



Food and Agriculture
Organization of the
United Nations



FAO'S WORK ON CLIMATE CHANGE

United Nations
Climate Change Conference 2015

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PHILIPPINES

Rice farmers from Maguindanao seize a window of opportunity to re-plant their farms.
©FAO





**FOR THE
WORLD'S
POOR,
ADAPTING
TO CLIMATE
CHANGE AND
ENSURING
FOOD SECURITY
GO
HAND-IN-HAND**

INTRODUCTION

**“AS CLIMATE
CHANGES, WE
NEED TO STEP
UP EFFORTS
TO MITIGATE,
ADAPT AND
SHIFT TO
MORE FOOD
SUSTAINABLE
SYSTEMS”**

JOSÉ GRAZIANO DA SILVA,
FAO Director-General

**We can end
extreme poverty
and hunger by
2030. We know
what works and
we have the
tools but climate
change threatens
to derail
our efforts.**

The Food and Agriculture Organization of the United Nations (FAO) estimates that almost 800 million people in the world are chronically hungry today.

Population growth and diet changes will drive food needs up by 60 percent by 2050. Climate change is already putting stress on food systems and rural livelihoods all around the globe. Today's response to climate change determines how we will feed future generations.

Climate variability and change poses multiple challenges: it reduces food productivity and production and adds a layer of pressure to already fragile food production systems. Drought, floods and hurricanes, ocean acidification and increasing sea levels, put people's lives at risk. Livelihoods are also increasingly in jeopardy, as crops, livestock and fish resources and their ecosystems; agriculture, livestock and fishing infrastructure; as well as productive assets such as irrigation systems and livestock shelters are destroyed.





TANZANIA

Habiba Msonga and her son Frank Adriano, 9, in her rice paddy.
©FAO/D. Hayduk

Natural and manmade disasters, many of which are exacerbated by climate change and which are increasing in frequency and intensity, cause havoc in these fragile ecosystems.

The strong linkages between the effects of climate change, the challenges it poses to the agricultural sectors and FAO's mandate of achieving global food security and improving nutrition through sustainable development are clear. Achieving FAO's vision of a world without hunger requires enhanced action to reduce climate change impacts on food security and nutrition.

Under the remit of the United Nations Framework Convention on Climate Change (UNFCCC), negotiations are nearing an important milestone with the post-2020 global agreement to be concluded in Paris in December 2015. As observer to the UNFCCC, FAO has an important role to play in supporting countries and in making sure that links are made between food security, agriculture and climate change.

By supporting the implementation of the Sustainable Development Goals (SDGs), FAO plays an important role in ensuring that people interact harmoniously with the planet's ecosystems and benefit from their services, while maintaining and sustainably using biodiversity and all the world's natural resources now and in the future.

Climate change is an integral part of the new 2030 Agenda for Sustainable Development, a set of 17 global goals that countries have adopted to end poverty and hunger, protect the planet, and ensure prosperity for all. FAO has placed climate change adaptation and disaster risk reduction at the core of its new Strategic Framework, focusing on increasing the resilience of livelihoods to risks, threats and crises.

How the international community addresses climate change today will determine how well future generations will be fed and whether food security will be a reality for everyone.

KEY MESSAGES

Climate change threatens to derail efforts to eradicate extreme poverty and hunger, which the international community has committed to doing by 2030 under the Sustainable Development Goals.

Climate change is disproportionately affecting the world's poorest countries who bear the brunt of its effects, while having contributed the least to its causes. These are Small Island Developing States, landlocked countries, arid- and semi-arid areas and countries where people are most dependent on natural resources.

The world's most vulnerable people - who are the first and hardest hit by climate change - are the same people who provide the bulk of the planet's food: family farmers, pastoralists, fisher folk and community foresters.

For the world's poorest, adaptation to climate change means ensuring food security.

Our ability to eradicate hunger by 2030, depends on ensuring that the whole agricultural supply chain: food systems and the communities is healthy, productive, and sustainable, and resilient to climate change.

To achieve the recently adopted 17 SDGs, climate change needs to be addressed now.

Food security goes hand in hand with achieving the SDGs. The elimination of hunger and malnutrition is fundamental to all other forms of socio-economic development. The detrimental impacts of climate change on food security and nutrition will further undermine our ability to achieve these goals.

Agriculture, forestry, fisheries and aquaculture can be transformational forces in the global response to climate change.

Nearly 80 percent of the world's poor live in rural areas, and most depend on agriculture for their livelihood. But climate change will severely compromise their ability to earn a living from agriculture, forestry and fisheries.

Investments in productive, inclusive and resilient agricultural development are critical to safeguarding incomes and food security of the world's rural poor in the face of a changing climate.

There is a clear need to channel public and private investments to agricultural sectors – including through flows of climate finance – to harness their transformative potential. Pursuing climate-resilient development pathways that can simultaneously contribute to reducing greenhouse gas (GHG) emissions will require integrated approaches and substantial, long-term investment in agriculture, fisheries and forestry. These are costs that smallholders cannot bear on their own.

Investing in the land and aquatic sectors, including the development and use of renewable resources, will contribute to the transformational change humanity needs.

Reducing emissions from deforestation and forest degradation (REDD+) has significant potential to mitigate climate change and to generate adaptation benefits.

SENEGAL

A farmer watering an area where onions will be planted.
©FAO/Olivier Asselin

AGRICULTURE IS KEY: IT CAN ADDRESS POVERTY, HUNGER AND CLIMATE CHANGE IN TANDEM



A paradigm shift towards agriculture and food systems that are more resilient, more productive, and more sustainable is required.

FAO invests in critical areas to support food security, climate change adaptation and mitigation. With the right policies and actions, FAO has seen an improvement in different areas. The first is in improved natural resource management, such as a reduction in waste,

deforestation and overfishing. The second is in improved soil fertility and the third, in an increase in ecosystems services and a reduction of fossil fuel use. All these improvements have the potential to abate emissions trajectories, while ensuring human and ecosystem well-being.

Boosting resilience also means preventing and/or preparing for climate-related shocks - a core prerequisite for climate change adaptation and sustainable development. Sustainable natural resource management is key to ensure

food security for a growing global population, as well as to mitigate climate change through ecosystem services such as carbon sequestration.

FAO has the experience and tools to support countries to develop, implement and assess actions in agricultural sectors to fulfil the objectives in their Intended Nationally Determined Contributions (INDCs).

And FAO intends to continue raising its support in this area to achieve a transformative impact at country level.

FACTS AND FIGURES



AGRICULTURE, FORESTRY, FISHERIES AND AQUACULTURE CAN PLAY A CENTRAL ROLE IN ADDRESSING CLIMATE CHANGE AND ADAPTING TO ITS IMPACTS

➔ **75 percent of poor** and food insecure people in the world rely on agriculture and natural resources for their livelihood.

