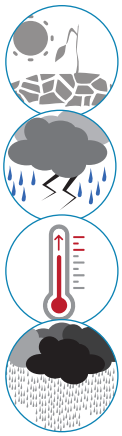
Rice paddy in viet nam. Photo: ©GIZ/ICMP

Opportunities in

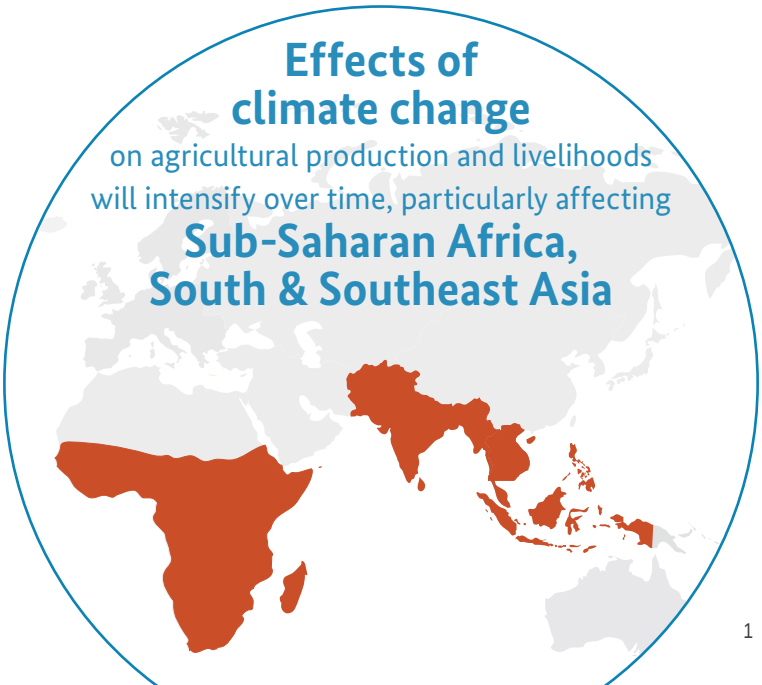
the agriculture sector [1]

for integrating ecosystem-based approaches to climate change and disaster risk reduction

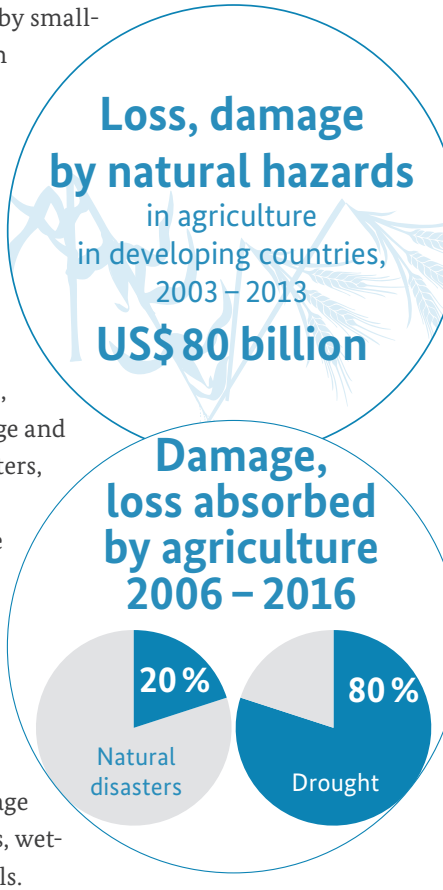


How is agriculture affected by climate and disaster risks?

Changing weather patterns and increasing frequency of natural hazards such as droughts, storms, heatwaves, and torrential rain are affecting agricultural productivity. They are causing severe impacts on crops, livestock and fish and farm infrastructure; this significantly affects agricultural investments, incomes, food production and food security now and in the future. Climate change is considered a significant "hunger-risk multiplier". Effects of climate change on agricultural production and livelihoods will intensify over time, particularly affecting Sub-Saharan Africa and South and Southeast Asia (FAO, 2016a). It is estimated that the population living in poverty could increase by between 35 to 122 million people by 2030 due to climate change, largely due to negative effects on household agricultural incomes (FAO, 2016a). Climate change will also disproportionately impact the most vulnerable that lack access to services and natural resources such as land (ILO, 2017).



