Young Regenerating Forest	Scrubs	Cleared / Open Land

3. AT FIELD LEVEL: ENHANCING SOIL

MITIGATION MEASURES AT FIELD LEVEL

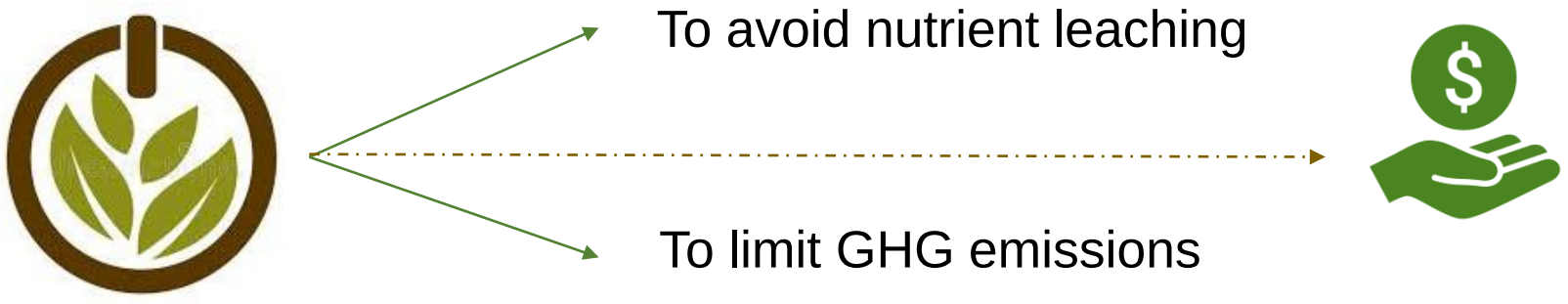
At field level, farmers can adopt 7 mitigation measures:

1. Promote organic fertilisers & monitor fertiliser application
2. Improve nitrogen management
3. Build up Soil Organic Matter (SOM)
4. Promote intermediate crops, intercropping and grass strips
5. Promote perennial crops
6. No till & covering soil
7. Limit residue burning