➔ FAO estimates that agricultural production must rise by about **60 percent** by 2050 in order to feed a larger and generally richer population. Climate change is putting this objective at risk.

➔ In its 2014 report, the Intergovernmental Panel on Climate Change (IPCC) warns that declining crop yields may already be a fact and that decreases of **10 to 25 percent and more, may be widespread by 2050.**

➔ Rising temperatures are predicted to **reduce catches of main fish species by 40%.**

➔ While global emissions from deforestation dropped, deforestation and forest degradation still account for an estimated **10 - 11 percent of global GHG emissions.** Emissions from forest degradation (logging and fires) increased from 0.4 to 1.0 Gt CO₂ per year between 1990 and 2015.

➔ Livestock contributes to nearly two thirds of agricultural

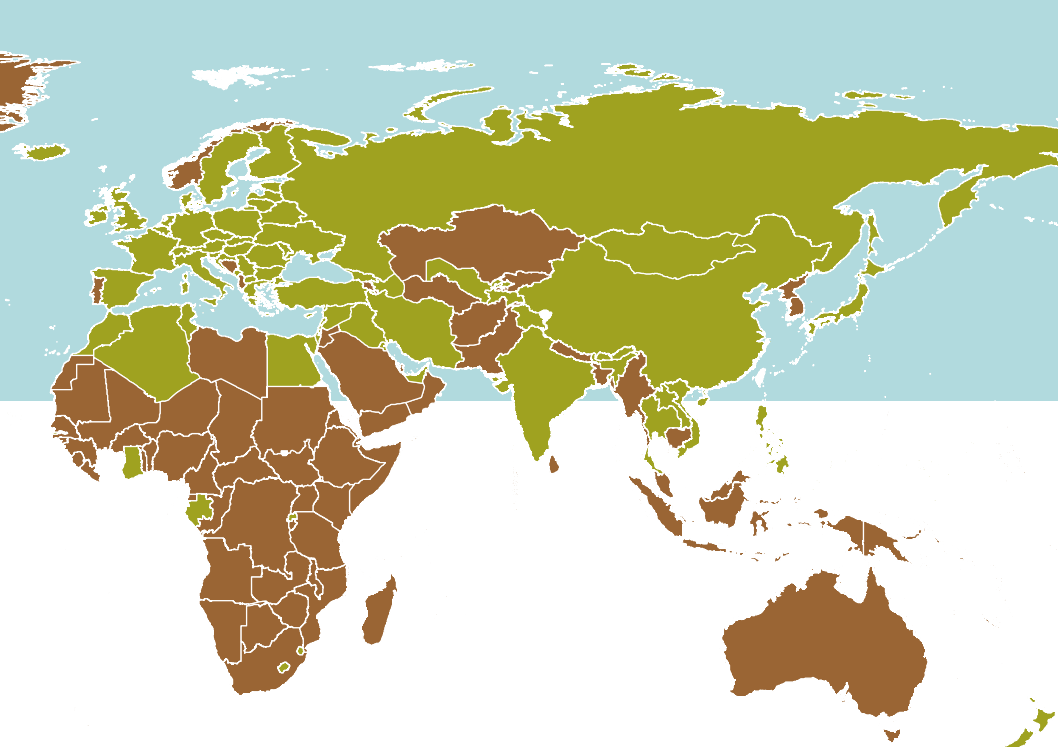
greenhouse gas (GHG) emissions, *stricto sensu*, and **78 percent of agricultural methane emissions.**

➔ Climate change may transfer risks of food-borne diseases from one region to another, threatening **public health** in new ways.

➔ FAO estimates that the potential to reduce emissions from livestock production and methane in particular is about **30 percent of baseline emissions.**

➔ Currently, **one third of the food we produce is either lost or wasted.** The global costs of food wastage amount to about **USD 2.6 trillion per year**, including USD 700 billion of environmental costs and USD 900 billion of social costs.

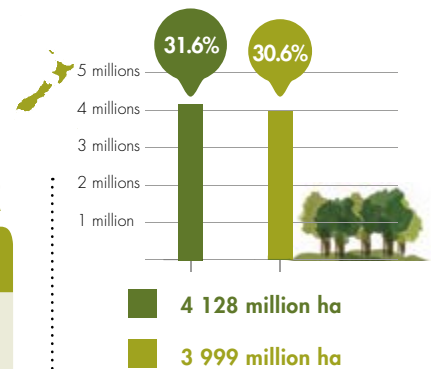
➔ Global food loss and waste generate about **8% of total GHG** per year.



FORESTED AREAS HAVE DECREASED BUT RATE OF NET FOREST LOSS HAS BEEN CUT BY 50%

● The biggest loss has been in the tropics, particularly in Africa and South America.

● Net forest area has increased in over 60 countries and territories, most of which are in the temperate and boreal zones.



SUSTAINABLE FOREST MANAGEMENT: PROGRESS SO FAR

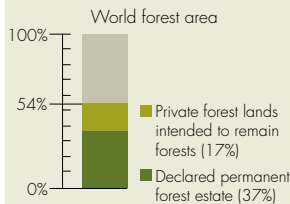
Forest located within legally established protected areas

Additional forest area has been put under protection, most of which in the tropics.



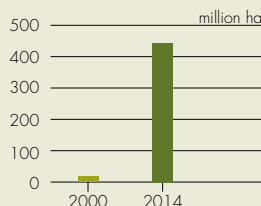
↑ 210 million ha
(1990–2015)

Permanent forest is increasing and includes both state and privately owned land



Forest area certified as sustainably managed increased everywhere

Forests under internationally verified certifications



■ 18 million ha
■ 438 million ha



2.1 billion ha, or 52% of the world's forest, is under management plans

The majority of these plans require social and community involvement.



More measurements, monitoring, and reporting



CHALLENGES REMAIN

● The extent of the world's forest continues to decline as human populations continue to grow and demand for food and land increases.



● Governments, private companies, communities, civil society and international organizations must invest in forest management to ensure a steady supply of forest goods and services for future generations.

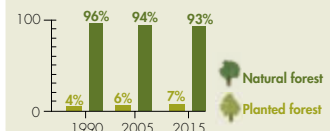


WHAT DO FORESTS LOOK LIKE?

The bulk of the world's forest is natural forest



The share of planted forest is increasing



Source: FAO. 2015.

SUPPORT TO COUNTRIES TO DEAL WITH THE IMPACTS OF CLIMATE CHANGE



MALDIVES

The population receive farming equipment after the tsunami that hit the coasts of 12 countries in the Indian Ocean, killing 200 000 people and leaving almost a million more homeless.

©FAO/C. Dowsett

No other sector is more sensitive to climate change than agriculture.

