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Adaptation in the agriculture sectors: leveraging co-benefits for mitigation and sustainable development





Adaptation in the agriculture sectors: leveraging co-benefits for mitigation and sustainable development

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Abbreviations and acronyms

CIFOR	Center for International Forestry Research
FAO	Food and Agriculture Organization of the United Nations
FTA	CGIAR Research Program on Forests, Trees and Agroforestry
GCF	Green Climate Fund
GEF	Global Environment Facility
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
M&E	Monitoring and evaluation
MRV	Measuring, reporting and verification
MICCA	FAO Mitigation of Climate Change in Agriculture Programme
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
SDGs	Sustainable Development Goals
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VNR	Voluntary national review

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Introduction

National planning and investment processes pursue multiple objectives, including economic growth, food security and well-being and environmental integrity, with varying temporal and spatial scales and competing resources and capacities. Investment in climate change adaptation programmes, policies and projects, therefore, may largely depend on their ability to optimize synergies with other national priorities.

As such, “adaptation co-benefits” are key to driving adaptation at the national level and are a crucial step in breaking down sectoral silos and pursuing climate-resilient development. It is critical for national policymakers to mainstream the consideration of adaptation co-benefits and interlinkages to sustainable development and climate goals into integrated strategies that can increase impact, maximize investments and incentivize cooperation across different sectors and stakeholders.

There is also a need to ensure that multi-objective mechanisms and institutions are in place to reconcile potential trade-offs and opportunity costs between climate action and sustainable development. In a post-2015 development world, national policy makers will increasingly have to report on the contribution of national policies to multiple international agendas, including National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs) under the Paris Agreement, the Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development and the Sendai Framework for Disaster Risk Reduction. Policies advancing multiple goals may also attract greater financial support (IPCC, 2014a).

This policy brief takes climate change adaptation in agriculture (crops, livestock, forestry, fisheries and aquaculture) as its starting point to identify potential co-benefits. It assesses the broad and multi-directional interplay between climate action and sustainable development. It identifies the various pathways by which economic, social and environmental co-benefits can be generated from adaptation interventions in agriculture (covering crops, livestock, forestry, fisheries and aquaculture), across sectors and at different scales.

The explicit incorporation of adaptation co-benefits into sectoral and cross-sectoral national projects, policies, and programmes can be a major driver and incentive for policy makers and all actors to invest in adaptation.

The purpose of this brief is to facilitate the process for integrating adaptation co-benefits into national development and sectoral policies by introducing a step-by-step approach directed at policy-makers.

The overall objective is to support national governments to leverage adaptation in agriculture as a means of co-delivering on multiple climate and sustainable development agendas, including the Paris Agreement, 2030 Agenda for Sustainable Development and Sendai Framework, as well as mobilize domestic and international support.

Key messages

- 1** *Adaptation in agriculture can generate a wide set of climate and non-climate co-benefits, contributing towards progress on sustainable development and the stabilization of the global climate.*
- 2** *Adaptation co-benefits often represent the main driver of adoption and investment in climate change adaptation at the national level.*
- 3** *The recognition and valorization of climate and non-climate co-benefits of adaptation in National Adaptation Plans (NAPs) can drive wider support amongst national stakeholders and extend its reach across sectors and scales.*
- 4** *It is critical for national policy makers to assess the economic, social and environmental costs and benefits of adaptation options to formulate policies and programmes that co-deliver on the long-term goals of the Paris Agreement and the 2030 Agenda for Sustainable Development.*



I. Definitions

What is adaptation in agriculture?

Climate change adaptation refers to changes in processes, practices and structures to moderate potential damages from climate change, or to benefit from opportunities associated with such changes.

Adaptation in agriculture signifies modifying land use, agricultural production, socio-economic and institutional systems and policymaking in response to and in preparation for actual or expected climate variability and change and their impacts, to moderate harmful effects and exploit beneficial opportunities (FAO, 2017a).

What is an adaptation co-benefit?

An adaptation co-benefit refers to a socially, economically and/or environmentally desirable outcome that is generated from the implementation of an adaptation policy or measure. Conversely, an adaptation tradeoff refers to an undesirable social, economic and/or environmental outcome generated from the implementation of an adaptation policy or measure. While the latter constitutes a reinforcing relationship between two objectives, the latter constitutes an opposing relationship.

