Sustainable Land Management and Climate-Smart Agroecology in Agricultural Policies

Mainstreaming climate change adaptation and mitigation into agriculture policies

Table of Contents

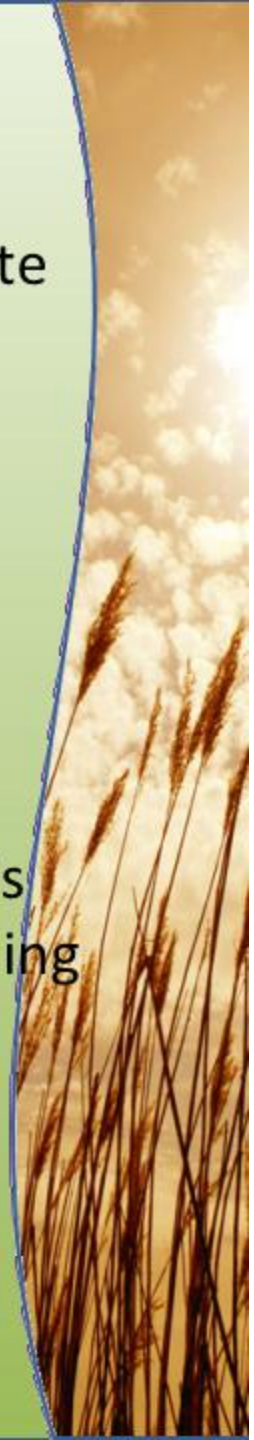
Background

The government of Mongolia targets to

- to increase productivity and economic efficiency by developing an environmentally friendly, adapted to climate change agriculture, and organic farming
- to produce self-sufficient amount of ecologically clean, healthy foods, and becoming an organic food exporting country

Despite these measures and attempts, the agriculture productivity and efficiency are still low, and production risk is high. We need modern smart agriculture technology in farming practices in Mongolia.

Mongolian University of Life Sciences (MULS), Mongolian Academy of Agricultural Sciences (MAAS), Zaisan St., Khanuul District, Ulaanbaatar, 17024, Mongolia Gombo Gantulga & Noov Bayarsukh, 2023



Diagnosis

Climate change

Length of growing seasons

More frequent and severe droughts, floods and weather extremes , rising of water temperatures

compromises

Agriculture production and productivity

Backbone of most Rural Asia economy

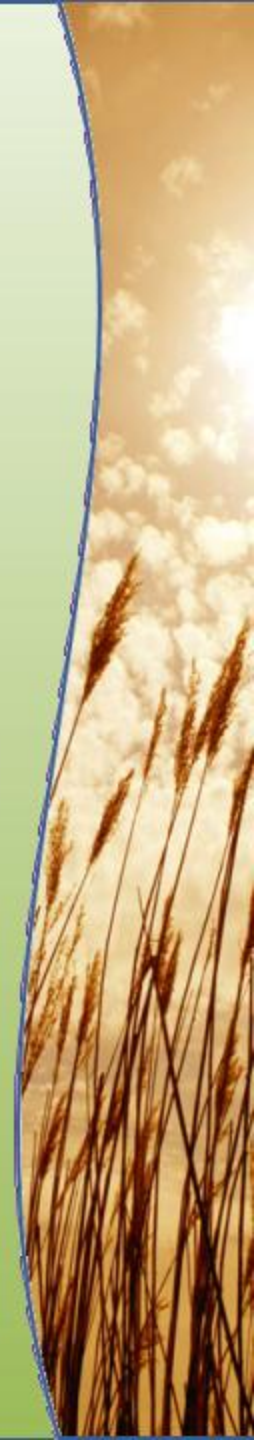
consequently

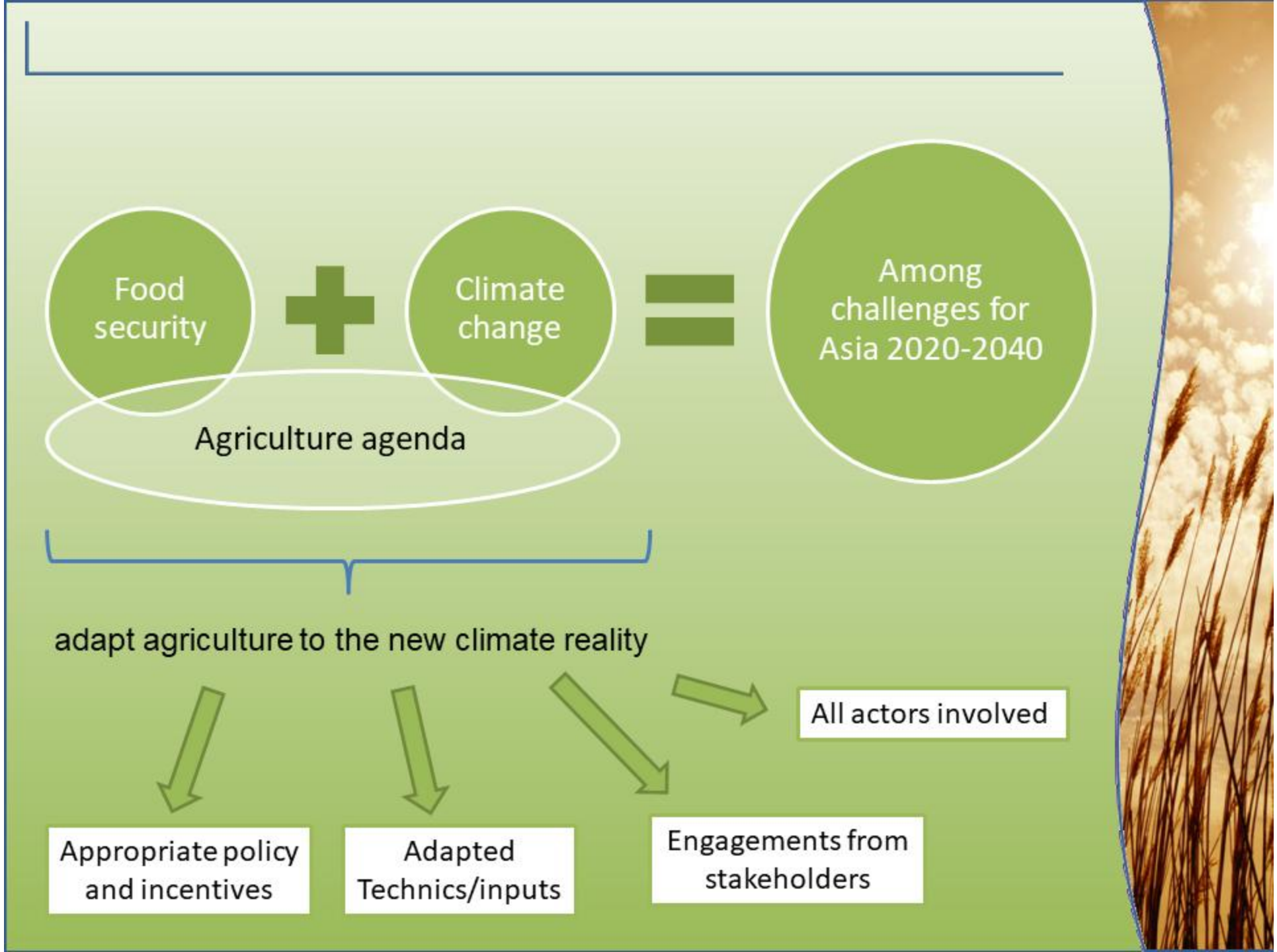
Exacerbate poverty and food insecurity

Threaten the livelihoods of large proportions of the population

Affect local food supplies

Compound the constraints on crop and livestock production systems




Food security
Climate change
Among challenges for Asia 2020-2040
Agriculture agenda
adapt agriculture to the new climate reality
All actors involved
Appropriate policy and incentives
Adapted Technics/inputs
Engagements from stakeholders

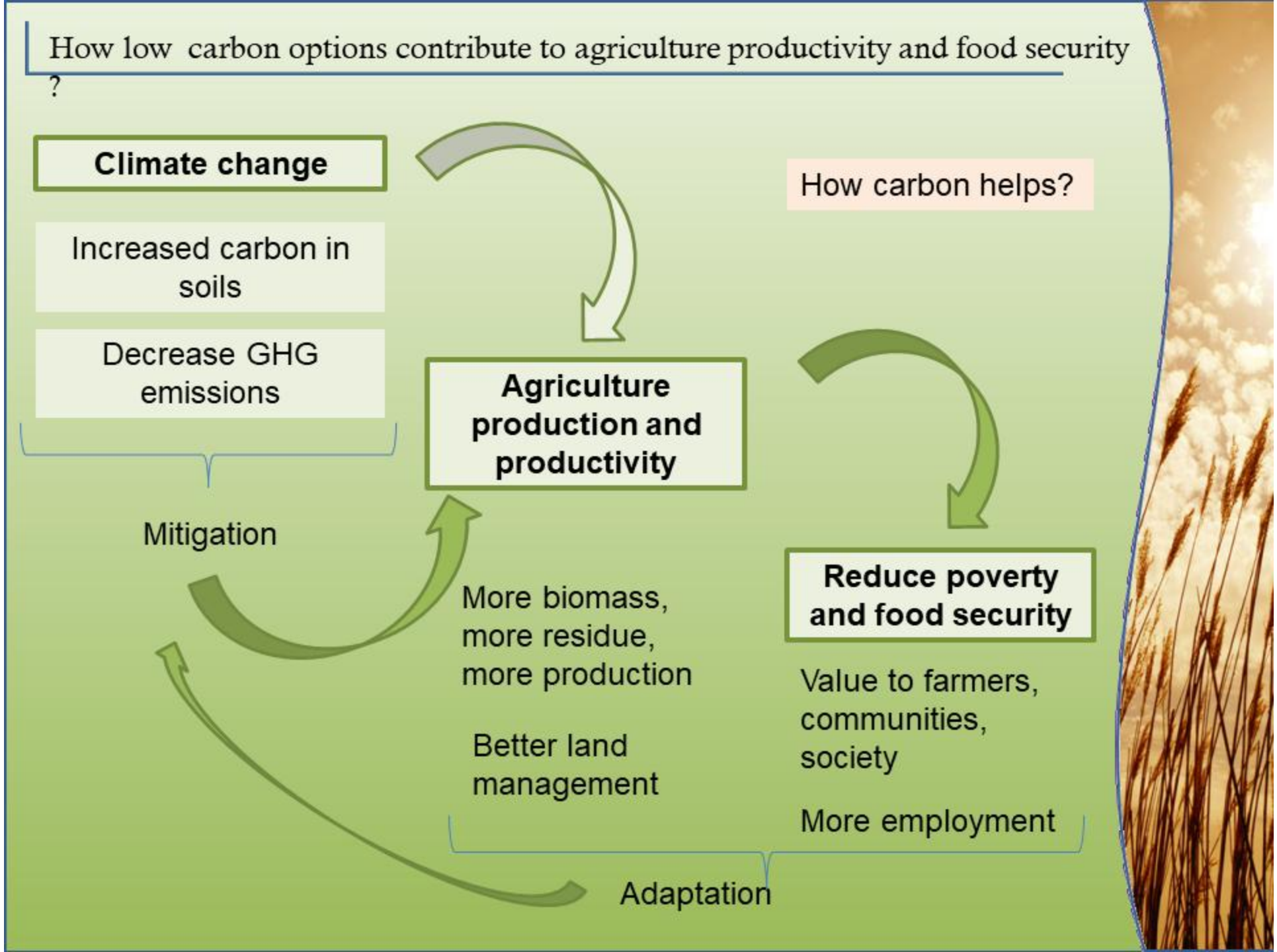
Potential synergies and trade offs between food security and mitigation in Asia

Food Security Potential

Food Security Potential: High Carbon Sequestration Potential: Low • Expand cropping on marginal lands • Expand energy-intensive irrigation • Expand energy-intensive mechanized systems	Food Security Potential: High Carbon Sequestration Potential: High • Restore degraded land • Expand low energy-intensive irrigation • Change from bare to improved fallow • Agro-forestry options that increase food or incomes • Conservation tillage and residue management, limited trade-offs with livestock • Improved soil nutrient management
Food Security Potential: Low Carbon Sequestration Potential: Low • Bare fallow • Continuous cropping without use of organic or inorganic fertilization • Slope ploughing • Over grazing	Food Security Potential: Low Carbon Sequestration Potential: High • Reforestation/afforestation • Restore/maintain organic soils • Expand biofuel production • Agro-forestry options that yield limited food or income benefits • Conservation tillage and residue management, large trade-offs with livestock

Carbon Sequestration Potential

How low carbon options contribute to agriculture productivity and food security ?