No other sector contributes so directly to the provision of food and livelihoods of people. The agricultural sectors – including crops, livestock, fisheries and forestry – absorbs approximately 22 percent of the economic impact caused by medium and largescale natural hazards and disasters in developing countries. Considering the vital role of these sectors to global food production and livelihoods, it is critical to integrate agriculture within adaptation efforts and financing.

Concrete steps to address the risks of climate change impacts include:

- Developing climate change impact and vulnerability assessments for crops, livestock, fisheries and forestry.
- Encouraging improved natural resource management, e.g. water management, soil conservation, resilient crops and trees.
- Improving weather and climate forecasting and the forecasting of changes in the aquatic ecosystems (e.g. salinity, oxygen and pH) as well as their communication to farmers.

- Developing disaster risk management capabilities.

A better understanding of the influence of a changing climate on agricultural sectors is a first step to climate change adaptation.

Crop yields, particularly from rainfed agriculture, depend highly on hydro-meteorological conditions such as rainfall, the onset and length of the rainy season, dry spells, heatwaves and floods.



PRODUCTIVE, INCLUSIVE AND RESILIENT AGRICULTURAL DEVELOPMENT IS A PRIME OPPORTUNITY TO BOOST FOOD SECURITY

They affect crop growth and animal health either directly or indirectly through pests and diseases. It is crucial to understand how climate change and variability affect the fisheries sector, the productivity and availability of ecosystem services from forests; and the increased risk of fire, pests and diseases that affect these sectors.

It is also fundamental to understand how climate change affects people living in rural areas, who depend on these sectors for their livelihoods. FAO provides, vulnerability and risk methods and tools for carrying out impact assessments of climate change and

monitoring of natural resources and greenhouse gas (GHG) emissions.

These tools provide fundamental information for climate change adaptation planning as well as reporting on GHG emissions from the agricultural sectors.

DATA, METHODS AND TOOLS

➔ **For inventories and measurement of emissions**

Taking stock of greenhouse gas emissions from the agriculture sectors allows countries to monitor progress in reaching climate action commitments. The data are also useful for countries to assess their current status of emissions and consider potential areas of action.

Database on GHG emissions from agriculture, forestry and other land use sectors. The GHG database on FAOSTAT is a global inventory of GHG emissions from all agricultural activities, including crop production, livestock and forestry and land use changes. The emissions database provides a coherent and internationally neutral data platform that is useful resource for member countries. faostat3.fao.org/browse/G1/*/E

Global Forest Resources Assessments (FRA). The FRA is the most comprehensive assessment of forests to date. Its aim is to assess all the benefits that come from forest resources.

It examines the current status and recent trends for about 90 variables covering the extent, condition, uses and values of forests and other wooded land. The results are presented according to the seven thematic elements of sustainable forest management. In addition to FRA, FAO assists countries in strengthening their national forest monitoring systems. Global and national data on forests, forest conditions and trends provide a basis for identifying vulnerabilities to climate impacts and for assessing progress in climate change adaptation and mitigation efforts.

www.fao.org/forest-resources-assessment/en/

Livestock Environment Assessment and Performance (LEAP). This partnership develops common metrics and methodologies to define and measure environmental performance and GHG emissions in livestock supply chains, and has implemented the *Reducing enteric methane for improving food security and livelihoods* project with the Climate and Clean Air Coalition.

The Ex-Ante Carbon-balance Tool (EX-ACT). This appraisal system was developed by FAO

and provides ex-ante estimates of the impact of land use and land use changes and natural resource management on GHG emissions and carbon balance. Currently, public and private partner initiatives promote the progressive integration of carbon balance appraisal and monitoring services at project and policy levels, e.g. *ex ante* appraisal at value chain and farm level. EX-ACT is a powerful decision making tool to ensure investments in the agricultural sectors are climate-proofed.

www.fao.org/tc/exact/ex-act-home/en/

Learning tool on Nationally Appropriate Mitigation Actions (NAMAs) in the agriculture, forestry and other land use sectors. Through this tool, FAO supports the efforts of developing countries in the identification, development and implementation of country-specific mitigation actions in the context of national sustainable development. The tool has been designed for colleagues working in the agriculture sector who want to deepen their understanding of NAMAs and increase their capacity to contribute to national and global climate change mitigation goals.



PANAMA

A researcher from the Ministry of Environment and member of the Embera-Wounaan Community measures the diameter of a Cuipo in the Darién Forest as part of the National Forest Inventory in this country.
©FAO

► For assessing risks and vulnerabilities

To identify what steps to take to adapt to climate change it is key to understand the vulnerability of people's food security to climate change. Climate change impacts can be reduced by reducing vulnerabilities.

Modelling System for Agricultural Impacts of Climate Change (MOSAICC). This system of models and utilities

FAO HAS THE EXPERIENCE AND THE TOOLS TO SUPPORT COUNTRIES TO ASSESS, DEVELOP AND IMPLEMENT CLIMATE ACTIONS

was designed to carry out interdisciplinary climate change impact assessment on agriculture through simulations. The main components of the system are a statistical downscaling portal to downscale Global Circulation Models (GCM) data to weather station networks, a hydrological model for estimating water resources for irrigation in major basins, two water balance-based crop models to simulate crop yields under climate change scenarios and a model to assess the effect of changing yields on national economies. This system will allow for a better integration of scientific information in the

DATA, METHODS AND TOOLS

design of agricultural development projects and decision-making or policy formulation

www.fao.org/climatechange/mosaicc/en/

Agricultural Stress Index

System. The development of early warning systems is essential to strengthen decision-making at all levels in order to reduce the impacts of extreme weather events such as dry spells, droughts, frosts and tropical cyclones. Using data on vegetation and land surface temperature, the FAO Agricultural Stress Index System (ASIS) monitors vegetation indices and detects hotspots where crops may be affected by drought. The system contributes greatly to the food security monitoring work of Global Information and Early Warning System on Food and Agriculture (GIEWS).

www.fao.org/giews/english/shortnews/20150429asis.htm

Self-evaluation and Holistic Assessment of climate

Resilience of farmers and Pastoralists (SHARP). This tool helps farmers and pastoralists assess and prioritize resilience aspects of their livelihoods in a participatory manner. The survey is paper and Android-tablet-

based and assesses governance, environmental, social, economic and agricultural practices using a combination of self-assessment and academic review of livelihood components. SHARP is used both as a monitoring and evaluation tool, as well as a learning method, integrated into agropastoral/farmer field schools in sub-Saharan Africa. The tool provides immediate results (offline) on the tablets in the field and has the ability to analyse results online in more detail.

www.fao.org/climate-change/programmes-and-projects/detail/en/c/328911/

Assessment tool for the potential impact of climate change on breed distribution.