In addition, the agriculture sector often bears a disproportionate share of disaster impacts, many of which are borne directly by smallholders and the poor in both urban and rural areas (FAO 2018a). In developing countries, during 2003 – 2013, loss and damage caused by natural hazards in the agricultural sectors totalled nearly US$ 80 billion (FAO 2015). It has been estimated that between 2006 and 2016, over 20 per cent of all damage and loss caused by natural disasters, and 80 per cent for drought was absorbed by agriculture (FAO, 2018a). Disasters have negative impacts on natural resources that sustain agriculture, including surface and groundwater depletion and contamination, increased soil erosion, damage to native forests, mangroves, wetlands and salinisation of soils.

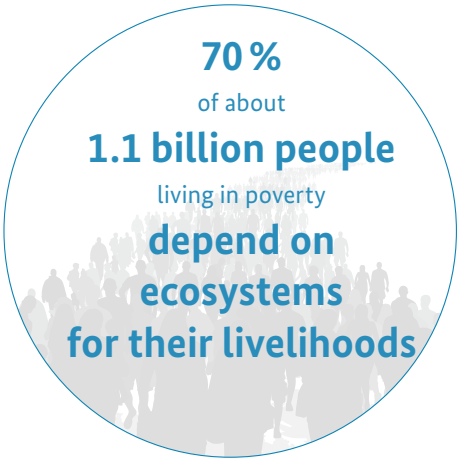


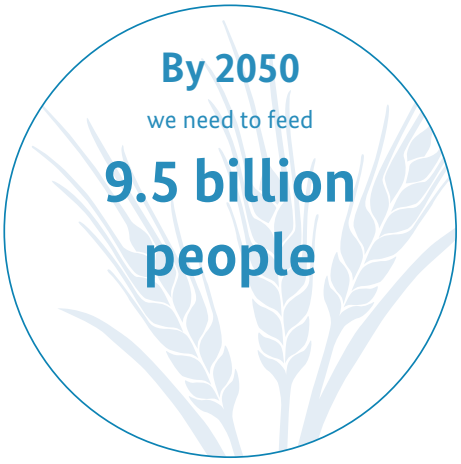
[1] The development and authorship of the sectoral brief "Opportunities in the agriculture sector for integrating ecosystem-based approaches to climate change and disaster risk reduction" was led by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the Food and Agriculture Organization of the United Nations (FAO).

Why ecosystem-based approaches should be strengthened

Agricultural production depends on well-functioning ecosystems and the services they provide such as the provision of healthy and fertile soils, water, pollination, climate regulation, natural pest management, as well as extreme event buffering. Nearly 70 per cent of the estimated 1.1 billion people living in poverty in rural areas depend directly on the productivity of ecosystems for their livelihoods (FAO 2019).

Nature-based solutions help building resilience of agricultural production systems as well as of the ecosystems on which they depend. Resilience against multiple threats is a key prerequisite for sustainable development, in particular, when it comes to the challenge of being able to feed over 9.5 billion people by 2050. Carbon neutral and climate resilient systems are needed across sectors, especially for agriculture and food systems, to sustain food and nutrition security. Ecosystem-based approaches can therefore play a significant role in the transformation of the agriculture sector towards long-term sustainable production systems that can meet the future population's dietary and food security requirements (FAO 2014).

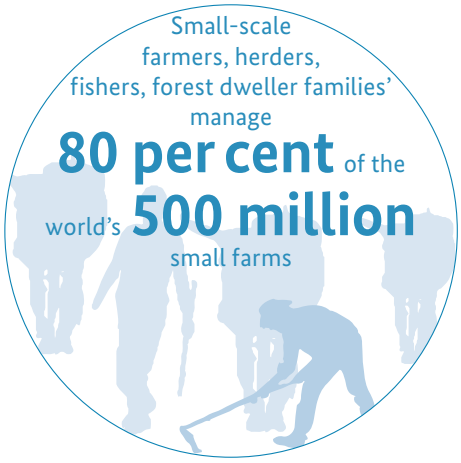




Many past policies and strategies have often led to unsustainable and / or even counter-productive goals (Munang, 2014). EbA and Eco-DRR look at the economic, ecological and social dimensions of agro-ecosystems and the ecological functionality of landscapes. They also aim to systematically integrate climate and disaster risk information into planning and decision-making within territories, governance and management systems.