Co-benefits and tradeoffs may be generated at different scales and across sectors, and their social, economic, or environmental desirability depend on local circumstances and implementation practices, among other factors (IPCC, 2018). True-cost accounting approaches that incorporate the direct and indirect costs and benefits of adaptation measures in terms of economic, social and environmental asset impacts can contribute to a more “holistic” and evidence-based approach to national policy making and investments.

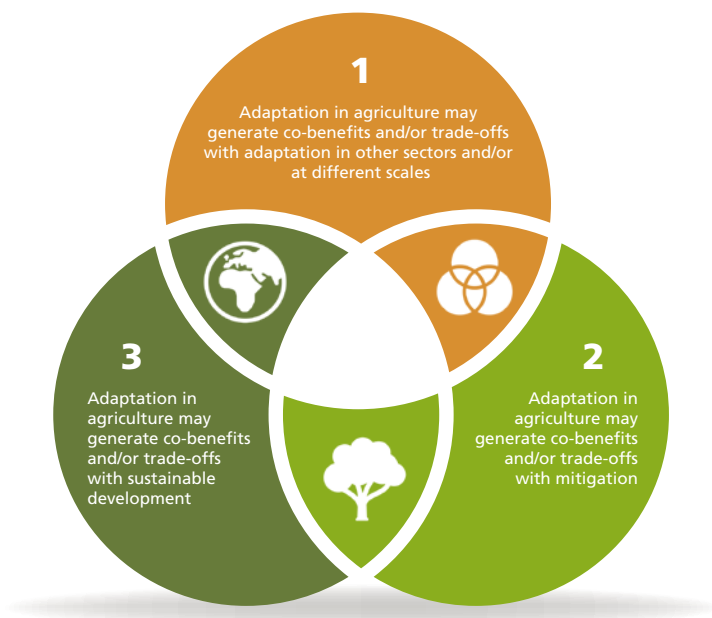
This brief situates adaptation co-benefits within the context of the United Nations Framework Convention on Climate Change (UNFCCC) where the co-benefits of adaptation fall generally into two categories: climate (i.e. climate change mitigation) and non-climate (e.g. sustainable development) benefits.

2. Interlinkages between adaptation in agriculture and adaptation co-benefits

How is adaptation in agriculture linked to other climate and non-climate co-benefits?

Three interlinked pathways are identified (Figure 1):

Figure 1. Interlinkages between adaptation in agriculture and adaptation co-benefits



1. *Adaptation in agriculture may generate co-benefits and/or trade-offs with adaptation in other sectors and/or at different scales*

Adaptation in agriculture can generate co-benefits for and/or trade-offs (or maladaptation) with other sectors, just as adaptation at one scale can impact, negatively or positively, actors at another scale, suggesting that it is more cost-effective if strategies are coordinated cross-sectorally and at multiple scales.

Table 1. Examples of adaptation co-benefits across scales and sectors

Sector	Intervention	Adaptation benefit	Sector	Co-benefit	Source
OCEANS	Restoration of marine ecosystems	Oceans provide ecosystem services, such as the maintenance of genetic diversity and habitat provision	FISHERIES	Increased economic opportunities for local fisher folk	Pörtner, H. <i>et al.</i> , 2014
FORESTRY	Protection of forest areas	Forests provide ecosystem services, such as flood management	TOURISM	Increased economic opportunities in tourism	Roy J. <i>et al.</i> , 2018

Table 2. Examples of adaptation trade-offs across scales and sectors

Sector	Intervention	Adaptation benefit	Sector	Trade-off	Source
WATER	Large water-related infrastructure development	Drought preparedness increases adaptive capacity for water management in response to reduced levels of precipitation	WATER	Lower levels of water available to downstream and other river basin users (e.g. small-scale agricultural systems)	IPCC, 2014b
BIODIVERSITY	Protection of critical habitat for vulnerable species	Preservation of natural corridors enable species migration and support the maintenance of ecosystem and genetic diversity	AGRICULTURE	Regulatory barriers may impede regional economic development in agriculture or forestry	IPCC, 2014a

2. *Adaptation in agriculture may generate co-benefits and/or trade-offs with mitigation*

In agriculture most actions for adaptation are likely to have effects on mitigation, positive or negative. It is widely recognized that sustainable food and agriculture systems carry the greatest potential for generating synergies across climate change adaptation and mitigation efforts (FAO, 2016). The Intergovernmental Panel on Climate Change (IPCC) finds that most categories of adaptation options in agriculture for climate change have positive impacts on mitigation (IPCC, 2014b). The most prominent option found in the scientific literature that enhances resilience to future climate change while also delivering mitigation in agriculture is the enrichment of soil carbon stocks (Smith and Olesen, 2010).