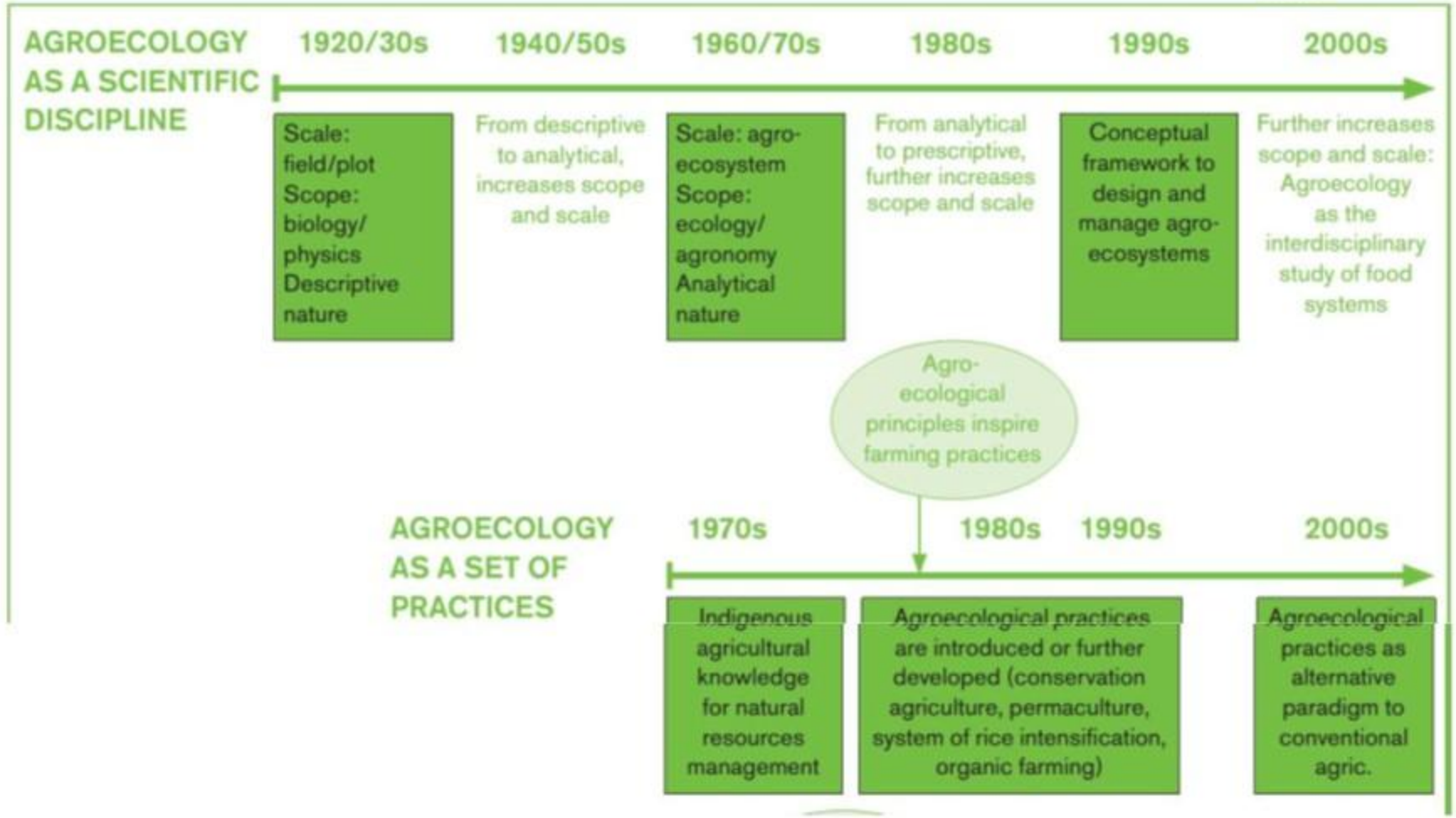
Introduction of concepts and approaches

Agro-ecology

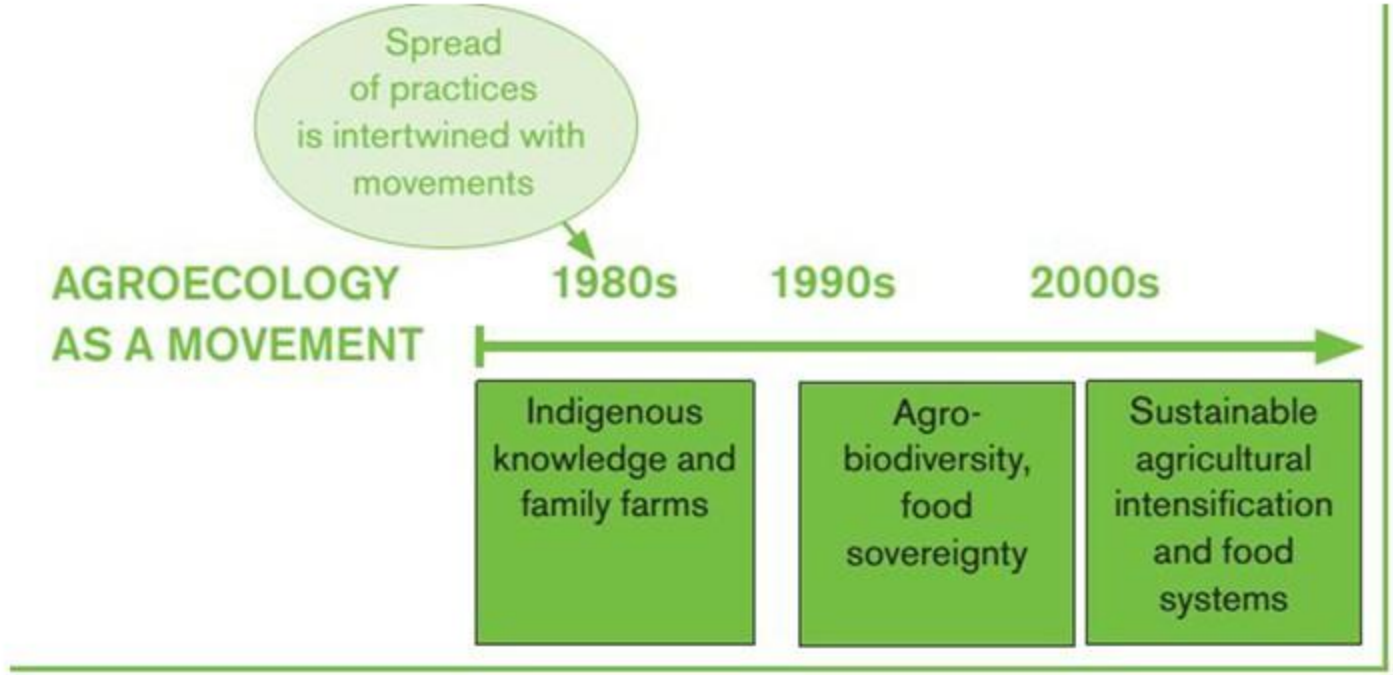
Agro-ecology

- Speaking about agro-ecology is quite new for public policies. But the actors of agriculture and environment development, developed, for years, agro-ecological practices. Researches carried out around agroecology made it possible to clarify the bases and distinguish three periods related to its building:

1) Agro-ecology as a science: The word appears for the first time in the 30's scientific writings, but. Until 60's, agro-ecology remains a scientific subject centred on ecology principles. In the 80's, Altieri (1983b) defines agro-ecology as the applying of ecology principles to the redefinition of agronomy.



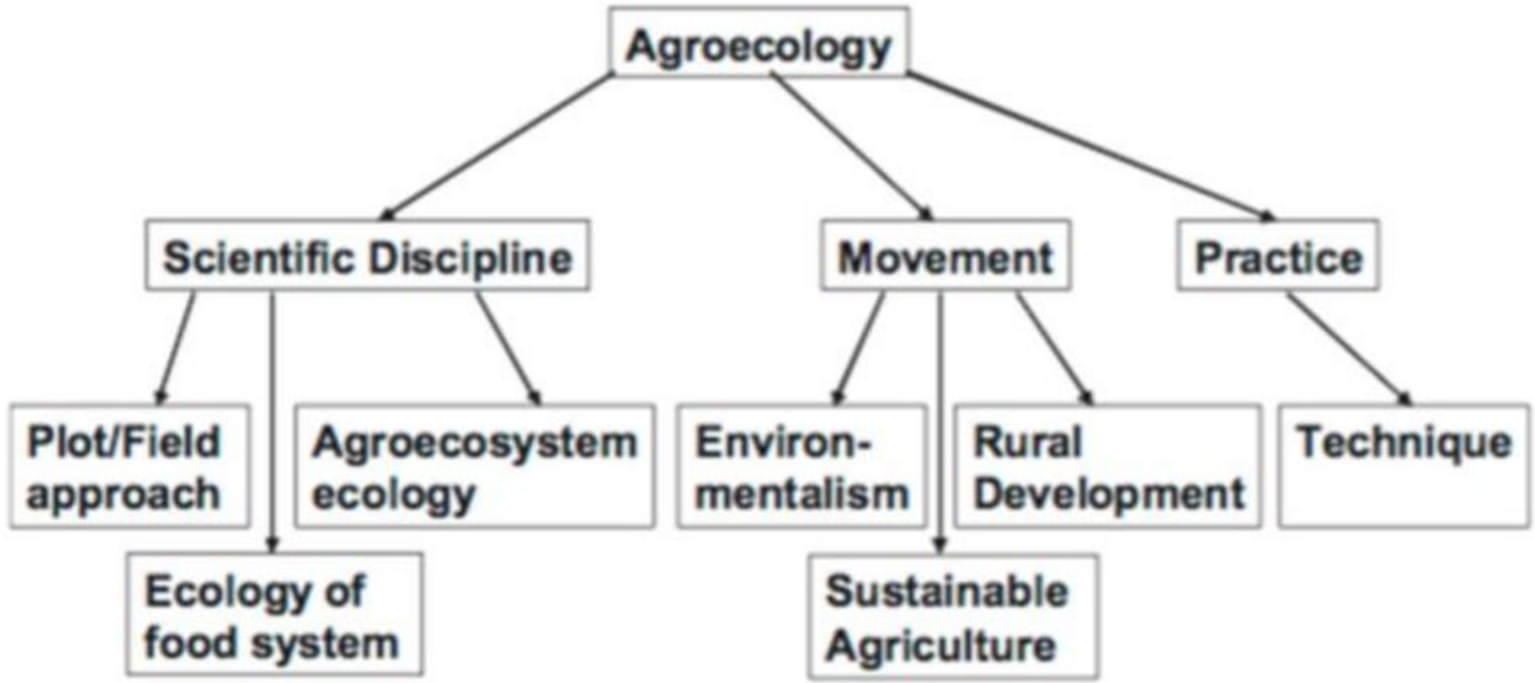
- **2) Agro-ecology as a social movement**: in the 80's-90's that social movements emerged, defending their food sovereignty and the protection of resources, extending therefore agro-ecology to new environmental, social, economic, ethic dimensions, linked to sustainable development. The associations, the citizens, the consumers seize the food question. It started being promoted in debates about agricultural policy choices