Agricultural practitioners are key managers of land and waterscapes and among the major beneficiaries of ecosystem services. Small-scale farmers, herders, fishers, forest dwellers and their families, manage over 80 per cent of the world's estimated 500 million small farms and are therefore if empowered can be important stewards of nature-based solutions. Through capacity building and provision of services and incentives, they can apply EbA and Eco-DRR interventions both at the territorial and farm level. For example, interlinked natural hazards of floods and droughts can be addressed through interventions, which capture water within the landscape through soil and watershed interventions (FAO, 2018e).

By reducing risks and building resilience at farm and territorial levels, nature-based solutions help to minimize losses and maintain or even increase agricultural productivity. In addition, other co-benefits can be promoted, such as carbon sequestration, restoration of habitats and biodiversity conservation. It has been estimated that a shift to more sustainable agricultural practices, including local and traditional knowledge from indigenous people, has the potential to create over 200 million more full-time jobs by 2050. Job creation will occur due to labour-intensive green farming practices, management and preservation of ecosystems, research and development, and training of rural populations in the use of green technologies (ILO, 2017a and 2017b).



Typical ecosystem-based approaches & technologies include the following:

Approach / technology examples (including weblinks of EbA/Eco-DRR examples from the PANORAMA Solutions platform) [2]	**Environmental benefit**	**Risk reduction benefit**	**Socio-economic benefit**
Crop diversification[3] – through the use of local varieties, intercropping, mixed farming systems, introduction of additional cultivated species and climate resilient varieties it is aimed at enhancing plant productivity, quality, health and nutritional value and build resilience to pests, diseases and climate change,	Erosion prevention, soil fertility maintenance	Buffering of extreme temperatures, precipitation droughts, floods, storm surges	Economic diversification, productivity and increased income, food security
Sustainable rangeland management, livestock production and pasture restoration[4] – with locally adapted breeds, optimization of grazing density and grazing rotation.	Erosion prevention, maintenance of biodiversity	Buffering of potential losses due to extreme events	Productivity and income stability; maintenance of productive assets
Agroforestry[5] – as an integrated approach to the production of trees and of non-tree crops or animals on the same piece of land. Agro-forestry can improve the resilience of agricultural production to current climate variability as well as long-term climate change through the use of trees for intensification, diversification and buffering of farming systems.	Climate regulation, food provision, habitats for species, pollination, carbon sequestration	Buffering of extreme temperatures, precipitation, droughts, storm surges	Economic diversification, productivity increase
Assisted Natural Regeneration (ANR)[6] – land restoration method that can convert degraded lands into more productive area, by retention of naturally regenerating seedlings (Monty, 2017).	Soil productivity, crop protection	Droughts, salinity	Enhanced productivity, limited resources required
Soil management[7] – crop rotation, green manure, soil cover / mulching, zero tillage, as used in agroecology, conservation agriculture.	Reduced loss / use of natural resources (water), improved soil fertility and biodiversity	Reduced water requirement, improved resilience to floods and droughts	Increased production / income, job creation
Territorial and landscape interventions (sustainable land and water management)[8] – water retention / regulation at landscape and field level. Can include conservation and connection of forest remnants, integrated management of peatlands, terracing, contour ploughing, protection of water catchments, and flood plains, trenches for water retention, shade and water capture trees, etc.	Improved water quality and availability, reduced soil erosion. Increased biodiversity and ecosystem functioning	Reduce variability of agricultural production, reduce incidence and severity of floods, droughts and landslides	Stable production and increased food security, job creation

(Source: FAO 2010, FAO, 2017a, FAO 2017b, GIZ, 2018 and www.panorama.solutions)

[2] PANORAMA Solutions for a healthy planet platform (www.panorama.solutions)
[3] panorama.solutions/en/solution/ecosystem-based-adaptation-small-holders-roslagen-sweden
[4] panorama.solutions/en/solution/developing-sustainable-landscapes-grasslands-south-africa
[5] panorama.solutions/en/solution/resilient-rural-livelihoods-through-eco-restoration-and-sustainable-natural-resources
[6] panorama.solutions/en/solution/sustainable-land-use-management-konegummez-village-turkmenistan
[7] panorama.solutions/en/solution/promoting-principles-ecosystem-based-adaptation-conservation-agriculture
[8] panorama.solutions/en/solution/promotion-agrobiodiversity-and-riparian-restoration-sixaola-binational-river-basin