However, trade-offs may emerge between adaptation and mitigation objectives if changes in practices, processes or structures to adapt to climate change in turn increases greenhouse gas (GHG) emissions and/or degrades carbon sinks.



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Table 3. Examples of adaptation co-benefits for mitigation

Sector	Intervention	Adaptation benefit	Mitigation benefit	Source
COASTAL ZONES	Coastal restoration of mangroves and salt marshes	Ecosystem-based adaptation provides a buffer against damage to coastal communities	Mangroves also provide biodiversity co-benefits, support fish nurseries, and enhance carbon sequestration	Pörtner, H. <i>et al.</i> , 2014
AGRICULTURE	Agroforestry	Agriculture is more resilient under increased climate variability.	Increased carbon stocks above and under ground	Verchot <i>et al.</i> , 2007

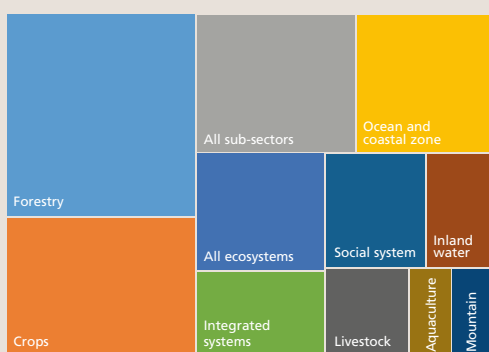
Table 4. Examples of adaptation trade-offs with mitigation

Sector	Intervention	Adaptation benefit	Mitigation trade-off	Source
LIVESTOCK	Temperature controlled livestock facilities	Reduced heat stress and animal mortality	Higher energy demand and associated GHG emissions	Denton F. <i>et al.</i> , 2014
WATER	Desalination	Increase water resource reliability and drought resilience	High energy demand and associated GHG emissions	IPCC, 2014a

BOX 1. Adaptation Co-benefits in Nationally Determined Contributions (NDCs)

A review of the NDCs shows that almost half of developing country Parties (63 out of 138) explicitly acknowledge the potential of adaptation in agriculture to generate co-benefits in agriculture and land use as of 1 April 2019. The majority of those countries reference the potential to generate co-benefits for mitigation but also include improved water quality, biodiversity, increased agricultural productivity, better health and nutrition outcomes and enhanced economic development opportunities for local communities amongst co-benefits. When countries quantify co-benefits, it is generally only mitigation co-benefits, expressed in terms of tons of CO₂ equivalent stored, sequestered or avoided.

Figure 2. Distribution of adaptation co-benefits reported in NDCs, by related eco and social system



Source: FAO NDC Database (unpublished)

Overall, the majority of co-benefits reported in the NDCs are generated from adaptation measures in forest ecosystems particularly from reducing forest degradation and sustainable forest management. Other co-benefits are generated in relation to nutrient and on-farm soil management, agroforestry and ocean and coastal zone conservation and restoration, for instance. **Figure 2** illustrates the distribution of adaptation co-benefits reported in the agriculture and land use components of NDCs at global scale.