- **3) Agro-ecology as a food system**: From the two previous schools, agro-ecology becomes the study of interaction between food production and society extending the scope to all the food systems (Lieblein & al. 2003), combining, not only the productive dimension but also the sector organisation and consumption dimensions.

Source:Temporal changes in scale and dimension of the definition of agroecology and in applied research (Silici, 2014).

Now in the EU countries there are different approaches and definitions of agro-ecology, different public policies implemented to encourage the agro-ecological transition. To put agroecological technologies into practice requires technological innovations, agriculture policy changes, socio-economic changes'



Introduction of concepts and approaches

Sustainable land management

SLM: definition

SLM is a knowledge-based procedure that helps integrate land, water, biodiversity and environmental management (including input and output externalities) to meet rising food and fiber demands while sustaining ecosystem services and livelihoods

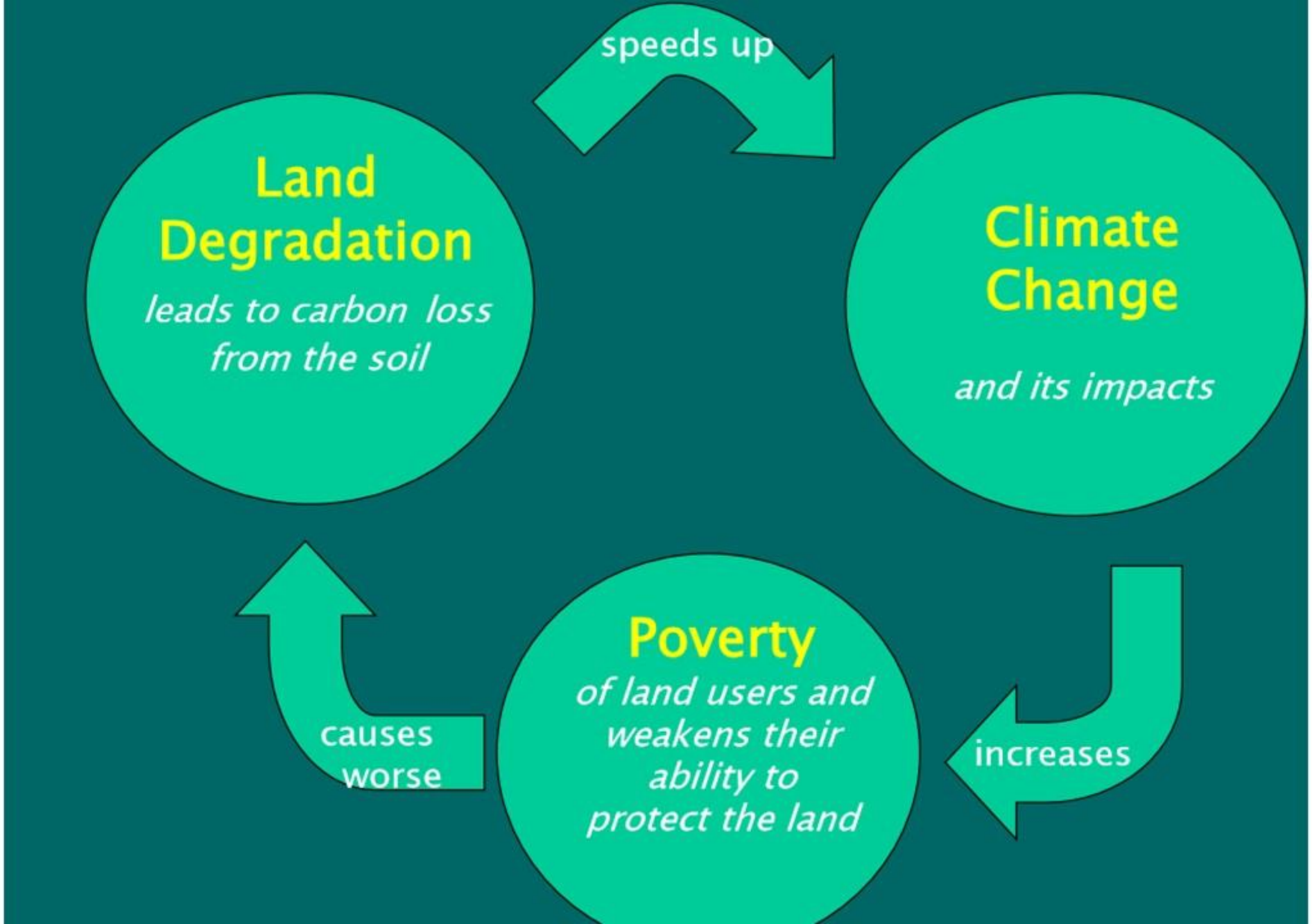
World Bank, 2005

SLM is the use of land resources, including soil, water, animals and plants for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and ensuring their environmental functions

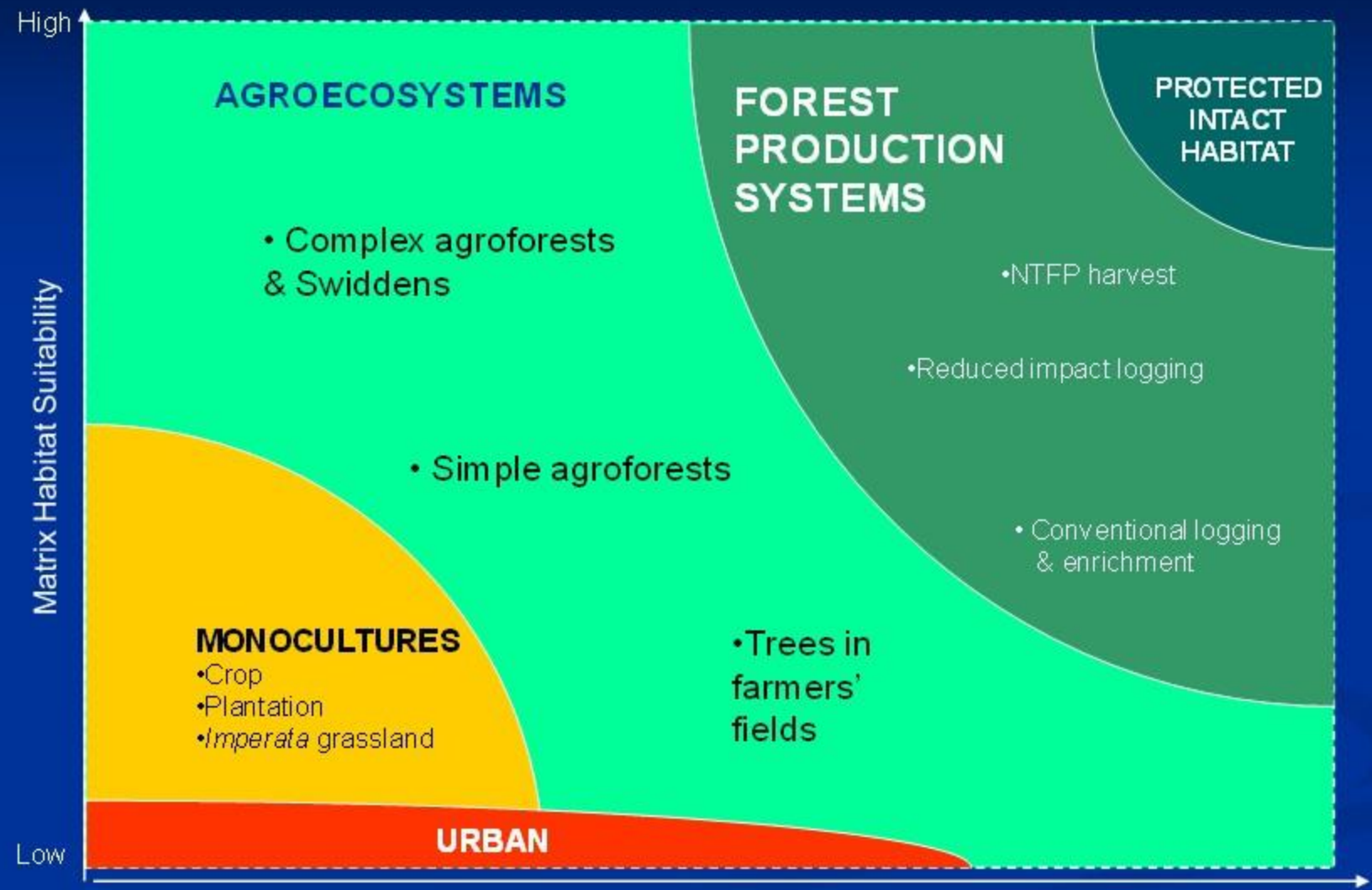
WOCAT, 2007

SLM is land managed in such a way as to maintain or improve ecosystem services for human well-being, as negotiated by all stakeholders