1 Promote organic fertilisers & monitor fertiliser application

CHEMICAL FERTILISER MONITORING TO LIMIT GHG EMISSIONS

- Closely monitor fertilisation to minimise the risk of environmental damage

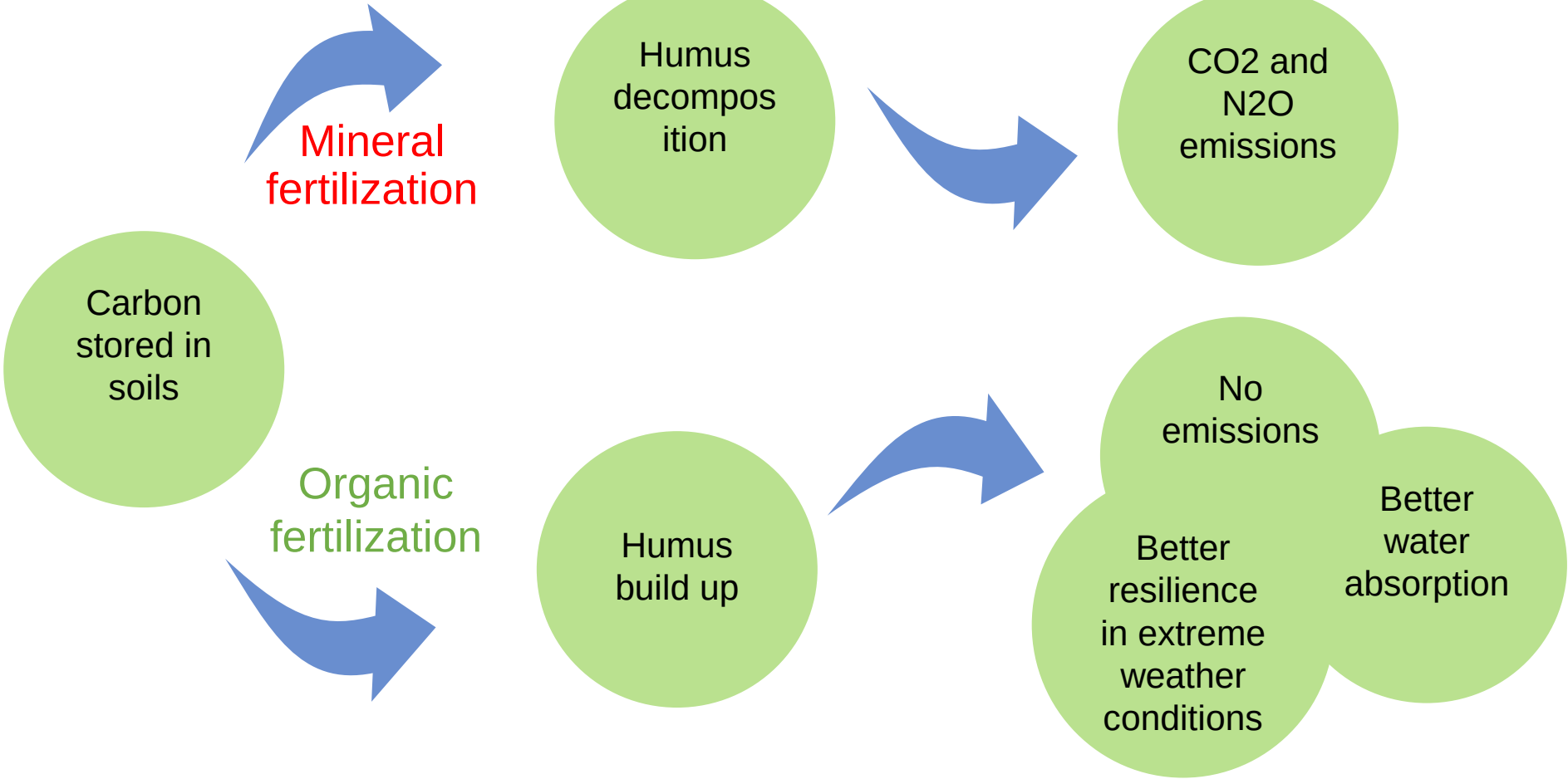


- Limiting inputs to strict crop needs, with a focus on N nutrients as being mainly responsible for NO2 emissions
- Adopt practices to introduce organic matter in cycle to partly substitute N, P and K inputs

THE IMPORTANCE OF ORGANIC FERTILISATION

Refer to the Soil Module 1

Promote organic fertilisers & monitor fertiliser application



A high humus level is the best adaptation to climate change!

IMPROVING NITROGEN MANAGEMENT

- Nitrogen is essential for the development of shoots, buds, leaves, roots and bolls
- Cotton takes up about 30 kg of nitrogen per 227kg bale produced
- A good nitrogen management scheme consists of 3 fundamental elements:

1. Applying approximately 10% – 20% of the total seasonal nitrogen fertilizer need prior to bloom
2. Applying the remaining nitrogen required during the boll development period
3. Limit nitrogen inputs to generate an abrupt deficiency, helping to mature the crop for harvest

NITROGEN MANAGEMENT: TIMING OF APPLICATION

- Too much nitrogen late in the season may cause excessive vegetative growth and should be avoided
- While grains and most vegetables maintain high yields when excess nitrogen is applied, cotton is one of the few crops that responds adversely to excess nitrogen
- Cotton suffers delayed maturity with high nitrogen levels
- This is due to both reduced early boll retention and delayed boll opening, and severely decreases yield and quality in short growing seasons

MAINTAIN HIGH LEVEL OF SOIL ORGANIC MATTER (SOM)

Application of organic matter:

- Organic matter from animals can be either manure, bone meal or horn chips
- Organic matter from plants can either be crop residues, other plant waste or green manure

4

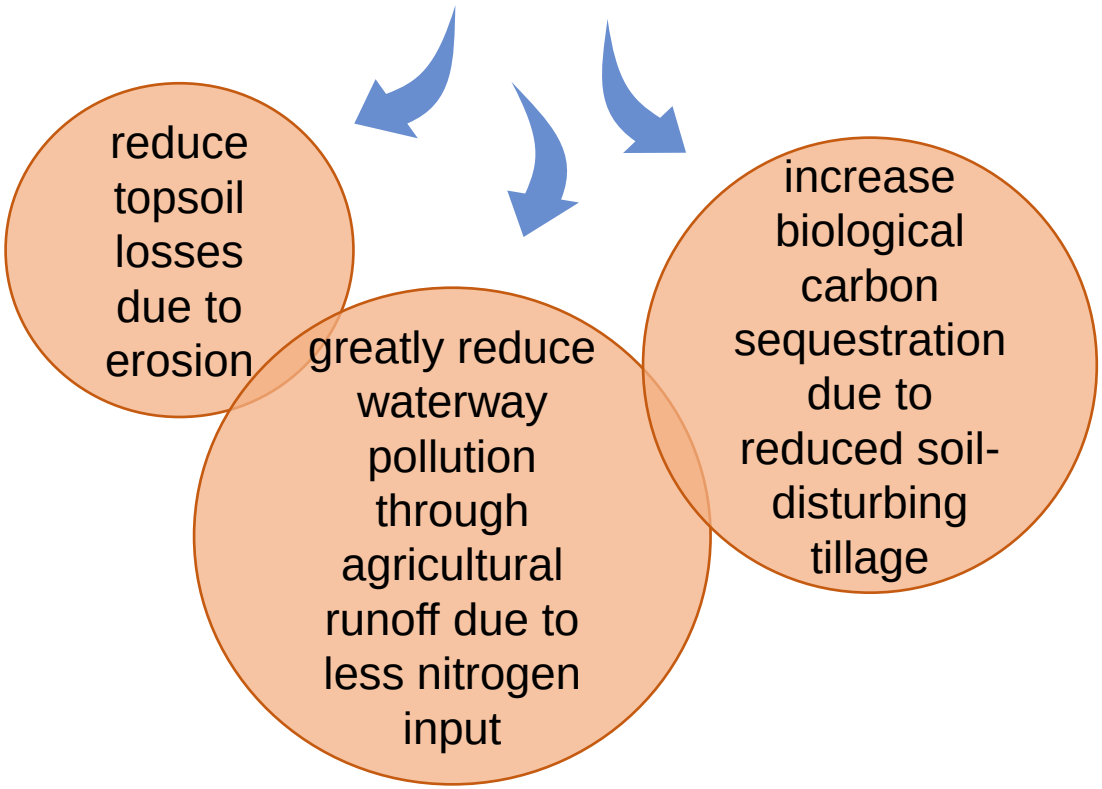
Promote intermediate crops, intercropping and grass strips