Table 5. Examples of adaptation measures and co-benefits mentioned in Nationally Determined Contributions (NDCs)

Country	Adaptation measure	Co-benefit
MONGOLIA	Improve pasture management	Increase the carbon sink of CO ₂ equivalent to 29 million tons per year, which is equal to 1/3 of emission reduction in energy sector
MARSHALL ISLANDS	Mangrove rehabilitation	Enhance carbon sinks as well as assist with protection of water resources and the health of the people
NEPAL	Protect 0.2 million ha of forests through the implementation of adaptation plans, and mainstream community/ecosystem-based adaptation by 2025	Forests are projected to provide additional benefits through forest-enterprise development, adaptation to climate change and contribution to local and national economy while sustainably conserving watershed and biodiversity
INDIA	Expanding tree plantation in complementarity and integrated manner with crops and livestock. It will help protect and stabilize ecosystems, and promote resilient cropping and farming systems to minimize the risk during extreme climatic events	It will also complement achieving the target of increasing forest/ tree cover



3. *Adaptation in agriculture may generate co-benefits and/or trade-offs with sustainable development*

Sustainable development is most often defined as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED, 1987) and includes balancing social well-being, economic prosperity and environmental protection. The UN 2030 Agenda for Sustainable Development sets out 17 ambitious goals for sustainable development for all countries by 2030, which aim to end all forms of poverty, fight inequalities and tackle climate change, while ensuring that no one is left behind.

Climate change is changing the contexts in which development takes place by changing the intensity and frequency of climate-related risks, and their impacts on people’s vulnerability and livelihoods. Adaptation strategies that seek to reduce exposure to climate change can also channel sustainable development benefits, such as reducing exposure to natural hazards (e.g. flood, drought), addressing socio-economic risks (e.g. food and water insecurity, health impacts) or addressing natural resource and biodiversity threats. The extent to which adaptation activities can contribute to sustainable development will vary by development process and underlying vulnerability contexts (IPCC, 2014b). The latest evidence suggests that, overall, the impacts of adaptation on sustainable development, poverty eradication and reducing inequalities in general are expected to be largely positive, given that the inherent purpose of adaptation is to lower risks (IPCC, 2018). If, however, re-distributional measures to facilitate equitable development, including the poor and most vulnerable, are not put in place, adaptation strategies risk impeding or reducing progress on poverty reduction and may exacerbate existing inequalities (IPCC, 2014b). Identifying adaptation options that generate adaptation co-benefits for sustainable development can assist in addressing existing development deficits while also meeting long-term sustainable development and resilience objectives (IPCC, 2014a), which is particularly important where adaptive capacity in developing countries is constrained by a lack of resources, poor institutions and inadequate infrastructure (Smith *et al.*, 2003).

Table 6. Examples of adaptation co-benefits for sustainable development, by social, economic and environmental dimension

Intervention	Adaptation benefit	Sustainable development benefit	SDG benefit		Source
Sustainable forest management programmes	Forest ecosystem services contribute to watershed management, biodiversity and erosion control in agriculture	Greater food availability and diversity of diets for marginal rural communities contribute to food security and nutrition; reduced burden on women to provide fuel wood services; and greater economic opportunities from forests for local communities	SOCIAL	2 5 10	FAO, 2017
Income, asset & livelihood diversification	Value addition or off-farm income generating opportunities can reduce sensitivity to climate extremes and change in agriculture	Livelihood security and poverty alleviation		1	IPCC, 2018
Storage of food	Coping strategy during climate shocks	Avoided liquidation of assets for food contributes to poverty alleviation	ECONOMIC	1	Roy J. <i>et al.</i> , 2018
Planting mangrove forests	- Coastal adaptation to sea level rise - Reduced flood risks and improved water quality	- Enhanced livelihoods on land and oceans - Increased local food security	ENVIRONMENTAL	1 6 2 14	IPCC, 2018
Soil conservation	Reduced vulnerability to climate-related erosion in cropping systems	- Reduce runoff and eutrophication of inland water ecosystems - Reduced silting in dams, conserving their storage potential - Reduced air pollution - Improved fertility - Better water retention		3 6 15	IPCC, 2014b

Table 7. Examples of adaptation trade-offs for sustainable development, by social, economic and environmental dimension

Intervention	Adaptation benefit	Sustainable development trade-off	SDG benefit		Source
Resettlement of communities	Reduced exposure to climate -related extremes and slow onset events affecting agriculture and dependent livelihoods	Loss of sense of place and cultural identity; erosion of kinship and familial ties; and impacts to receiving communities, driving reduced human security and violent conflict	SOCIAL	16	Adger, W.N. <i>et al.</i> , 2014
Changes in crop mix	Crop species better adapted to drought or salinity under climate change	Loss of income or culturally inappropriate food	ECONOMIC	1 2	Roy F. <i>et al.</i> , 2018; Carr, E.R. and M.C. Thompson, 2014
Increased use of chemical pesticides	Suppress opportunistic agricultural pests and invasive species	Used without regulation, pesticides can lead to water pollution; adverse impacts on non -target species; increased GHG emissions; and human exposure to pollutants	ENVIRONM.	3 6 13 15	IPCC, 2014a