UNCCD, 2009

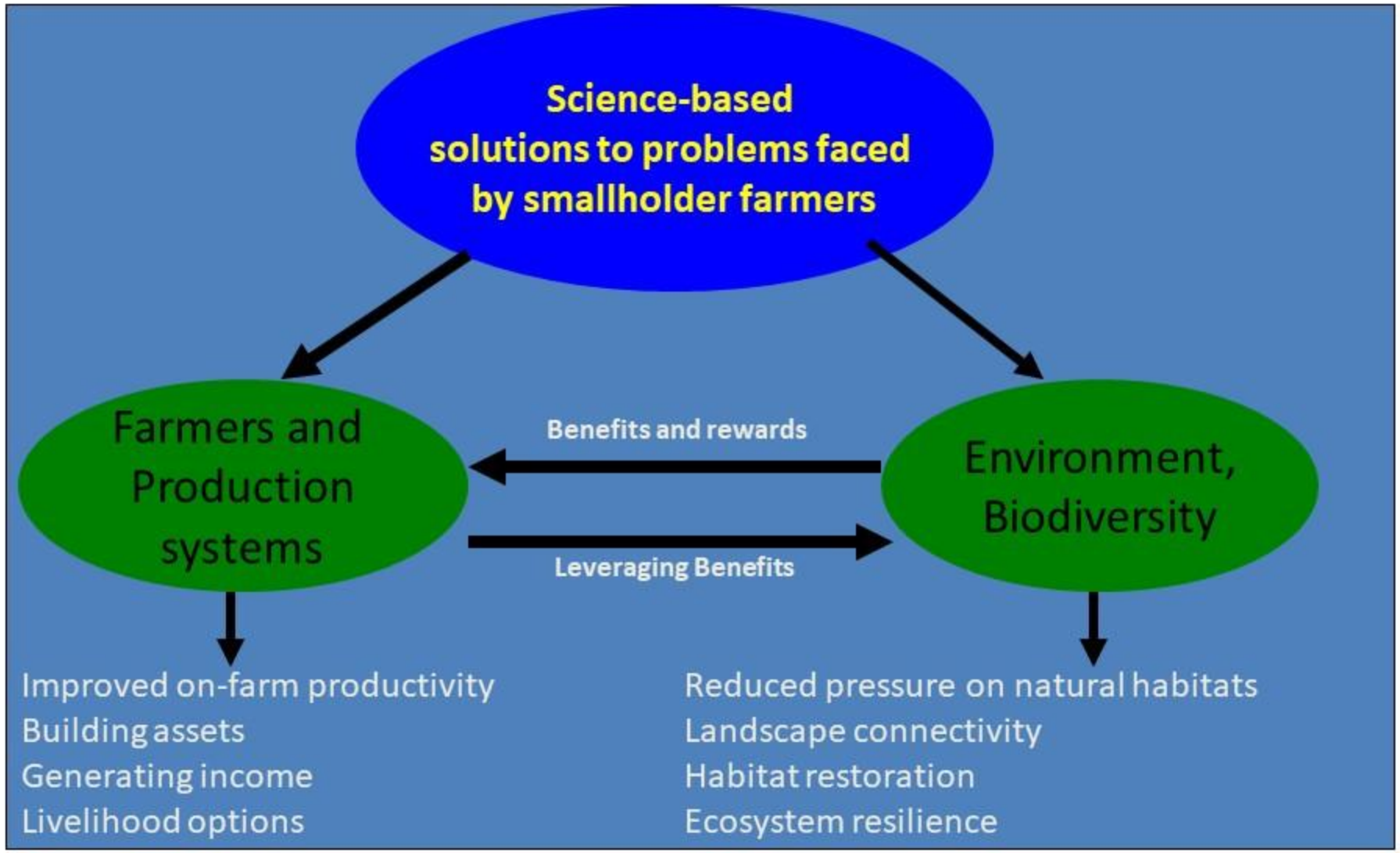

speeds up
Land Degradation
leads to carbon loss from the soil
Climate Change
and its impacts
increases
Poverty
of land users and weakens their ability to protect the land
causes worse

INCORPORATING TREES ACROSS A LANDSCAPE MATRIX



World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Strategic Importance of Agroforestry



World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Finding a sustainable trade-off between food production and one or more of other ecosystem services, given the variety of stakeholders, is a matter of optimizing land use in a dynamic and complex socio-ecological system.

Land degradation reduces our options to meet both food demands and environmental needs.

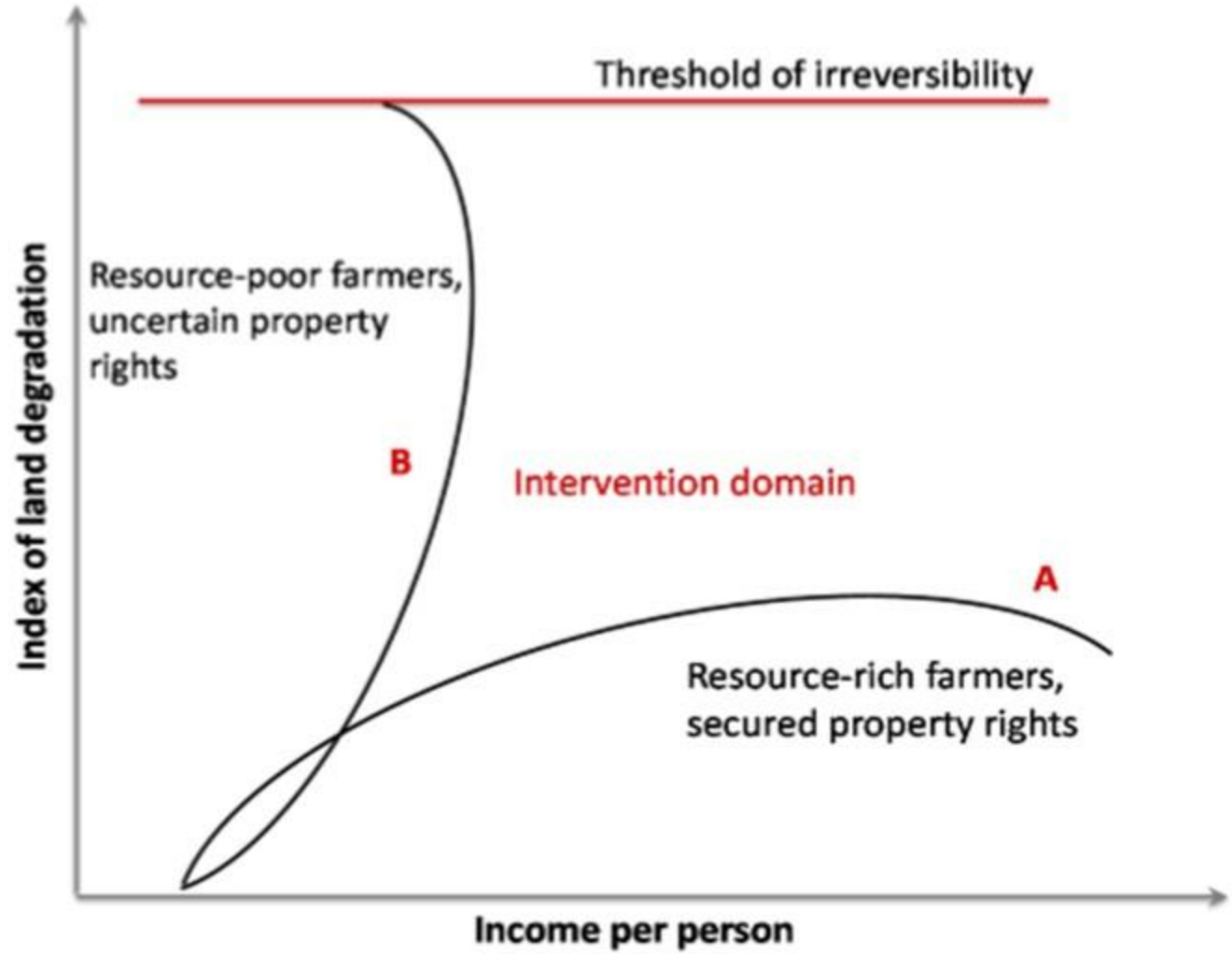


Figure 1. Land degradation as a function of income for resource-rich farmers (trajectory A) and resource-poor farmers (trajectory B).

Source Ademola Braimoh , 2017

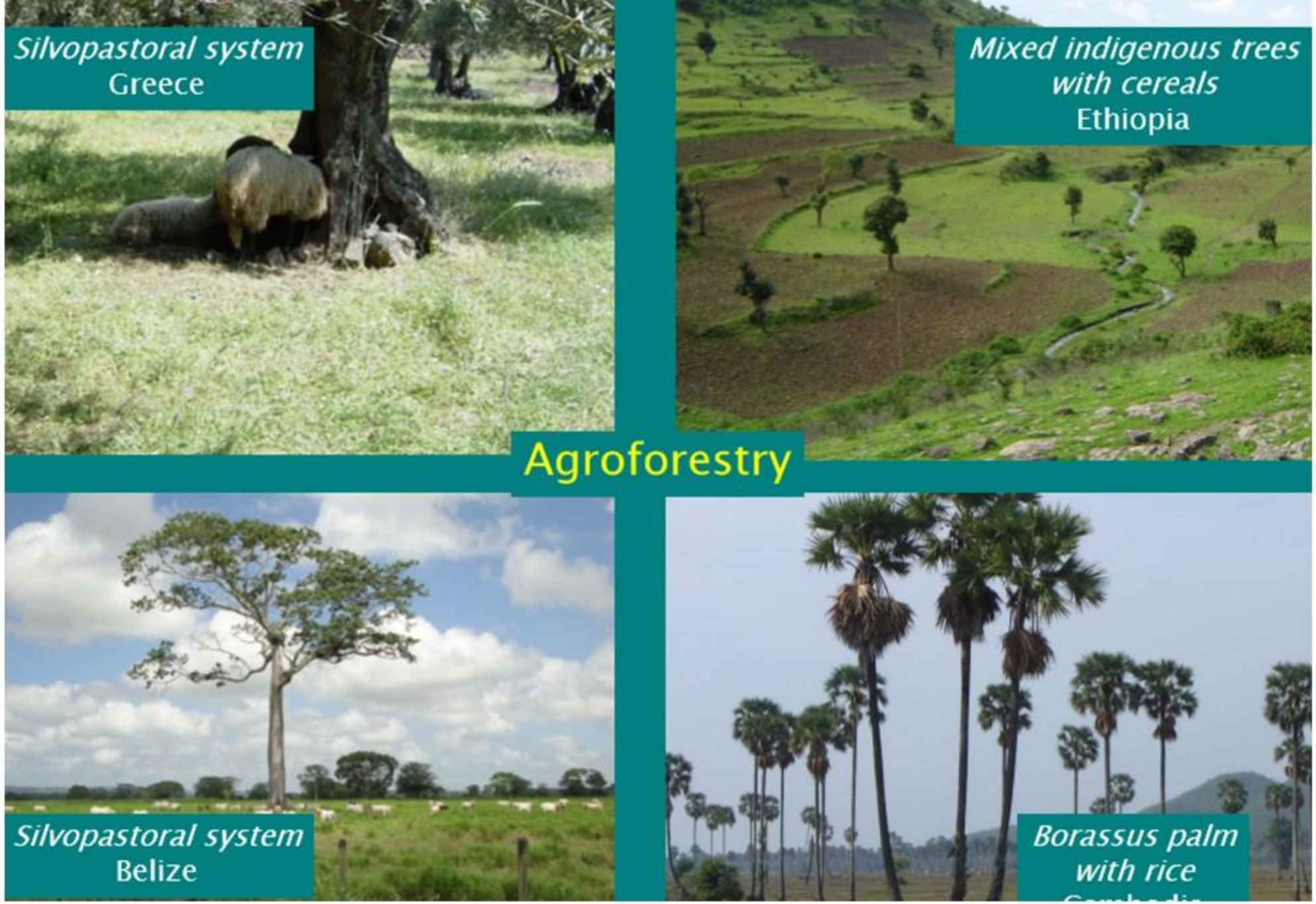
Examples: Morocco

Source: Adapting Soil-Water Management to Climate Change William Critchley – University of Amsterdam