Livestock breeds that are raised in a given production environment over a long period of time tend to acquire characteristics that enable them to thrive in local conditions and meet the needs of the people that keep them. For breeds that are raised in extensive farming, climate is a key element of the production environment. The current geographic distributions (available at least at country level and in some cases at subnational level) of about 8 800 livestock breeds, as

recorded in the Domestic Animal Diversity Information system (DAD-IS), are being used to model currently suitable areas to which these breeds are adapted, taking several temperature and humidity parameters into account, and areas suitable under future conditions. Those future habitats are modelled using the "Hadley Global Environment Model 2". Such analyses can potentially contribute to more informed decision-making on breed management in a changing climate and hence strengthen the capacity of national governments, livestock keepers and farmers to protect and enhance food security and manage their animal genetic resources sustainably.

www.fao.org/climate-change-breed-distribution/

Assessments of Climate Change Impacts and Mapping of Vulnerability to Food Insecurity under Climate Change

(AMICAF). The assessment is aimed at strengthening household food security through livelihood adaptation approaches. It is currently being implemented in the Philippines and Peru and is funded by the Ministry of Agriculture, Forestry and Fisheries of Japan. The main objective of



CAMBODIA

Rice vendor going around the village selling rice to the fishing community.
©FAO/J. Thompson

the project is to bridge climate change impact assessment, food insecurity vulnerability analysis and livelihood adaptation approaches.

www.fao.org/climatechange/amicaf/en/

Global assessment of fisheries and aquaculture compliance with the Code of Conduct for Responsible fisheries (CCRF). The implementation of the Code is monitored by the Committee on Fisheries (COFI), through global questionnaires

that cover each Article of the Code and are sent to all FAO member states, biennially. A progress report, comprising of statistical results that are compiled from the responses, is prepared for each session of COFI. This global assessment can also be used by member countries to review and improve their fisheries and aquaculture performance. This instrument can also be used to addresses member states' preparedness and adaptation to climate change.

**BOOSTING
RESILIENCE
MEANS
PREVENTING
AND
PREPARING FOR
CLIMATE-SHOCKS
- A REQUISITE
FOR CLIMATE
CHANGE
ADAPTATION**

8 ACTIONS ON THE GROUND



**THE IMPACTS
OF CLIMATE
CHANGE
ON FOOD
SECURITY WILL
UNDERMINE
OUR ABILITY
TO ACHIEVE THE
SUSTAINABLE
DEVELOPMENT
GOALS**





CHINA

Hani rice terraces
in Yunnan province.
©FAO/Min Qingwen

8 ACTIONS ON THE GROUND

In order to respond to the increasing pressures that countries have been facing as a result of the impacts of climate change, the FAO climate change project portfolio has grown rapidly in recent years. In the period 2009 - 2014, over 300 FAO projects and programmes explicitly address climate change adaptation and mitigation in the sectors of agriculture, forestry and fisheries and aquaculture. Through the network of climate change professionals across the different FAO departments, representations and regional offices, FAO support countries in a wide range of climate change issues from policy design, to improved practices and capacity development.

1 Creating a positive cycle through agroforestry

In line with the vision for sustainable food and agriculture developed in support of its strategic objective to “Make agriculture, forestry and fisheries more productive and more sustainable” FAO promotes Climate-Smart Agriculture (CSA) as a way to increase productivity, adapt and build the resilience of food systems and, whenever possible, reduce GHG emissions.

The FAO project *Climate-Smart Agroforestry Systems for the Dry Corridor of Central America* supports farmers in Guatemala and Honduras to increase the uptake of climate-resilient agroforestry systems through the farmer field school approach. The systems, Kuxur rum in Guatemala and Quesungual in Honduras, were developed based on traditional farming practices in both countries. *The Quesungual Agroforestry System* was developed as an alternative to slash and burn agriculture. By conserving the soil cover and an efficient use of fertilizers, it supports the sustainable management of vegetation, soil, and water resources in drought-prone hillsides. In addition to the positive effects of enhanced soil and water conservation

by avoiding slash-and-burn techniques, emissions are avoided and more resilient and productive agriculture systems are achieved.

The Quesungual system not only meets the needs of farmers for fruit, timber, firewood and grains, but it also generates cash income when sold on the market. Once farmers achieve food security, crop diversification is sought to increase product variety in the local market or for home consumption. In addition, more grains mean improvement of household post-harvest storage systems. When basic grain security is assured, families can invest their time in improving their living conditions and in education.

2 Towards resilient and efficient fisheries and aquaculture

Oceans and freshwater aquatic systems are critical to global food security and are key to regulating the world's climate. With about one third of anthropogenic emissions ending up in the oceans, they act as the largest active carbon sink on earth.

Weather and climate variability and change, as well as ocean acidification and changes in the water bodies' physical and

REDUCING EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION (REDD+) HAS SIGNIFICANT POTENTIAL TO MITIGATE CLIMATE CHANGE



VIET NAM

Farmer Nguyen Thi Bang
harvesting longan fruits.
©FAO/AFP/Hoang Dinh Nam

chemical characteristics, in addition to all other stressors faced by the fisheries and aquaculture systems, are adding to the sense of urgency to ensure resilient socio-ecological systems. FAO has helped to improve knowledge on the impact of climate change on the fisheries and aquaculture sectors on the livelihoods of fishers and has supported the development of relevant policies and action plans. This has been achieved through global assessments on the vulnerability of fisheries and aquaculture sectors, regional assessments such as in the Benguela Current and the Gulf of Guinea large marine ecosystem fisheries and through national and community-level assessments in Bangladesh, Myanmar and Seychelles. Building resilience to

climate change and variability is addressed in the recently adopted Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication. Fisheries and aquaculture should continue to play an important role in broader resilience efforts.

FAO also assists countries to improve management and technology uptake to reduce the feed conversion ratio in aquaculture, decrease GHG emissions and increase resource use efficiency in general.

FAO gives priority to identifying and reducing the vulnerability of fisheries and aquaculture systems through improving the resilience and adaptability of the fisheries and aquaculture sectors

to shocks, climate change, ocean acidification and natural disasters.

These activities will support calls from recent sessions of regional bodies to:

- ① Support policy, legal and implementation frameworks at local, national and regional levels to mainstream climate change into fisheries and aquaculture;
- ② Reinforce capacity of regional and national agencies and institutions to address climate change issues;
- ③ Plan for adaptation and mitigation within members' fisheries and aquaculture sectors; and
- ④ Integrate fisheries and aquaculture into national climate change adaptation and mitigation plans and enable financial mechanisms, such as the National Adaptation Programmes of Actions (NAPA) and supporting adaptation funds.