3. Leveraging adaptation co-benefits through National Adaptation Plans

Adaptation co-benefits present an opportunity to rally national commitments to act and incentivize investment in climate change adaptation. With limited resources, the capacity to identify policies that co-deliver on both climate and sustainable development goals is critical for enabling progress across both agendas by 2030. The recognition and valorization of climate and non-climate co-benefits of adaptation in NAPs can drive wider support amongst national stakeholders and extend its reach across sectors and scales.

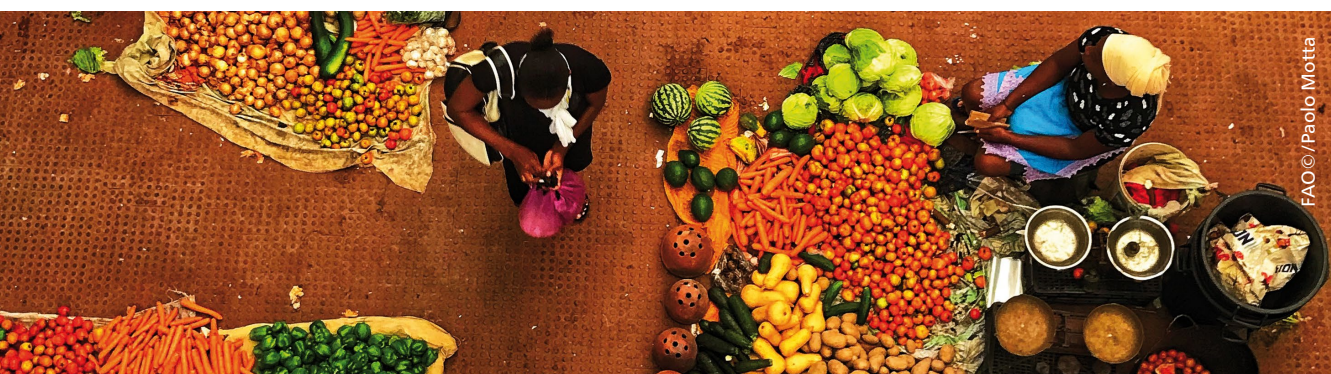
We propose hereunder a step-by-step approach to support national and sub-national governments to identify, prioritize and mainstream adaptation co-benefits into adaptation processes, particularly into sectoral or cross-sectoral NAPs.

Integrating adaptation co-benefits into national policies and budgets for climate-resilient development: a step-by-step approach

Step 1: Identifying climate-related vulnerabilities, impacts and risks in agriculture

In order to identify appropriate adaptation options, adaptation planners should first assess the observed and/or projected impacts of climate change on agro-ecosystems and related livelihood systems to determine the extent to which climate change will have an impact, pose a risk or even offer beneficial opportunities in these systems.

- Analysis of climatic and non-climatic vulnerabilities, impacts and risks in agro-ecosystems and livelihood systems.
- Identification of most vulnerable natural resources, sub-sectors, economic activities and populations.
- Identification of development trends and socio-economic factors that will influence future vulnerability, impacts and risks.



Step 2: Assessing the costs and benefits of adaptation options in agriculture

Assessing the economic, social and environmental costs and benefits of adaptation options plays an important role in informing adaptation planners on how, when and where to prioritize adaptation and allocate scarce financial, technical and human resources. The assessment should consider the extent to which an adaptation option will address climate-related vulnerabilities, impacts and risks identified and contribute to desired adaptation outcomes and/or national development objectives. The evaluation of adaptation options should be based on a cost-benefit approach that assesses whether the benefits (i.e. adaptation outcomes) and co-benefits (e.g. additional economic, social and environmental outcomes) of an option outweigh its costs, and by how much in relation to other alternatives. Adaptation planners can make use of a range of approaches proven to be effective decision-making tools in broader development and sectoral planning contexts, including cost-benefit analysis, cost-effectiveness analysis and multi-criterial analysis (UNFCCC, 2011). All costs and benefits should be quantified, when possible, or qualitatively assessed, with special attention to the distribution of benefits and costs across different groups in society and the discounting of costs and benefits that accrue to future generations (OECD, 2006). Engaging affected stakeholders for identifying the criteria and their weights for the prioritization and selection of adaptation options can be useful to identify an appropriate set of options considered acceptable in a given society (Climate-ADAPT, n.d.).