Source: Adapting Soil-Water Management to Climate Change William Critchley – University of Amsterdam

Source: Adapting Soil-Water Management to Climate Change William Critchley – University of Amsterdam

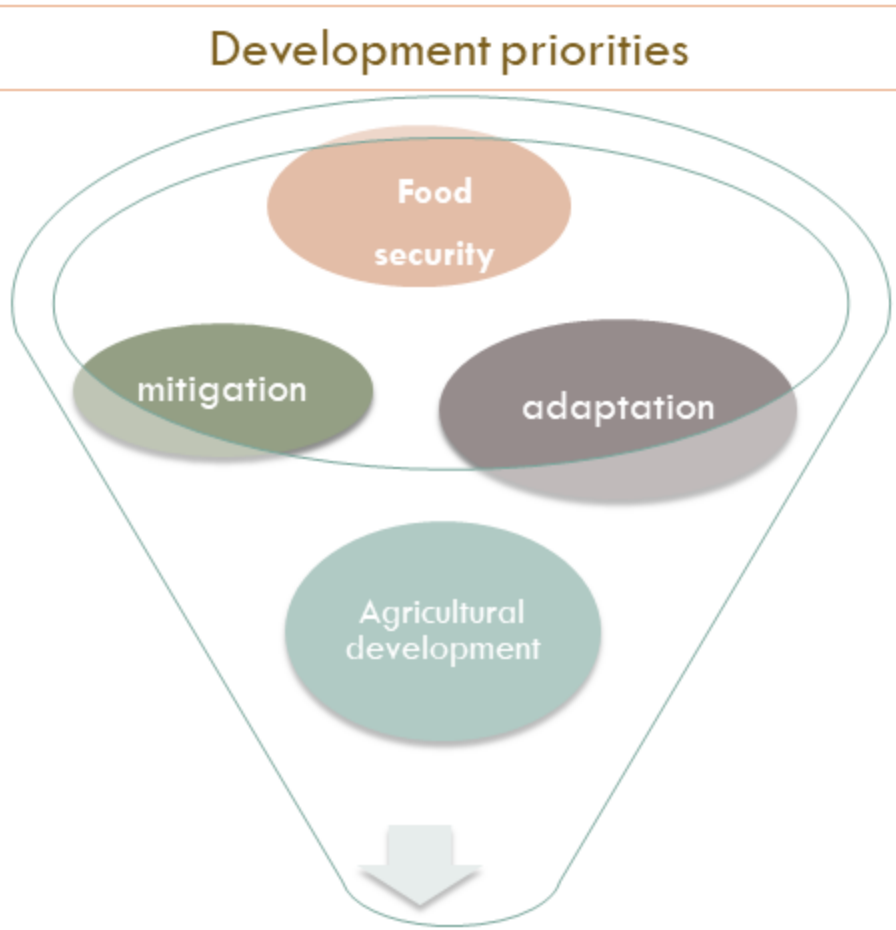
Source: Adapting Soil-Water Management to Climate Change William Critchley – University of Amsterdam



Source: Adapting Soil-Water Management to Climate Change William Critchley – University of Amsterdam

CLIMATE SMART AGRICULTURE

THE CONCEPT



Climate Smart agriculture

FAO definition: Climate-smart agriculture "sustainably increases productivity, resilience (adaptation), reduces/removes GHGs (mitigation), and enhances achievement of national food security and development goals;"

CLIMATE-SMART AGRICULTURE: THE SIMULTANEOUS ACHIEVEMENT OF THREE IMPACTS

- **Productivity & Food Security**

  Farming systems are productive and yield gaps to optimal yield levels are small. The production system is an instrumental means to support the livelihood of the household.

- **Adaptation**

  Production systems are adapted in a way that weather variability have minimized impacts on production levels. Safety nets are in place for extreme weather events and climate events do not cause severe livelihood crises.

- **& where possible: Mitigation**

  Production systems are optimized in a way to have reduced impacts on GHG emissions and increased carbon sequestration while not compromising on other development goals.

MITIGATION & ADAPTATION - CONCEPTS

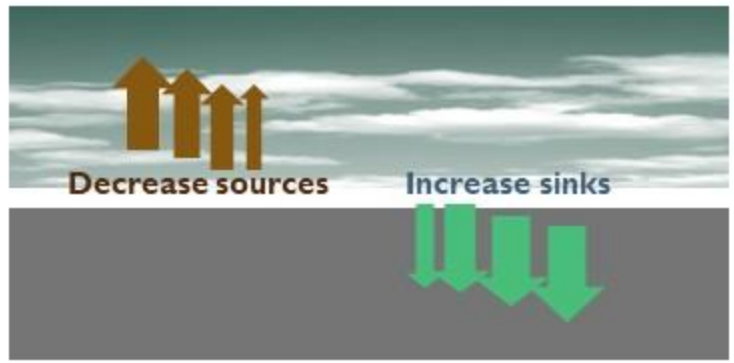
Mitigation

I attack the problem

Decrease GHG sources

Increase sinks of GHG

Strategies can and should be implemented jointly



Adaptation

I act in response to the impacts of the problem

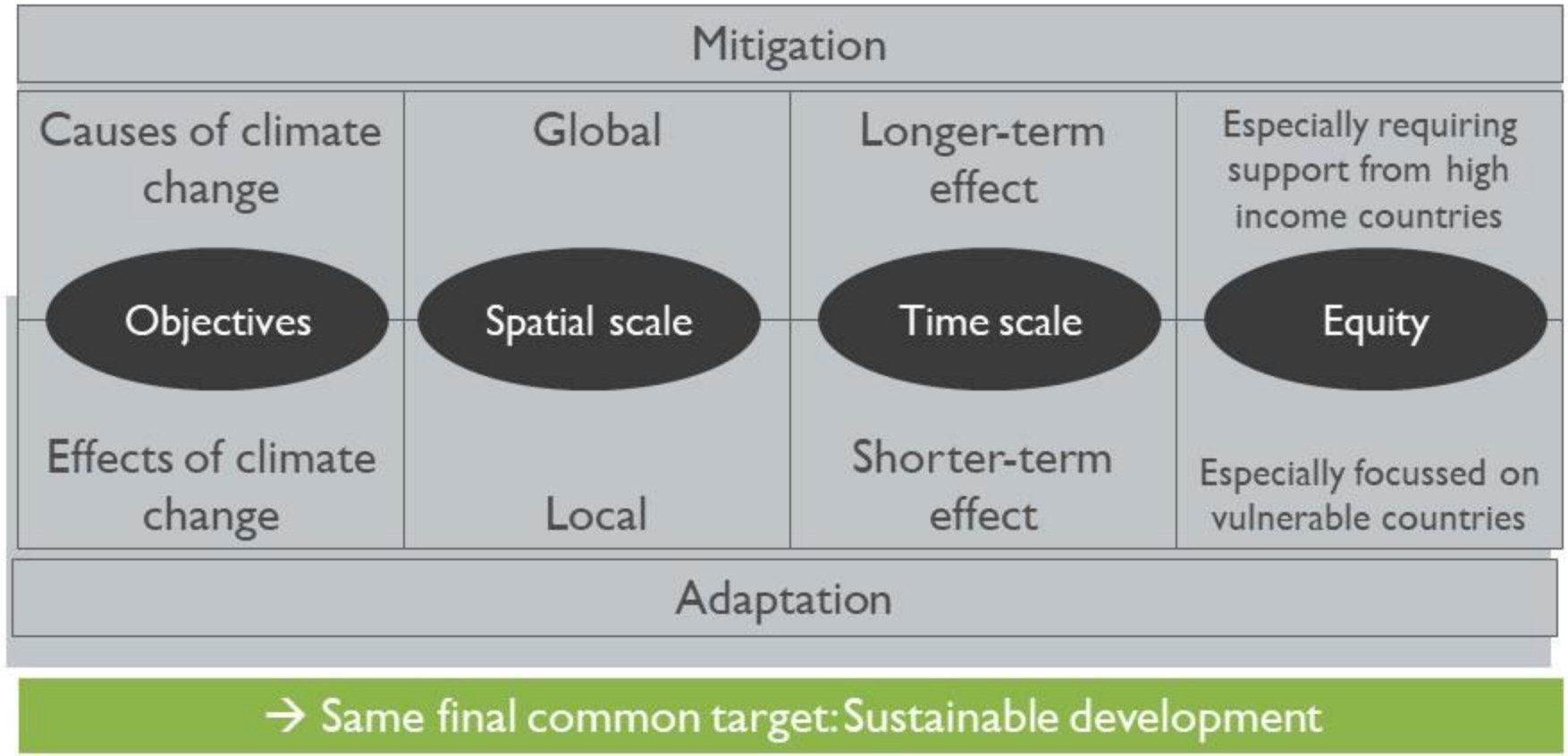
Risk management

Strenghtening institutions

Trainings

Investments in rural economy

MAIN DIFFERENCES BETWEEN ADAPTATION AND MITIGATION



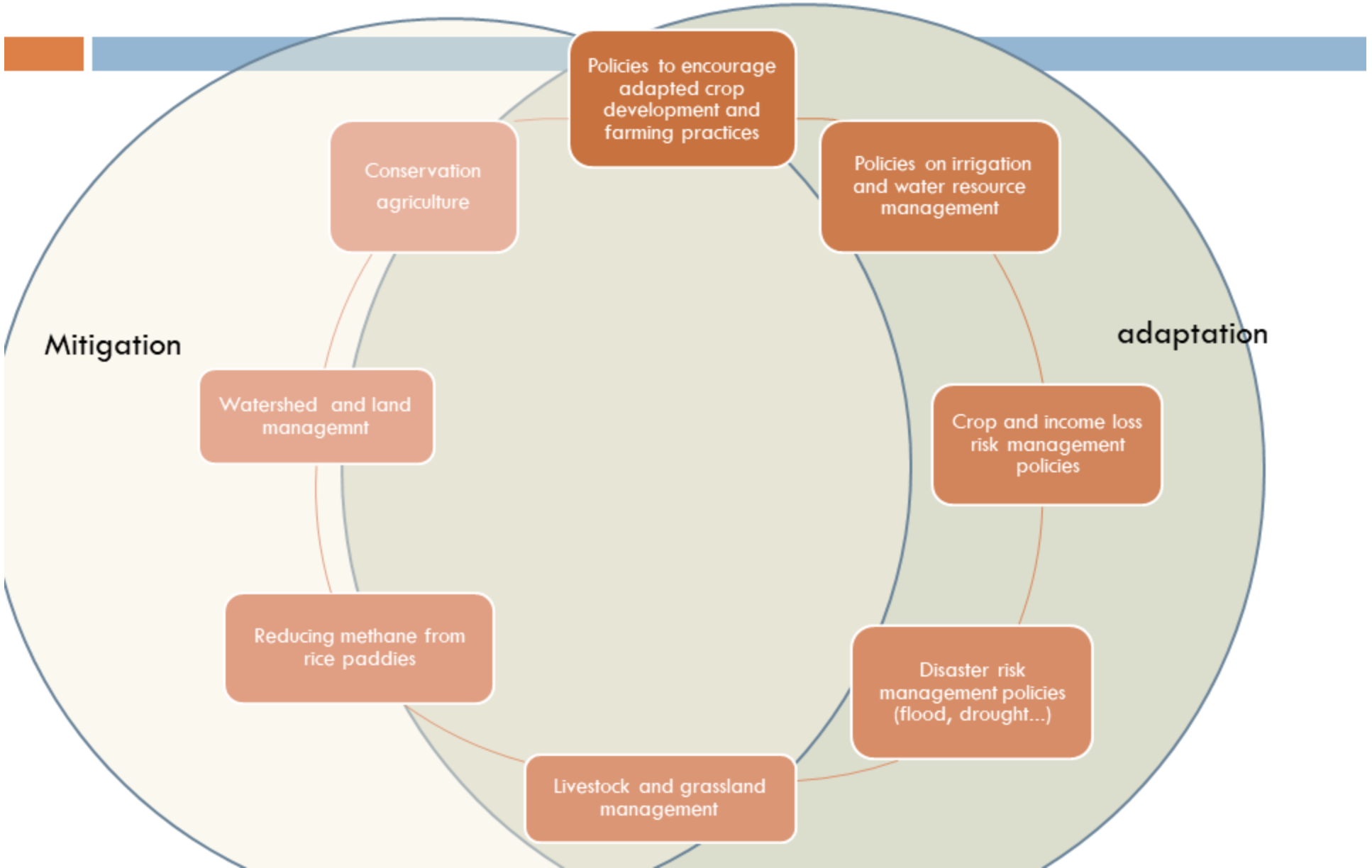
→ Same final common target: Sustainable development