8 ACTIONS ON THE GROUND

► With this focus, FAO is an active member of the Global Partnership on Climate, Fisheries, and Aquaculture (PaCFA). The partnership is a voluntary global level initiative among more than 20 international organizations and sector bodies with a common concern for climate change interactions with global waters and living resources and their social and economic consequences. PaCFA members share a commitment to raising awareness of the vital importance of these issues, developing effective tools and management approaches to address them, and building international development support to implement change and bring about lasting positive outcomes.

3 Partnering for livestock development

Climate change has direct effects on livestock productivity as well as indirectly through changes on the availability of fodder and pastures. It determines the type of livestock, species and breeds that can most adapt to different agro-ecological zones and therefore the animals that are able to sustain rural communities. Climate change is expected to affect livestock at the species level. FAO facilitates the sustainable development of livestock which contributes to food security and poverty alleviation, while reducing its environmental footprint and resource use.

FAO provides comprehensive and reliable assessments of the sector environmental impacts and mitigation potential, and the concomitant effects on food security and poverty reduction. This information is crucial to inform policy dialogue, strategic guidance and advocacy. FAO is an active member of the **Global Agenda for Sustainable Livestock**, a multi-stakeholder partnership that brings together partners from the private sector, governments, civil society organizations, research and international organizations, committed to sustainable livestock sector development. It is directed at coherent and concerted collaborative action to catalyze practice change. The Agenda responds to a global need by simultaneously addressing the social, economic and environmental performance of livestock systems.

4 Better planning for climate change adaptation

In most sub-Saharan African countries, the agricultural sectors, including crops, forestry and fisheries, represent the highest share of GDP. They are also the main source of livelihoods for the poorest and most vulnerable people. At the same time, studies show that these sectors are among the most exposed to the threats of climate change. Achieving strong

and sustainable agricultural growth while adapting to climate change in these countries will be crucial to sustainably lifting millions of people out of poverty. National policies can play a key role in achieving this transformation as they have the potential to identify national priorities, key areas for actions and main stakeholders, as well as building an enabling environment and creating incentives to achieve these priorities. Having strong and aligned national policies that encompass social and economic policies, and agricultural and environmental policies which also include disaster risk-reduction strategies are crucial to increase resilience and food security, as well as to bring about transformational change.

With this in mind, the FAO **Economics and Policy Innovations for Climate-Smart Agriculture (EPIC)** programme works in Malawi and Zambia to support evidence based policy making for Climate-Smart Agriculture (CSA). The programme works with national ministries to review and align national policies on food security, agriculture and climate change. Based on solid evidence on food security, needs for adaptation and potential for mitigation, the programme has used large scale socio-economic surveys with high resolution climate data. To better support countries, the programme



1



2



3

1 KENYA

A woman collecting drinking water from a polluted watering hole.
©FAO/Ami Vitale

2 MOROCCO

Fishermen setting out to sea to fish, from Port Dikky.
©FAO/A. Senna

3 NIGER

Assistance to improve food security of vulnerable households.
©FAO/G. Napolitano

has also identified barriers to the adoption of suitable agricultural practices and helped developing national capacities to implement and assess CSA options. Recently, the EPIC programme is expanding the CSA relevant evidence base to other countries such as Tanzania, Uganda, Ethiopia and Niger.

Climate-smart agriculture is an approach to identify production systems that can best respond to the impacts of climate change. These systems sustainably increase production and incomes; adapt and boost farmers' resilience to the impacts of climate change and wherever possible, reduce greenhouse gas emissions.

Building on prior work done on National Adaptation Programmes of Action (NAPA), FAO has also recently launched ***Integrating agriculture into National Adaptation Plans (NAPs)***: a global programme implemented in partnership with UNDP to support countries in identifying and integrating climate adaptation measures for the agricultural sectors into relevant national planning and budgeting processes. Through the programme, FAO is currently working in Kenya, Uganda and Zambia, where it is mainstreaming climate change adaptation and disaster risk reduction into agriculture sector plans, policies and budgets, and strengthening coordination

mechanisms to ensure effective and sustainable adaptation to climate change in the long term.

5 Addressing deforestation in Central Africa

Central Africa is home to the second largest tropical rainforest area in the world with over 240 million hectares (ha). Despite the fact that the annual rate of natural forest loss is declining in Africa, the FAO Global Forest Resources Assessment revealed an annual loss in this region of about 3.1 million ha of natural forests in the last five years.

Central African governments face tough challenges to address poverty, food security and climate change which put pressure on their tropical forests. Policy and governance reforms in the region are advancing, but efforts to conserve and sustainably use forests are still fragmented and underfinanced. To address these issues, the new Central African Forest Initiative (CAFI) was launched at the UN Sustainable Development Summit in 2015. This was a joined collaboration between FAO, six Central African countries, donors and international organizations, which included the United Nations Development Programme (UNDP) and the World Bank.

The participating Central African countries: Cameroon, the Central

8 ACTIONS ON THE GROUND

► African Republic, the Democratic Republic of Congo, Equatorial Guinea, Gabon, and the Republic of Congo will develop investment frameworks to support the sustainable use and conservation of their forest resources. These frameworks will play a vital role in climate change mitigation and poverty alleviation in the region. This initiative will work in close collaboration with *the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries* (UN-REDD Programme comprised of FAO, UNEP and UNDP).

The CAFI Initiative builds on the work carried out through the Congo Basin Forest Fund. Through this initiative, the Central Africa Forests Commission (COMIFAC) and FAO in close collaboration with the Brazilian National Institute for Space Research (INPE), Norway and the United Kingdom through the African Development Bank, assist countries in developing their national forest monitoring systems.

6 Genetic diversity and climate change

Climate change is one of the key drivers of biodiversity loss. The stressors and risks posed by climate change to the various sectors of genetic resources for food and agriculture (plants, animals, forests, aquatic

resources, invertebrates and micro-organisms) are numerous. However, genetic resources for food and agriculture are also expected to play a significant role in mitigation of and adaptation to the consequences of climate change in support of efforts to achieve food security and nutrition objectives.

Genetic resources could contribute greatly to our efforts to cope with climate change, but in many cases the magnitude and speed of climate change will surpass our ability to identify, select, reproduce and – eventually – use these resources in the field. The Commission on Genetic Resources for Food and Agriculture of the Food and Agriculture Organization of the United Nations provides an intergovernmental forum for the discussion and development of knowledge and policies relevant to biodiversity for food and agriculture. Its global plans of action for genetic resources provide the international policy frameworks for the sustainable management of these resources, including on climate change. During its recent session, members to the Commission approved the Voluntary Guidelines to Support the Integration of Genetic Diversity into National Climate Change Adaptation Planning.