- **Identification of adaptation options and potential trade-offs.**
Analysis of adaptation options with potential co-benefits and tradeoffs generated (i.e. by type of co-benefit, for who, under what conditions, cost, timeframe, potential risks and trade-offs).
- **Valorization of adaptation options with co-benefits.**
Score options by impact potential criteria (technical feasibility, cost effectiveness, resource efficiency, social equity, institutional sustainability and scalability) and rank options by impact potential.
- **Prioritization of adaptation options with co-benefits.**
Prioritize adaptation options by impact potential ranking using a multi-stakeholder consultation process.

Adaptation co-benefits are place- and context-specific. Adaptation co-benefits present an opportunity for pursuing climate-resilient pathways that have the potential for significant positive outcomes for well-being in countries at all levels of development. The IPCC finds that positive sustainable development outcomes emerge when adaptation pathways are place- and context-specific and (i) ensure a diversity of adaptation options based on people's values and the trade-offs they consider acceptable, (ii) maximize synergies with sustainable development through inclusive, participatory and deliberative processes, and (iii) facilitate equitable transformation (Roy *et al.*, 2018).

BOX 2. Cost-benefit ratio of adaptation options in Burkina Faso's National Adaptation Plan

In the formulation of its National Adaptation Plan (NAP) in 2012, Burkina Faso assessed the costs and benefits of selected adaptation options using a multi-sectoral modelling tool, designed to support long-term development planning by incorporating economic, social and environmental development considerations in order to model the potential impact of development policies.

It was concluded that the cost of adaptations under the NAP should not present a deterrent to funding efforts but rather optimization of the cost/benefit ratio must guide prioritization and implementation.

The social and economic gains expected from implementation of the NAP were summarized:

- greater resilience of agriculture and ecosystems;
- greater security for pastoralism and sustainable development of the pastoralist economy;
- greenhouse gas mitigation;
- improved public health protection; and
- improved access for women to natural resources and decision-making arenas.

Step 3: Integrating adaptation co-benefits into national policies, institutional arrangements and budgets

Achieving policy coherence and multi-level coordination of adaptation activities across different levels of government and line ministries allows for planning synergies, particularly in the agriculture sector where co-benefits cut across multiple agendas.

Consultation processes that promote policy dialogue and exchange across sectors and at multiple scales can ensure that information and knowledge is shared. It follows that indicators for tracking progress should also be coordinated, where the non-climate co-benefits of adaptation are particularly relevant for tracking national SDG targets.

- Review and alignment of new or existing agricultural policies, institutional arrangements and budgets with prioritized adaptation options in agriculture.
- Review and alignment of new or existing environmental policies and budgets with prioritized adaptation options in agriculture with climate co-benefits.
- Review and alignment of new or existing development policies and budgets with prioritized adaptation options in agriculture with sustainable development co-benefits.

Step 4: Implementing adaptation in agriculture and leveraging co-benefits

Translating national adaptation and development goals into concrete, multi-level implementation strategies requires defining clear roles and responsibilities of national, sub-national and local governments and exchanging with non-state actors to drive action on the ground.

Local budgets should be aligned with national priorities, and opportunities to incentivize private sector investment through adaptation co-benefits should be explored. Establishing coordination mechanisms to promote cooperation across stakeholders related to agriculture, climate and sustainable development agendas is fundamental to optimizing resources, scaling up impact and reconciling potential trade-offs.

- Formulation of national, sub-national and local adaptation implementation strategies with clear allocation of roles and responsibilities.
- Development of domestic finance and investment plans (cross-cutting or sector specific).
- Establishment of institutional arrangements and cooperation mechanisms to coordinate adaptation policy within agricultural sub-sectors and across different levels of government and line ministries, including Ministries of Environment, Social Planning and/or Finance.