KEY MITIGATION ACTIONS AND THEIR CO-BENEFITS

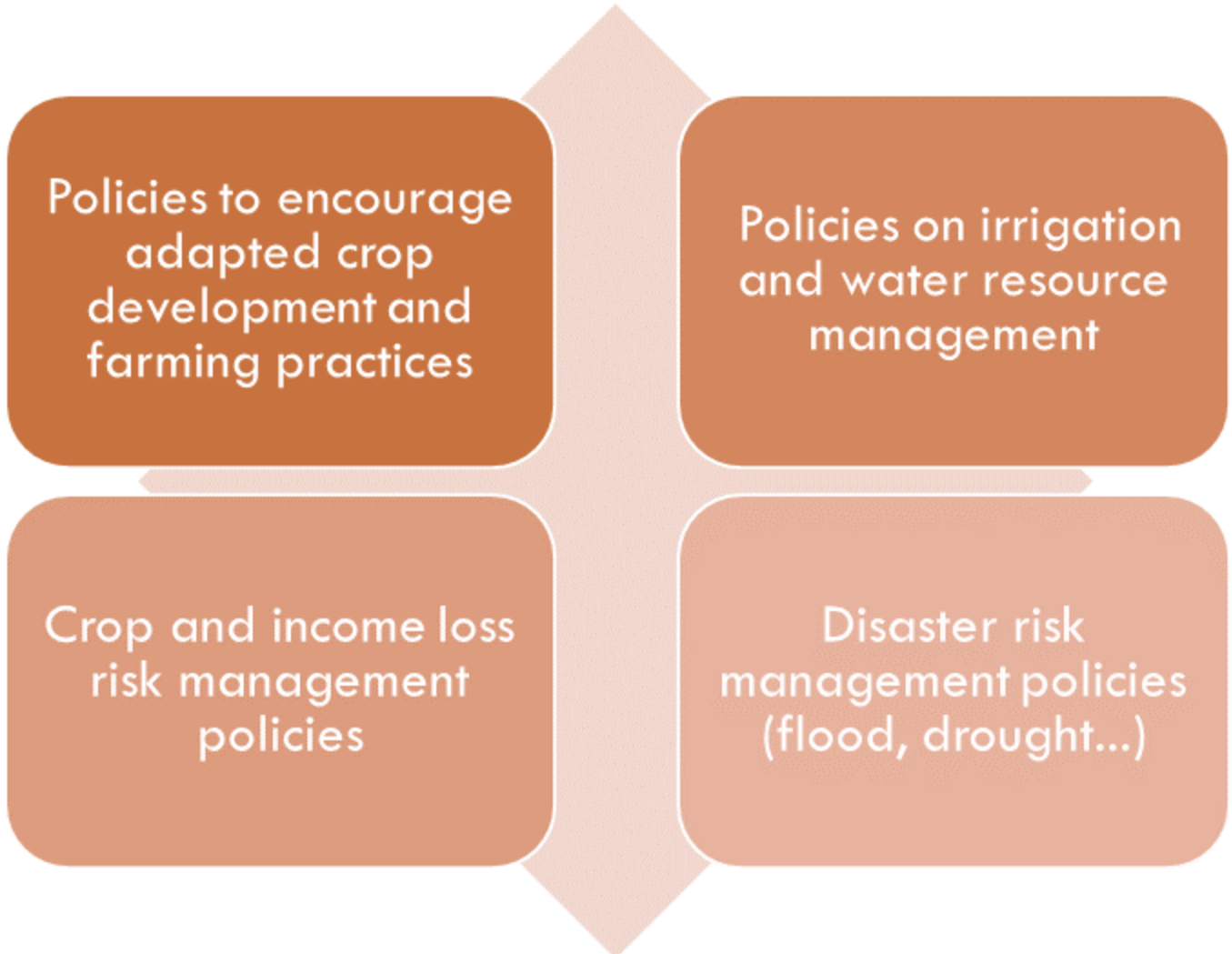
Agriculture Adaptation Targets	Multi objective practices	Agriculture Mitigation Targets
Cropping systems resilient to drought and water stress	L&W conservation measures	Soils enriched in carbon
Reduce flood recurrence and improved resilience to natural disasters	Watershed rehabilitation	Increased carbon stored in forest and rehabilitated land
Diversify rural income and strengthen economic resilience	PES to farmers	Reduced deforestation and slash and burn practices
Increase investments in long term soil fertility and nutrient cycling	Improved institutions for land tenure	Effective soil conservation measures

mainstreaming refers to the incorporation of climate change considerations into established or on-going development programs, policies or management strategies, rather than developing adaptation and mitigation initiatives separately.

Main agriculture policy options with mitigation -adaptation impact



Four agriculture policy panels relevant for adaptation



Encourage adapted crop development and farming practises

- Diversify crop types and varieties, including crop substitution,
- Develop new crop varieties, including hybrids, to increase the tolerance, resistance and suitability (research)
- Promote seed banks so as to help farmers diversify crops and crop varieties
- To increase diversification through subsidies, taxes

Irrigation and water resource management

Improve

- infrastructure for **small-scale water capture**, **storage** and use
- **demand management and water allocation** to encourage **efficiency of use** (best timing and dose of irrigation)

Develop

- **water management innovations**, including irrigation, to address increasing frequency of droughts.
- schemes to **reduce distribution losses** of irrigation water by **maintaining** canals

Innovate

- **Reuse wastewater** for agricultural purposes.
- Encourage improved irrigation methods like **drip and sprinkler irrigation**
- Undertake research to develop crop varieties requiring **little water**

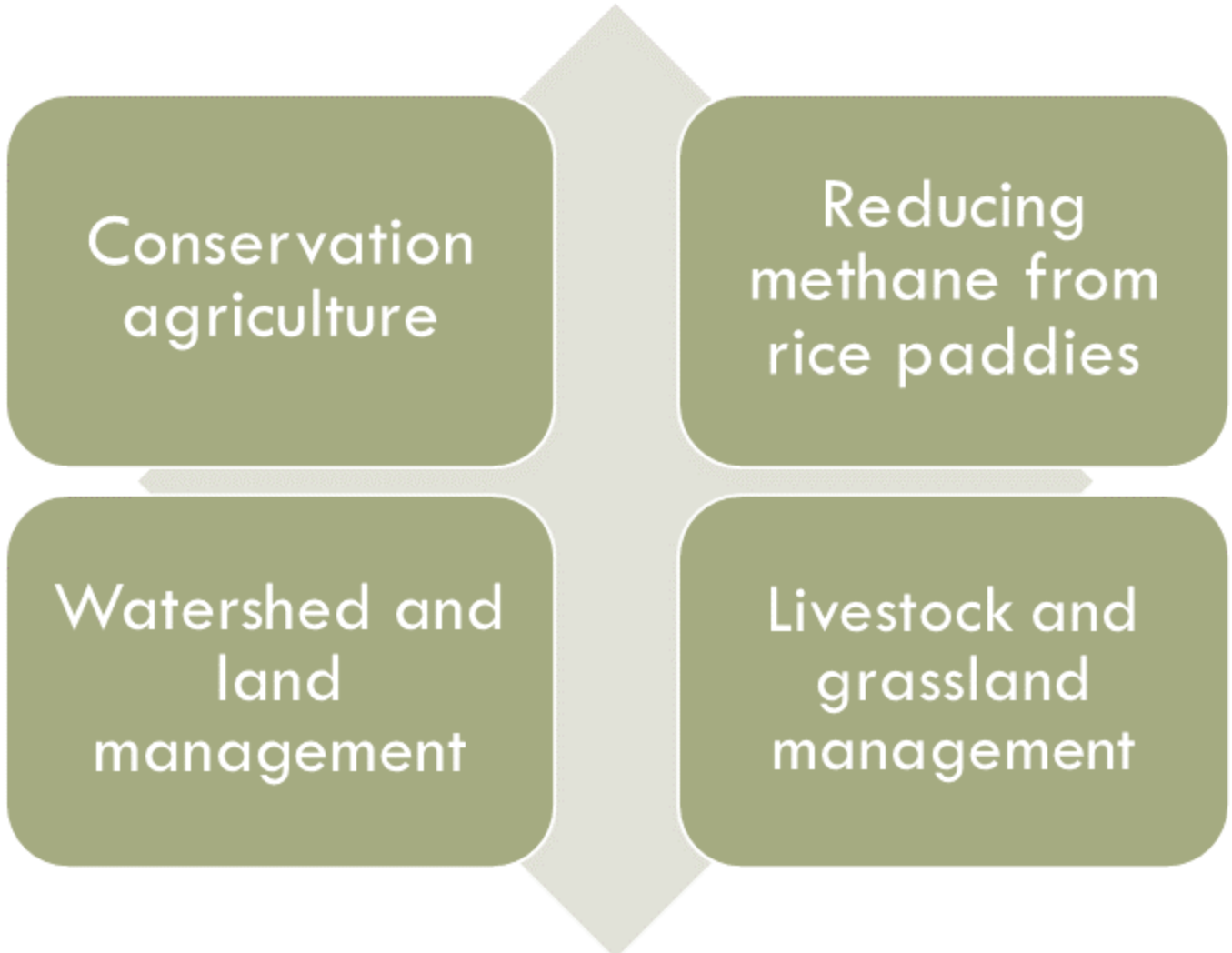
Crop and income loss risk management

- **Diversify** source of household income
- Strengthen self help groups
- Establish weather/meteo-rological stations
- Participate in income stabilization programs
- Promote community based risk management **tools to face crop failures** and **soaring food prices** (grain banks, tontines, self help groups)
- Develop innovative risk financing instruments and **insurance** schemes to reduce climate-related risks