7 Reducing Emissions from Deforestation and Forest Degradation

The UN-REDD Programme is the United Nations collaborative initiative on Reducing Emissions from Deforestation and Forest Degradation (REDD+) in developing countries. The UN-REDD Programme was launched in 2008 and builds on the convening role and technical expertise of FAO, the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP). The Programme supports nationally-led REDD+ processes and promotes the involvement of all stakeholders, including Indigenous Peoples and other forest-dependent communities, in national and international REDD+ implementation.

The Programme supports national REDD+ readiness efforts in 61 partner countries, spanning Africa, Asia-Pacific and Latin America, through direct support to individual countries in the design and implementation of UN-REDD National Programmes and targeted support upon request on thematic areas such National Forest Monitoring System (NFMS) and Monitoring, Reporting and Verification (MRV) of greenhouse gas emissions, national strategies, governance, distribution of benefits and safeguards.



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1 TANZANIA

A FAO project aims to promote climate resilient agriculture. ©FAO/D. Hayduk

2 VIETNAM

The Mekong Delta is set to face more extreme weather conditions in Vietnam threatening rice production. ©FAO/G. Smith

3 INDIA

Woman scientist in a greenhouse of the Indian Agricultural Research Institute taking seeds from one particular variety of wheat. ©FAO/J. Spaul

The technical expertise of FAO in forestry makes it a trusted technical partner to provide support to countries in developing their capacities to build robust national monitoring forest systems for REDD+ which also fulfills broader monitoring needs for sustainable development. REDD+ supports countries on how to gather information on safeguards as well as design systems to safeguard information, assess governance, provide advice on land tenure regimes and legal preparedness and identify best-practices for sustainable forest management.

FAO main activities within the UN-REDD Programme include:

- 1 Help build institutional capacity by providing technical assistance in countries to support the design and implementation of multipurpose forest inventories that also include forest carbon estimates in the context of REDD+ readiness.
- 2 Develop tools, technical documents addressing different components/steps for the construction of Forest Reference Emission Levels/Forest Reference Levels in accordance with decisions from the UNFCCC.
- 3 Generate knowledge through manuals, reference materials, toolkits and software applications (e.g. remote sensing tools and allometric equations for estimating biomass and carbon) to assist with monitoring and with national forest and greenhouse gas inventories for the forest and land-use sectors.

In addition FAO also supports countries in revising legal frameworks, governance assessments and safeguards information systems. FAO also assesses land tenure issues

through the promotion of the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security

8 Saving Food and Avoiding Waste

FAO currently supports 47 countries in the area of food losses and waste. Activities range from providing technical support in designing country policy and strategy to guiding the implementation of national level food loss assessments to identifying actual loss levels and supporting national and regional organizations in engaging public and private partners to take action on food losses and waste reduction. This includes the SAVE FOOD initiative, a unique partnership with the private sector which now counts over 500 companies and organizations who are active in food losses and waste reduction. Together with members from industry, politics and civil society, SAVE FOOD aims to drive innovations, promote interdisciplinary dialogue and spark off debates in order to generate solutions, across the entire value chain “from field to fork”.

A Global Community of Practice on Food Loss Reduction is now fully operational and FAO has also developed a new Case Study methodology for food loss measurement. FAO is also developing a new Food Loss Index being proposed as the indicator for 12.3 on food losses and waste.

LEVERAGING RESOURCES

The ability to respond to the impacts of climate change will require a paradigm shift from an input intensive approach to more sustainable and resilient food systems.

This change has a cost – a cost that poor farmers, pastoralists, fishers, foresters and indigenous communities, especially those living in developing countries – are unable to pay.

For many countries, learning how to access and effectively use international financing options represents the first step in the long-term transition to climate-resilient development pathways.

FAO helps countries to look into what it takes to put in place the necessary policy, technical and financial means to mainstream climate change considerations into agriculture, forestry and fisheries and to provide the basis to shift to sustainable agriculture

development and sustainable food systems. It also supports the development of national strategies and investment proposals that can support food security under the realities of climate change. The current dynamics in international climate finance offer opportunities for investment in sustainable agriculture with the potential to use international financing and turn public and private agriculture investments into sound climate-proof investments.

FAO assists member countries to mobilize financing from the Global Environment Facility (GEF) as one of 10 agencies through which countries can request GEF funds.

The GEF is the designated financial mechanism assisting developing countries in implementing their obligations under a number of multilateral environmental agreements (MEAs) or conventions. The facility provides financing according to its six Focal Areas, plus two funds supporting adaptation to climate change.

The FAO Investment Centre coordinates the Organization's collaboration with both the

GEF Secretariat and other GEF Agencies.

The Green Climate Fund, established at the 16th Conference of Parties to the United Nations Framework Convention on Climate Change in 2010, is promoting a paradigm shift towards low-emission and climate-resilient development pathways. It aims to provide support to developing countries to limit or reduce their greenhouse gas emissions and to adapt to the impacts of climate change.

The GCF Board has defined key investment priorities which target many challenges directly relevant to the mandate and work of FAO. This includes providing support to reduce emissions from deforestation and land use, and enhancing the resilience of people's livelihoods and food security.

FAO is accredited to the Fund as an observer and has applied to become an implementing agency to support countries to develop their projects in areas such as adaptation, climate-smart agriculture, climate action and healthy natural systems, forestry, disaster risk reduction and national climate planning.

BUILDING ON GLOBAL MOMENTUM

In the years to come, countries will require support to refine and achieve the commitments made in their voluntary climate-related pledges known as Intended Nationally Determined Contributions.

Many of these commitments include a considerable emphasis on the agriculture sectors.

FAO is ready to help countries meet these commitments thanks to its unique strengths in climate change adaptation and mitigation, by providing highly valued technical support, information and tools; helping government agencies and other partners to harmonize climate change and disaster-risk reduction policies and strategies and acting as a trusted facilitator and neutral source of technical data among global climate-related



institutions and forums. The Organization can draw on its broad cross sectoral and interdisciplinary expertise and a network of decentralized offices in all regions. Through its convening power, FAO can offer countries, development partners as well as civil society organizations, a neutral platform for dialogue and advocacy.

FAO places particular emphasis on country support where its comparative advantage is based on its core functions for:

- ❶ Generating and analysing climate, environmental, agricultural and socio-economic data to underpin the evidence base.
- ❷ Carrying-out cross-sectoral and multi-objective analysis assessing

trade-offs between food security, adaptation and mitigation as well as costs and benefits of changes in smallholder agricultural practices.

❸ Supporting the development and coordination of policy and investment frameworks at national and at regional levels;

❹ Supporting international negotiations and processes on policy and finance including analysis of food security implications of climate change policies and agreements; strengthening agricultural focus of emerging international climate change financing instruments including the GCF.

❺ Developing the capacity of institutions and stakeholders in the agriculture, climate change and related sectors, especially at national level, to strengthen the quality of decision-making.

PUBLICATIONS

Climate change and Food Systems: Global assessments and implications for food security and trade



FAO, Rome,
2015
357 pp.