INTERCROPPING,

- ?

PROMOTING PERENNIAL CROPS

- Perennial crops do not need to be replanted each year
- After harvest, they automatically grow back
- By eliminating replanting, perennial cropping can:



Examples of perennial crops

Miscanthus giganteus: *high yields and high GHG mitigation potential*

Perennial sunflower: *a perennial oil and seed crop*

Perennial grain: *more extensive root systems allow for more efficient water and nutrient uptake, while reducing erosion due to rain and wind year-round*

Perennial rice: *reduced deforestation through increases in production efficiency by keeping cleared land out of the fallow stage for long periods of time*

NO-TILL SYSTEMS AND COVER CROPS

- A combined action of no-till system and cover crops can:
  - Improve soil function and SOM stock
  - Avoid soil to air emissions
  - Sustain productivity
  - Save on water use
  - Lower the soil temperature

- In Brazil, the no-till system increased by 20% the level of carbon stocked in the soil after 9 years rotation cotton, soybeans, maize and Brachiaria
- In the USA, they use a no-till and wheat/cotton double crop system

AVOID LOSS OF NUTRIENTS: LIMIT RESIDUE BURNING

- Although burning residues allow for quick availability of nutrients, it is also responsible for :
  - GHG emissions
  - A significant loss of minerals – straight into the air (smoke), through air erosion (fly away), leaching and run-off

- More efficient ways to use residues:
  - As an organic fertilizer *(i.e. composted with manure)*
  - Mechanical destruction
  - As domestic fuel *(i.e. densified and energized cotton stalks)*

OVERVIEW

CC MITIGATION AND COTTON PRODUCTION: KEY POINTS

- Cotton producers have a role to play in Climate Change mitigation
- Those practices will benefit farmers on economic & environmental level
- There is a multi-scale approach to maximise mitigation efficiency

Territorial level

Land use control

Field level

Organic matter management

Fertilizer monitoring

ASSESSMENT

QUIZ: QUESTION 1

Which mitigation practice can cotton farmers have the biggest impact on?

Avoiding GHG emissions	Coping with consequences
Carbon sequestration – maintaining & restoring stocks	Energy conservation & efficiency

QUIZ: QUESTION 1

Which mitigation practice can cotton farmers have the biggest impact on?

Avoiding GHG emissions	Coping with consequences
Carbon sequestration – maintaining & restoring stocks	Energy conservation & efficiency

QUIZ: QUESTION 2

What are the main mitigation practices which can be implemented in cotton production?

Promoting intermediate crops, intercropping & grass strips	The Control of Land-Use change by protecting high carbon territories
Enhancing vegetation cover to promote SOC	No-till & covering crops
None of the above	All of the above

QUIZ: QUESTION 2

What are the main mitigation practices which can be implemented in cotton production?

Promoting intermediate crops, intercropping & grass strips	The Control of Land-Use change by protecting high carbon territories
Enhancing vegetation cover to promote SOC	No-till & covering crops
None of the above	All of the above

QUIZ: QUESTION 3

How can soils stock more carbon?

?	The more soil is covered, the richer it will be in organic material, and therefore stock carbon
?	?

QUIZ: QUESTION 4

How can vegetation cover be enhanced?

By protecting and restoring riparian areas

By favoring the establishment of new crops on already open/degraded land

?

By introducing trees in cotton cropping systems

QUIZ: QUESTION 5

Suggestion for additional questions?

QUIZ: QUESTION 6

Suggestion for additional questions?

QUIZ: QUESTION 7

Suggestion for additional questions?

QUIZ: QUESTION 8

Suggestion for additional questions?

QUIZ: QUESTION 9

Suggestion for additional questions?

QUIZ: QUESTION 10

Suggestion for additional questions?