Step 5: Leveraging international finance for adaptation co-benefits

Until recently, international climate finance mechanisms, including the Green Climate Fund (GCF), Global Environment Facility (GEF), Adaptation Fund, Least Developed Countries Fund, did not incorporate non-climate co-benefits of climate action into their investment criteria. Measurement issues around the tracking of development outcomes over a shifting climatic baseline and their attribution to adaptation present a number of methodological challenges when evaluating adaptation projects on short-term time scales (IIED, 2011).

Aligning indicators and measurement approaches in national programming with international finance results frameworks would likely attract greater investments in adaptation projects able to measure and report on climate co-benefits (e.g. mitigation) and non-climate co-benefits (e.g. sustainable development).

- Mobilization of international climate finance for climate co-benefits of adaptation (e.g. mitigation co-benefits).
- Mobilization of international development finance for non-climate co-benefits of adaptation (e.g. social co-benefits – gender equality, safe migration; economic co-benefits – poverty reduction, green growth; and environmental co-benefits – climate regulation, biodiversity, natural resources).

Global Environment Facility (GEF) Trust Fund: A multilateral financial mechanism funded through developed country contributions that are replenished every four years, under which five GEF focal areas (biodiversity, climate change, land degradation, international waters, and chemicals and waste) and three cross-cutting impact programs (food, land use and restoration; sustainable cities; and sustainable forest management) have been established. The GEF examines possibilities for also achieving multiple, **cross-focal area benefits** from these investments. A 2017 evaluation of multi-focal area projects found that 88 percent of GEF projects delivered positive socio-economic co-benefits (GEF, 2017). Core indicator 11 refers to the “number of direct beneficiaries disaggregated by gender” and serves to monitor the GEF seven results framework on gender equality. The socio-economic co-benefits and gender results constitute significant entry-points for leveraging adaptation co-benefits to attract GEF finance. The Seventh Replenishment of the GEF trust fund pledged USD 4.1 billion in 2018.

Step 6: Monitoring and reporting of adaptation co-benefits

Monitoring and reporting instruments are essential to track adaptation progress and its co-benefits, evaluate key challenges and incentives for implementation at different governance levels, and provide an evidence base for future policy decisions (UNFCCC, 2011). Tracking adaptation and its climate and non-climate co-benefits will bring together what are generally separate and distinct monitoring and reporting processes at the national and international level, namely monitoring and evaluation (M&E) of adaptation actions, measuring, reporting and verification (MRV) of mitigation actions and voluntary national review (VNR) of national SDG priorities. To measure adaptation and sustainable development co-benefits, tracking frameworks should include outcome and process indicators related to natural resources and ecosystems, agricultural production systems, social and economic variables, and institutions and policymaking (FAO, 2017a). In addition to quantitative indicators, there will often be a need to incorporate qualitative assessments.

The knowledge and information gained from monitoring and reporting of adaptation and adaptation co-benefits should be fed back into the planning process (Step 2) to ensure that future adaptation efforts are successful.

- Improvement or establishment of national M&E system to track adaptation progress.
- Improvement or establishment of national MRV system to track mitigation co-benefits of adaptation.
- Coordinate with VNR process to track sustainable development co-benefits of adaptation.
- Feed information from adaptation and co-benefits progress reports back into iterative adaptation planning process to promote best practices and reduce uncertainties.

4. Conclusion



Adaptation co-benefits generated in the agriculture sector are key to driving adaptation at the national level and are a crucial step to breaking down sectoral silos and pursuing climate-resilient development. Faced with increasingly limited resources, institutional bottlenecks and stretched capacities, it is critical to identify and prioritize policies and programmes that can deliver on multiple objectives and optimize planning and monitoring processes.

This policy brief aims to support national policy makers – through a step-by-step practical approach - in incorporating the mitigation and sustainable development co-benefits generated from adaptation in the agriculture sector into policy development processes that advocate for an integrated approach to climate action – one that optimizes resources and investments, incentivizes cooperation across different sectors and stakeholders and scales up impact.