This book collects the findings of a group of scientists and economists who have taken stock of climate change impacts on food and agriculture at global and regional levels over the past two decades. The evidence presented describes how global warming will impact where and how food is produced and

discusses the significant consequences for food security, health and nutrition, water scarcity and climate adaptation. The book also highlights the implications for global food trade.

Voluntary guidelines to support the integration of Genetic Diversity into national Climate Change Adaptation Planning



FAO, Rome,
2015
32 pp.
(also available
in French,
Spanish,
Chinese,
Russian and
Arabic)

The Voluntary Guidelines to Support the Integration of Genetic Diversity into National Climate Change Adaptation Planning address the genetic resources dimension of adaptation planning. The Guidelines were developed under the aegis of FAO's intergovernmental Commission on Genetic Resources for Food and Agriculture and approved by the

FAO Conference in 2015. They aim to assist countries in managing genetic resources – the diversity of plants, animals, aquatic resources, forests, micro-organisms and invertebrates – as a pivotal reservoir and tool at their disposal to adapt agriculture and build resilience into agricultural and food production systems.

Cambio climático y sostenibilidad del banano en el Ecuador: Evaluación de impacto y directrices de política.



FAO, Rome,
2015
198 pp.

At the request of the Ecuadorian Government, FAO undertook a technical assistance to generate an integrated assessment climate impacts on the banana value chain in support of the Ecuador initiatives towards

The Impact of Disasters on Agriculture, Livelihoods and Food Security (Forthcoming)



FAO, Rome, 2015
130 pp.

This study assesses the impact of medium-to-large scale natural hazards and disasters on the agriculture sector and sub-sectors in developing countries between 2003 and 2013, focusing on direct physical damage and indirect economic losses. The findings of the study are expected to support national and international efforts to reduce damage and losses

caused by disasters and strengthen the resilience of the agriculture sector, in line with resilience targets set under the Sendai Framework for Disaster Risk Reduction, the Sustainable Development Goals, and the Universal Climate Change Agreement.

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sustainable and climate-adapted strategies. Both biophysical and socio-economic analyses were carried out using a team of FAO and international experts.

Gender in Climate-Smart Agriculture.

Module 18 for the Gender in Agriculture Sourcebook.



World Bank, FAO, IFAD, 2015, Rome, 96 pp.

This module provides guidance and a comprehensive menu of practical tools for integrating gender in the planning, design, implementation, and evaluation of projects and investments in climate-smart agriculture (CSA). The module emphasizes the importance and ultimate goal of integrating gender in CSA practices, which is to reduce gender inequalities and ensure that men and women can equally benefit from any intervention in the

Assessing climate change vulnerability in fisheries and aquaculture.

Available methodologies and their relevance for the sector.



FAO, Rome, 2015. 98 pp.
(also available in French, Spanish)

It also analyses how these methodologies have been applied in the context of fisheries and aquaculture, with illustrative examples of their application.

This document provides an overview of vulnerability assessment concepts and methodologies. It sheds light on the different vulnerability assessment methodologies that have been developed, and on how these are conditioned by the disciplinary traditions from which they have emerged.

agricultural sector to reduce risks linked to climate change.

Enabling Farmers to Face Climate Change



FAO, Rome, 2015
70 pp.

This publication provides an overview of the characteristics

and main activities of the projects that are being implemented as part of the second project portfolio of the Benefit-sharing Fund of the International Treaty on Plant Genetic Resources for Food and Agriculture. This second portfolio consists of 22 projects being implemented in 33 countries across Africa, Asia, the Near East, Latin America and the Caribbean. The publication also aims

to share achievements, best practices and lessons learned during the projects' implementation.

Emerging Activities to Combat Climate Change

Use of FAO Data and IPCC GHG Inventory Guidelines for Agriculture and Land Use



FAO, Rome, 2015
44 pp.

The FAO-IPCC-IFAD report summarizes the findings of a joint workshop held at FAO Headquarters on 13-14 November 2014. It provides information on access and use of FAO data and analysis tools for Agriculture, Forestry, and other Land Use (AFOLU), in support of national reporting processes under the UN Framework Convention on Climate Change (UNFCCC), including greenhouse gas inventories, Biennial Update Reports, and national mitigation planning.

PUBLICATIONS

Climate-Smart Agriculture: A Call for Action



FAO, Rome,
2015
120 pp.

This publication is a summary of the workshop held in Bangkok, Thailand from 18 to 20 June 2015 to promote the mainstreaming and up-scaling of Climate-Smart Agriculture in the region. Included in the report are successful case studies that agriculturists have been practicing as a means to address food security under adverse circumstances.

Kenya's Tea Sector under Climate Change



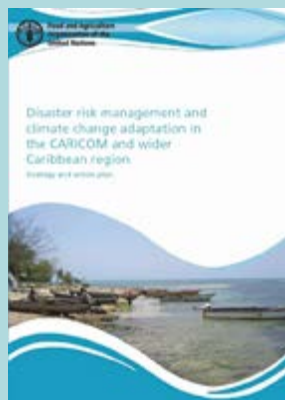
FAO, Rome,
2015
184 pp.

Following the Intergovernmental

Disaster risk management and climate change adaptation in the CARICOM and wider Caribbean region

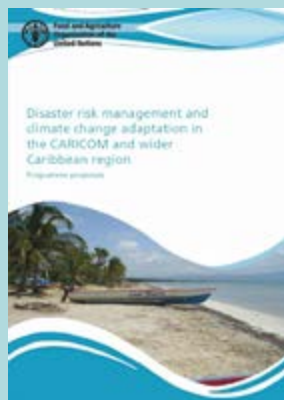
Strategy and action plan.

Programme proposals



FAO, Rome, 2015
36 pp.

The strategy and action plan are part of an initiative of the Caribbean Regional Fisheries Mechanism (CRFM) and FAO on climate change adaptation and disaster risk management in fisheries and aquaculture. The aim was to develop a strategy and action plan with a focus on small-scale fisheries and small-scale aquaculture. Reviewed and refined by 65 local, national and regional stakeholders, the strategy and action plan were subsequently adopted by CRFM member states in 2013.



FAO, Rome, 2015
26 pp.

This programme proposal is part of an initiative of the Caribbean Regional Fisheries Mechanism and FAO that was discussed at a regional workshop on the formulation of a strategy, action plan and programme proposal held in Jamaica in December 2012. Proposals are set out in the format of the logical framework used by many technical and funding agencies within and beyond the CARICOM region.

Group Meeting on Tea in New Delhi in 2010, FAO was requested by the Government of Kenya to assist with a climate change impact assessment of tea in Kenya and to help develop a new strategy to confront its effects. This report is the outcome of a two-year project in Kenya and offers the findings from an integrated climate impact assessment

Making it count: increasing the impact of climate change and food security education programmes



FAO, Rome,
2015
54 pp.