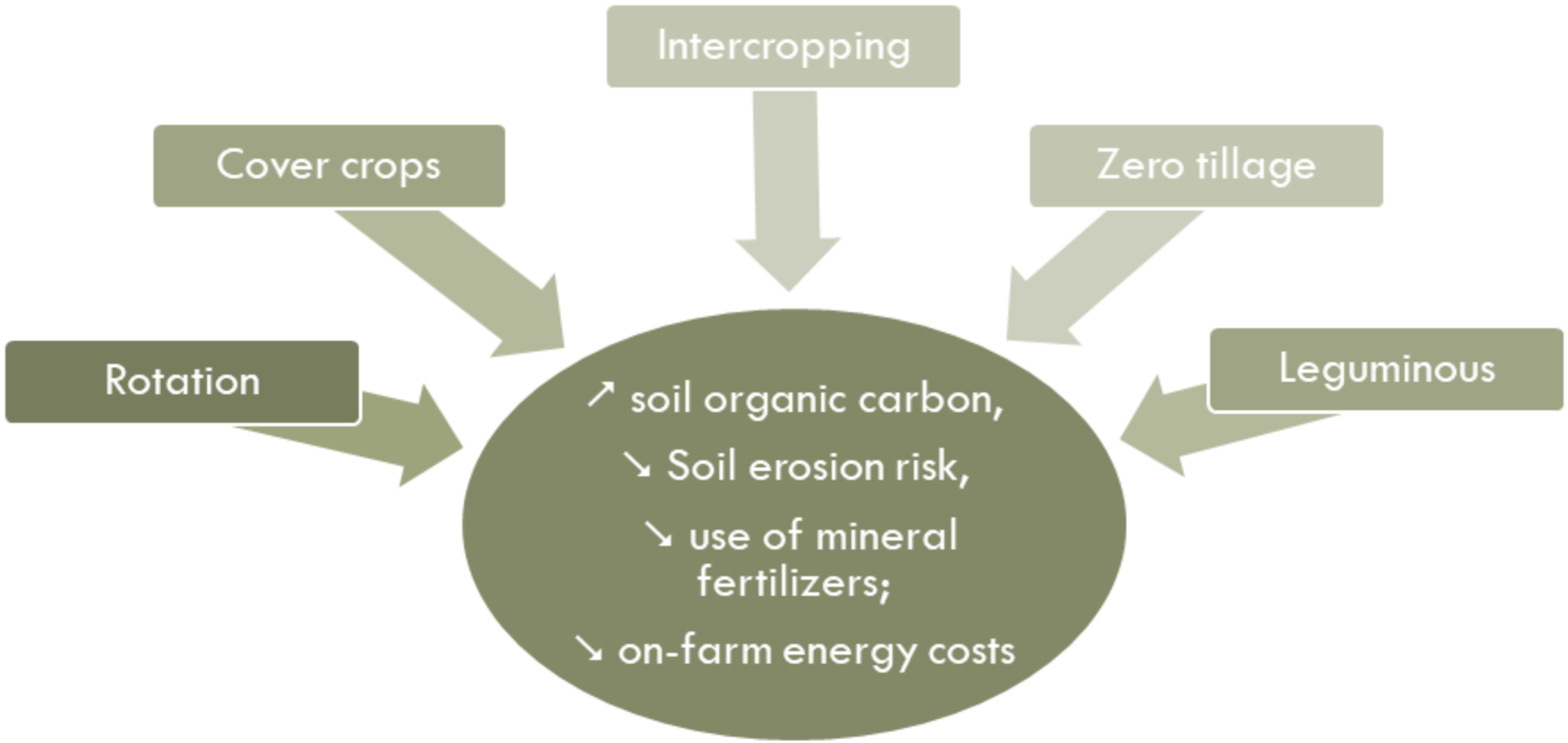
Disaster risk management (flood, drought...)

- **Develop early warning** systems
- **Invest** in infrastructure to **protect against asset loss**
- Protect equipped areas from **flood damage** and maintain **drainage** outlets
- Support the meteorological department,
- **Strengthen community and municipality capacities** in disaster management
- Plant more water-efficient and/or **drought tolerant** crop varieties,

Four mitigation policy panels

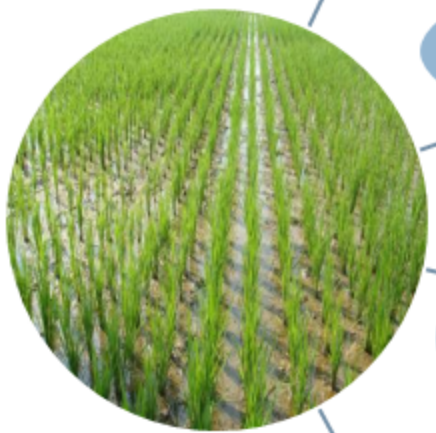


Conservation agriculture



Policy option for adaptation as well as for mitigation, reduces vulnerability to both excessive rainfall and drought

Reducing methane from rice paddies



> 140 million hectares worldwide

The most heavily consumed staple food on earth.

90% of world's rice produced and consumed in Asia, 90 % of rice land flooded (IFPRI 2009).

Emitting between 50 and 100 million tonnes of ↘ CH_4 a year

- Periodic **draining** of fields
- Off-season application of rice crop waste
- **Discourage straw burning**
- Implement a **water-saving technology** as **alternate wetting and drying** (AWD),
- Modify water-management strategies coupled with **efficient application of fertilizer**
- Some rice varieties can be grown under much drier conditions (↘CH_4, = yields)

↘ CH4 should be eligible for offsets and other mitigation funding opportunities

Livestock management

Livestock

Schemes to include **additives** that reduce methane formation

Research and development to improve productivity through **breeding and heifer management**

Grasslands

Encourage adjustments in **intensity** and **timing of grazing** to increase carbon sequestration in pasture lands

Schemes to **improve pasture** quality

Programs to **prevent degradation** of pastures

Watershed and forest management

Promote **reforesting of hillside** degraded areas

Develop **local watershed / land use planning** through municipality and community participatory planning

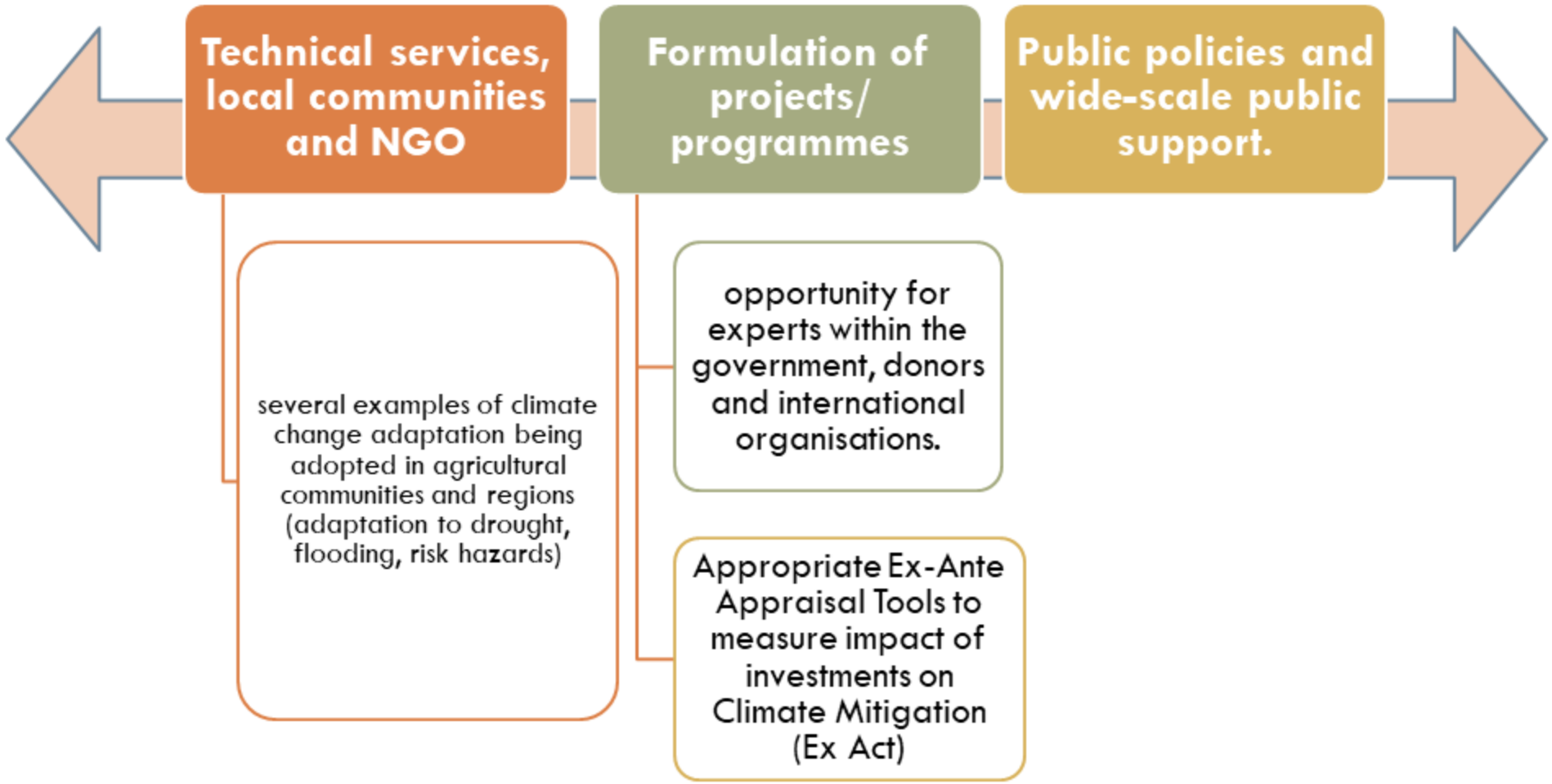
Develop schemes to improve watershed resilience building **at community level**

Mobilize municipality-driven semi permanent **labour intensive public works** (socio-environment safety nets)

Monitor carbon-fixing impact generated to **allow Carbon funding** to support such actions