Photos, from top to bottom:
❶ Agroforestry system, Indonesia. © GIZ / Mathias Bertram ❷ Livestock, Mongola. © GIZ / Dirk Ostermeier ❸ Trees ForTheFuture, Ethiopia. © Flickr, creative commons, Trees for the Future, www.flickr.com/photos/plant-trees/2675275368, is licensed under CC BY 2.0 ❹ GCS-Tenure Project in Maluku. © Flickr, creative commons, Ulet Ifans, www.flickr.com/photos/cifor/36827416006, is licensed under CC BY 2.0 ❺ Plants in nursery. © Flickr, creative commons, CIFOR, www.flickr.com/photos/cifor/35387442373, is licensed under CC BY 2.0 ❻ Aerial photo of village in North Dafur, Sudan. © UNEP

Existing opportunities & required action

Several entry points for strengthening ecosystem-based approaches for climate change adaptation and disaster risk reduction within the agriculture sector include the following:

Entry points	Examples
Policies	Food security policies, economic development policies, UN Agenda 2030 and Sustainable Development Goals (SDGs), UNFCCC Paris Agreement including Nationally Determined Contributions (NDC) with agriculture sectors (crops, livestock, forestry, fisheries and aquaculture), UNCCD Land Degradation Neutrality Target Setting Programme, CBD Aichi Targets and Post 2020 Framework, UNISDR, Guidelines for a just transition towards environmentally sustainable economies and societies for all.
Planning instruments	Development plans, agricultural production plans, sector plans, watershed management plans, land use plans, climate change strategies including National Adaptation Plans (NAPs) and Nationally Appropriate Mitigation Action (NAMAs), UNFCCC Koronivia Joint Work on Agriculture (KJWA), FAO Climate Smart Agriculture (CSA) framework, skills development strategies.
Command and control instruments	Agrarian laws, standards, environmental laws and impact assessments, mandatory certification schemes.
Economic and fiscal instruments	Agricultural investment programmes, funds, taxes, fees and subsidies as incentive systems, Payments for Environmental Services (PES).
Informative measures	Formal education, such as agricultural schools and non-formal extension programmes, demonstration sites, farmer to farmer exchanges, IT agricultural solutions, etc.
Voluntary measures	Voluntary environmental agreements, standards and certification schemes e.g. fairtrade and “green” certification schemes.
Institutions	Task forces, committees, associations, unions, cooperatives, regional government agricultural and environmental advisory bodies, international and national food producing companies, extension services.
Management types	Public, collaborative and private management of farmland and pastures, Integrated Water Resource Management (IWRM) approaches, micro-watershed management for improving irrigation, CSA approaches.

Further action will be needed in the following areas:

- Assess the dependency of agricultural value chains on ecosystem services and how agricultural activities affect the provision of ecosystem services.

- Assess risks and vulnerabilities of the agriculture sector to climate change and disaster impacts in terms of sensitivity, exposure to risks and adaptive capacity. This includes a risk assessment for agricultural value chains - from production to consumption - to estimate possible impacts of current and future hazards and the potential of nature-based solutions to mitigate risks.

- Assess the capacity and skills of agricultural practitioners needed to manage, implement and monitor ecosystems-based practices.

- Identify short-, medium- and long-term actions to address these risks based on existing local and traditional / indigenous knowledge and scientific knowledge.

- Develop approaches for integrated risk reduction strategies that systematically include nature-based solutions in the overall planning and implementation.

- Improve cross-sector coordination of public institutions (e.g. Ministries of Agriculture and Environment, Finance and Planning), policy and legislation to create the needed enabling environment for the adoption of EbA / Eco-DRR measures.

- Identify leaders and key actors from government (planning and sector ministries), civil society (associations, foundations, community organizations, media and academia) and private sector (including food producing companies, cooperatives and retailers as well as investors) to become allies / partners during the planning and implementation of measures.

- Strengthen local governance and management structures by improving technical and institutional capacities of land use organizations (e.g. farmers, pastoralists, fishers) and by fostering the participation of local communities and marginalized groups in decision-making processes.

- Identify priorities and entry points to mainstream EbA into development plans at local, regional, and national scales.

- Development of appropriate tools to determine main benefits, barriers, and costs for the adoption of appropriate EbA / Eco-DRR measures by different practitioners such as farmers and in particular smallholders.

- Promote an enabling environment to implement and scale out EbA / Eco-DRR measures adoption, including the effective use of financial incentive and taxation schemes.

- Assess the potential for integrating the risk reduction potential of ecosystems into agricultural insurance products and credit lines.

- Set up of sound M&E-systems as well as appropriate indicators and criteria to measure impact of EbA-practices.

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