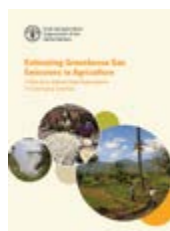
The evidence is clear: to change behaviour 'environmental education' needs to change its focus – with less emphasis on knowledge and raising awareness (although still needed) and more on competency, action skills and problem

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solving. Based on the educational and psychological research reviewed in this report, the following key objectives are proposed for planning or evaluating educational programmes designed at achieving behaviour change.

Estimating Greenhouse Gas Emissions in Agriculture

A Manual to Address Data Requirements for Developing Countries



FAO, Rome, 2015
193 pp.
(also available in French and Spanish)

This Manual seeks to guide the staff of national statistical offices and environmental ministries and agencies in compiling statistics related to GHG emissions and removals. In particular, the Manual provides information on accessing and using the FAOSTAT Emissions database.

Global guidelines for the restoration of degraded forests and landscapes in drylands



FAO, Rome, 2015
171 pp.

Drylands cover nearly half of the earth's land surface and are home to one-third of the global population. They face extraordinary challenges, including those posed by desertification, biodiversity loss, poverty, food insecurity and climate change. Up to 20 percent of the world's drylands are degraded, and people living there are often locked into a vicious circle of poverty, unsustainable practices and environmental degradation.

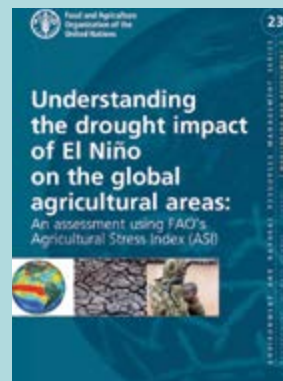
Forest and Climate Change in the Caribbean



FAO, Rome, 2014
34 pp.

Understanding the drought impact of El Niño on the global agricultural areas.

Available methodologies and their relevance for the sector.



FAO, Rome, 2015
52 pp.

During El Niño episodes the normal patterns of tropical precipitation and atmospheric circulation become disrupted triggering extreme climate events around the globe: droughts, floods and affecting the intensity and frequency of hurricanes. Disasters create poverty traps that increase the prevalence of food insecurity and malnutrition.

This document is part of the publication series of FAO's Forest and Climate Change Programme. The programme works to strengthen countries' capacities to mitigate and adapt to climate change through actions consistent with sustainable forest management and to promote regional cooperation and international policy development related to forests and climate change.

Science to support climate-smart agricultural development

Concepts and results from the MICCA pilot projects in East Africa



FAO, Rome, 2014
56 pp.

The publication reports on the concepts driving the scientific activities of the MICCA's pilot

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projects in East Africa. It provides the research results, describes the analytical approaches used and concludes with key messages relevant to discussions on Climate-Smart Agriculture. In partnership with the World Agroforestry Centre (ICRAF), the East Africa Dairy Development Project (EADD) and Care International, the MICCA pilot projects mainstream Climate-Smart Agriculture in the regions by identifying, verifying and scaling up farm management practices.

Adapting to climate change through land and water management in Eastern Africa.

Results of pilot projects in Ethiopia, Kenya and Tanzania



FAO, Rome, 2014
180 pp.

This publication presents the results and lessons learned

from the FAO-Sida supported pilot project “Strengthening capacity for climate change adaptation in land and water management” in Ethiopia, Kenya and Tanzania.

Managing climate risks and adapting to climate change in the agriculture sector in Nepal



FAO, Rome, 2014
162 pp.

Projected future scenarios of climate suggest that climatic conditions in Nepal will worsen, which may imply even more frequent occurrences of climate-related extremes and negative impacts on food production. However, by adopting the right measures, it is possible to manage the climate risks and adapt to the challenges posed by increasing climate variability and climate change.

Climate change guidelines for forest managers

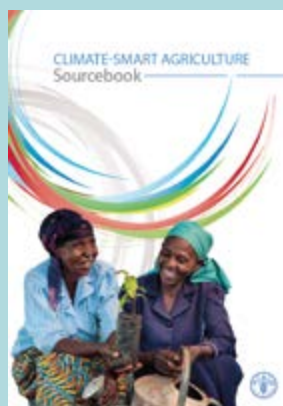


FAO, Rome, 2014
130 pp.
(also available in French and Spanish)

The effects of climate change and climate

variability on forest ecosystems are evident around the world and further impacts are unavoidable, at least in the short to medium term. Addressing the challenges posed by climate change will require adjustments to forest policies, management plans and practices.

Climate-smart agriculture sourcebook



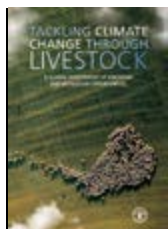
FAO, Rome, 2015
570 pp.

Between now and 2050, the world's population will increase by one-third. Most of these additional 2 billion people will live in developing countries. At the same time, more people will be living in cities. If current income and consumption growth trends continue, FAO estimates that agricultural

production will have to increase by 60 percent by 2050 to satisfy the expected demands for food and feed. Agriculture must therefore transform itself if it is to feed a growing global population and provide the basis for economic growth and poverty reduction. Climate change will make this task more difficult under a business-as-usual scenario, due to adverse impacts on agriculture, requiring spiralling adaptation and related costs.

All FAO publications can be accessed at www.fao.org/publications

Tackling Climate Change through Livestock



FAO, Rome,
2013
139 pp.
(also
available
in French)

As renewed international efforts are needed to curb greenhouse gas emissions, the livestock sector can contribute its part. An important emitter of greenhouse gas, it also has the potential to significantly reduce its emissions.

Food waste footprint - Impacts on natural resources.

Summary report



FAO, Rome,
2013
63 pp.

This FAO study provides a global account of the environmental footprint of food wastage (i.e. both food loss and food waste) along the food supply chain, focusing on impacts on climate,

Strategy for Fisheries, Aquaculture and Climate Change



FAO, Rome, 2012
27 pp.

More than 500 million people depend directly or indirectly on fisheries and aquaculture for their livelihoods. Fish also provides essential nutrition for 3 billion people and at least 50 percent of animal protein and essential minerals for 400 million people in the poorest countries. However, climate change is creating huge challenges for a sector already facing serious threats from overfishing and poor management.

water, land and bio-diversity. A model has been developed to answer two key questions: what is the magnitude of food wastage impacts on the environment; and what are the main sources of these impacts –with a view to identifying “environmental hotspots” related to food wastage.

Learning Tool on nationally Appropriate Mitigation Actions (NAMAs) in the agriculture, forestry and other land use (AFOLU) sector



FAO,
Rome,
2013
162 pp.

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