References

- Adger, W.N. et al.**, 2014. *Human security*. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 755-791.
- Carr, E.R. and M.C. Thompson**, 2014. *Gender and climate change adaptation in agrarian settings*. Geography Compass, 8/3, 182–197.
- Denton F. et al.**, 2014. *Climate-resilient pathways: adaptation, mitigation, and sustainable development*. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1101-1131.
- FAO**. 2016. *The State of Food and Agriculture: climate change, agriculture and food security*. Rome. (also available at: www.fao.org/3/a-i6030e.pdf)
- FAO**. 2017a. *Tracking adaptation in agricultural sectors: Climate Change Adaptation Indicators*. Rome. (also available at www.fao.org/3/a-i8145e.pdf)
- FAO**. 2017b. *Addressing Agriculture, Forestry and Fisheries in National Adaptation Plans – Supplementary guidelines*. Rome. (also available at www.fao.org/3/a-i6714e.pdf)
- GEF**. 2017. *Evaluation of the Multiple Benefits of Global Environmental Facility (GEF) Multifocal Area Portfolio*. GEF/ME/C.53/Inf.05. (also available at: www.thegef.org/sites/default/files/council-meeting-documents/EN_GEF_ME_C53_Inf.05_Multiple_Benefits_Nov_2017.pdf)
- ICF**. 2011. *Co-benefits of adaptation, mitigation and development: International Climate Fund (ICF) background paper*. (also available at https://assets.publishing.service.gov.uk/media/57a08adee5274a31e0000806/DEWPoint_A0406_Jan2011_Co_Benefits_of_adaptation_v1-1.pdf)
- IIED**. 2011. *IIED Tracking Adaptation and Measuring Development*. IIED Climate Change Working Paper No. 1, November 2011. (also available at: <https://pubs.iied.org/pdfs/10031IIED.pdf>)
- IPCC**. 2007. *Summary for Policymakers*. In: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 7-22.

IPCC. 2014a. *Climate Change 2014: Synthesis Report*. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. Geneva, Switzerland.

IPCC. 2014b. *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects*. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1132 pp.

IPCC. 2018. *Summary for Policymakers*. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

Knittel, N. 2016. *Mitigation: Co-Benefits and Interlinkages to Adaptation*. Climate Policy Info Hub, 03 February 2016. Online available at: <http://climatepolicyinfohub.eu/mitigation-co-benefits-and-interlinkages-adaptation>

OECD. 2006. *Cost-Benefit Analysis and the Environment: Recent Developments*. OECD Publishing, Paris. (also available at: <https://doi.org/10.1787/9789264010055-en>)

Pörtner, H. et al., 2014. *Ocean systems*. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 411-484.

Roy, J. et al., 2018. *Sustainable Development, Poverty Eradication and Reducing Inequalities*. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.

Smith et al., 2014. *Human health: impacts, adaptation, and co-benefits*. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 709-754.

Smith P. and Olesen J. E. 2010. *Synergies between the mitigation of, and adaptation to climate change in agriculture*. Journal of Agricultural Science, 148: pp. 543-552.

UNFCCC. 2011. *Assessing the Costs and Benefits of Adaptation Options: An Overview of Approaches*. Nairobi, Kenya. (also available at : https://unfccc.int/resource/docs/publications/pub_nwp_costs_benefits_adaptation.pdf)

UNFCCC. 2012. *National Adaptation Plans. Technical guidelines for the national adaptation plan process*. Least Developed Countries Expert Group. UNFCCC Secretariat. Bonn. Germany (available at [www.unfccc.int/nap/Guidelines/Pages/ Technical-guidelines.aspx](http://www.unfccc.int/nap/Guidelines/Pages/Technical-guidelines.aspx))

Verchot et al., 2007. *Climate change: linking adaptation and mitigation through agroforestry*. Mitigation and Adaptation Strategies for Global Change, 12(5): pp. 901-918.

WCED. 1987. *Brundtland Report: World Commission on Environment and Development (WCED)*. (also available at: www.are.admin.ch/are/en/home/sustainable-development/international-cooperation/2030agenda/un-_milestones-in-sustainable-development/1987--brundtland-report.html)





Adaptation in the agriculture sectors: leveraging co-benefits for mitigation and sustainable development

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