FROM MAINSTREAMING TO SCALING UP

Implementation through…



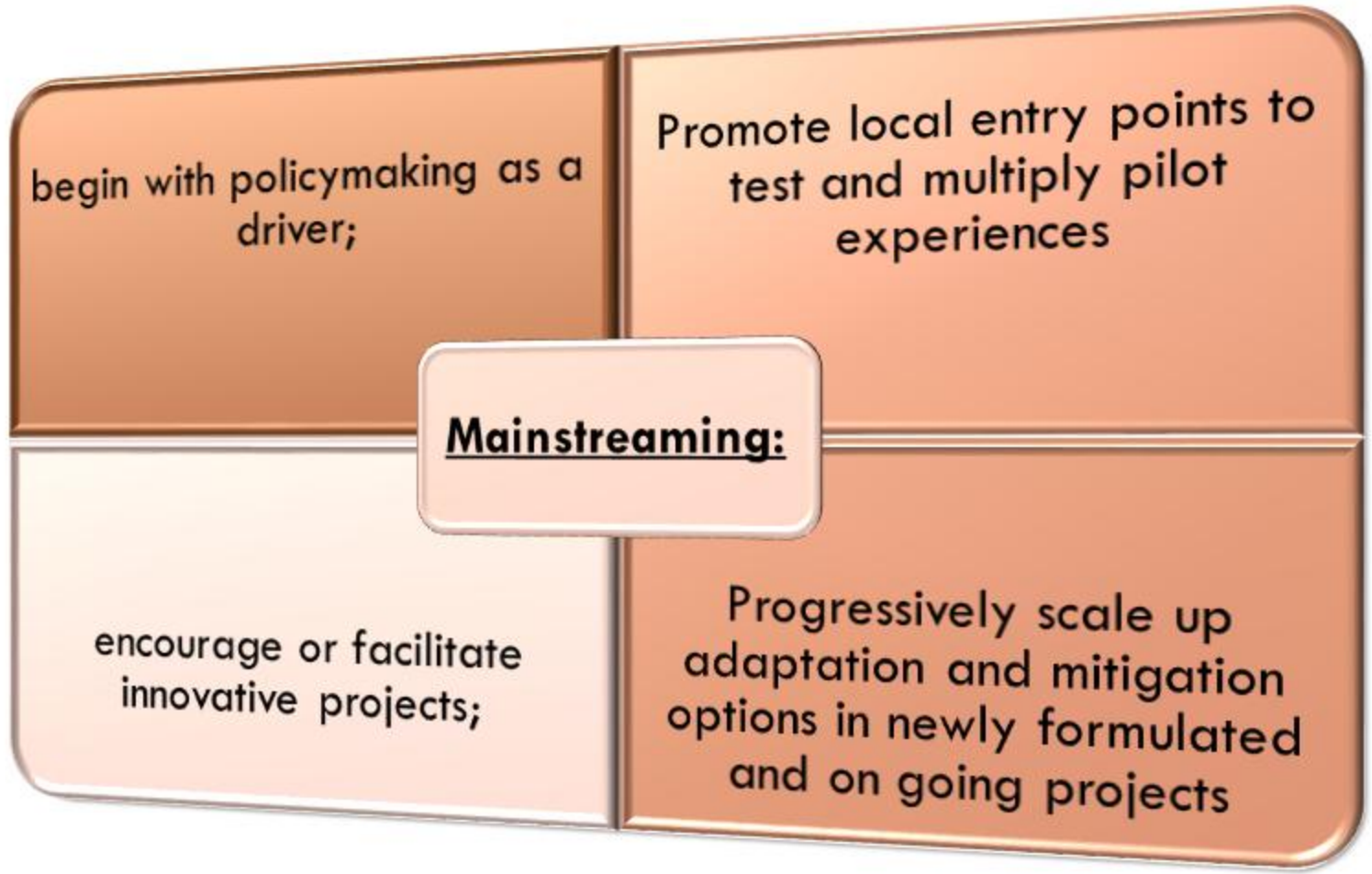
Role of donors and fundings

Significant share of funding is expected to come through two performance-based financing channels for GHG mitigation in developing countries:

- **Support for the implementation of NAMAs**
- **REDD and REDD+**

Agencies or organizations from outside the country can help "climate proofing" a policy requiring stimulus, resources and expertise.

Stimulus and support for adaptation and mitigation can also come from the UN system and from international development institutions


begin with policymaking as a driver;
Promote local entry points to test and multiply pilot experiences
Mainstreaming:
encourage or facilitate innovative projects;
Progressively scale up adaptation and mitigation options in newly formulated and on going projects

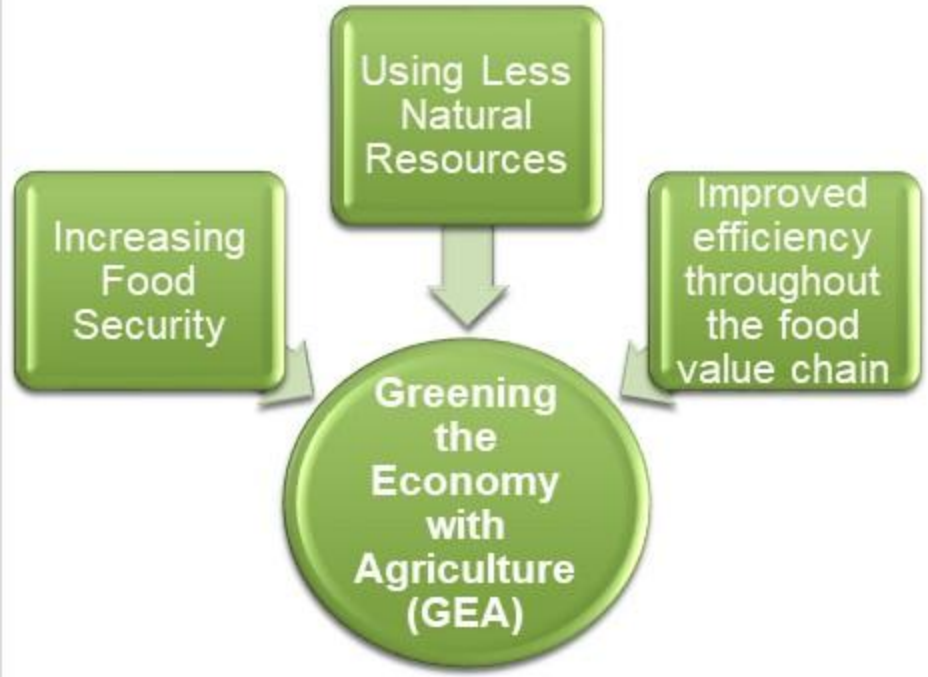
Further readings…

- Bockel L, Smit B, 2009, Climate Change and Agriculture Policies, FAO, Easypol draft of policy guidelines,
- Bernoux M, Bockel L, Branca G, 2009, The EX-ante Appraisal Carbon-balance Tool (EX-ACT), FAO, brief presentation
- Bockel L Thoreux M, Sayagh S, 2009, Resilience of Rural Communities to Climatic Accidents: A Need to Scale Up Socio-Environmental Safety Nets (Madagascar, Haiti). Easypol Policy Brief
- Bockel L, Rao K, 2009, Risk Management as a Pillar in Agriculture and Food Security Policies - India Case Study. Policy Brief

THE GREENING OF AGRICULTURE

The greening of agriculture refers to the increased use of farming practices and technologies that simultaneously:

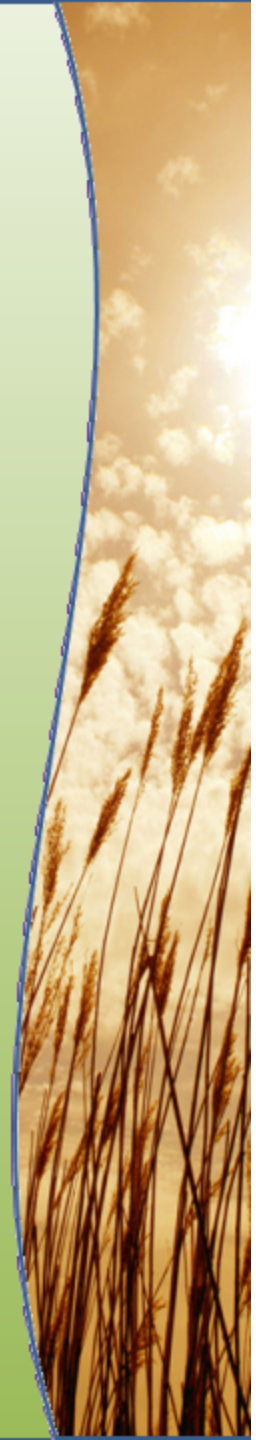
- maintain and increase farm productivity and profitability while ensuring the provision of food on a sustainable basis;
- reduce negative externalities and gradually lead to positive ones; and
- rebuild ecological resources (i.e. soil, water, air and biodiversity "natural capital" assets) by reducing pollution and using resources more efficiently.



Moving toward green agriculture

A Green Economy could be of great benefit to much of Asian agriculture, but need to work on the following areas:

- Need to strenghten institutions to manage the demands for 'greening' agriculture
- Develop agriculture infrastructure and investment
- Capacity building to allow research/extension services to enable farmers to cope with climate variability
- Develop modern risk-management tools such as index insurance and other formal insurance schemes
- New finances to conduct the necessary changes (carbon fund?)



Moving toward green agriculture

With what kinds of options?

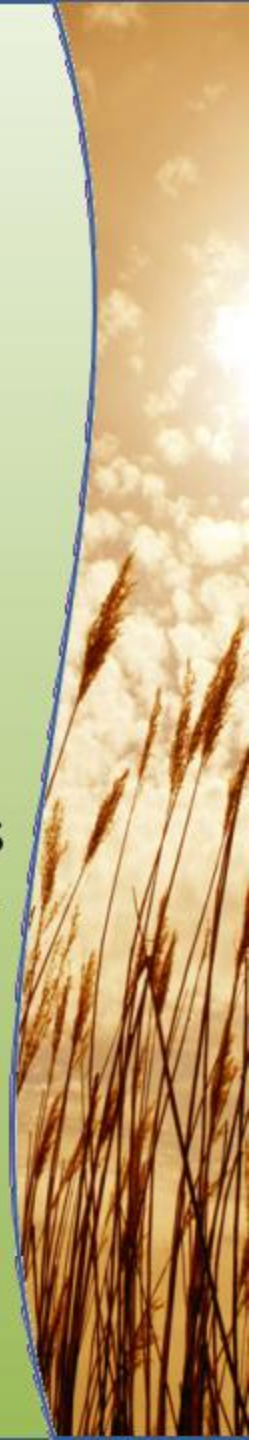
Suppression of the burning (harvest residues…)

Improve soil fertility and plant biomass production

Improve management: Reduce/no tillage and/or cover crop/mulch

Conclusion

- Asia's ability and means for mitigating climate change lies in agriculture Forestry and Land carbon.
- This contribution would concurrently bolster Asian food security, through increased investments in sustainable land management practices that are carbon-friendly.
- Agricultural carbon activities also offer significant co-benefits through rehabilitating degraded soils, increasing productivity of agricultural landscapes, and expanding capacity of communities to cope with climate accidents (flood, drought)



Environment externalities and policy incentives - PES

« Agri-environmental services»

These are the services provided by farmers that contribute to the preservation or improvement of the environment. These services are useful for society as a whole.

The so-called "agri-environmental" practices such as fallow land, grassed strips, hedge maintenance, etc., produce environmental services that can be of several types:

- preservation of water in quality and quantity,
- combating soil erosion,
- protection against floods or forest fires,
- carbon sequestration,
- landscape maintenance.

What are ecosystem services?

- Ecosystem services (MEA, 2005)

Provisioning services	**Supporting services**	**Regulating services**	**Cultural services**
- Food - Fresh water - Fuel wood - Fibre - Bio-chemicals - Genetic resources	- Soil formation - Nutrient cycling - Primary production	- Climate regulation - Water regulation	- Non-material benefits obtained from ecosystems - Spiritual and religious - Recreation and tourism - Sense of place - Cultural heritage

Why do we need to pay for ecosystem services?