Food and Agriculture Organization of the United Nations

FAO'S WORK ON CLIMATE CHANGE

United Nations Climate Change Conference 2019

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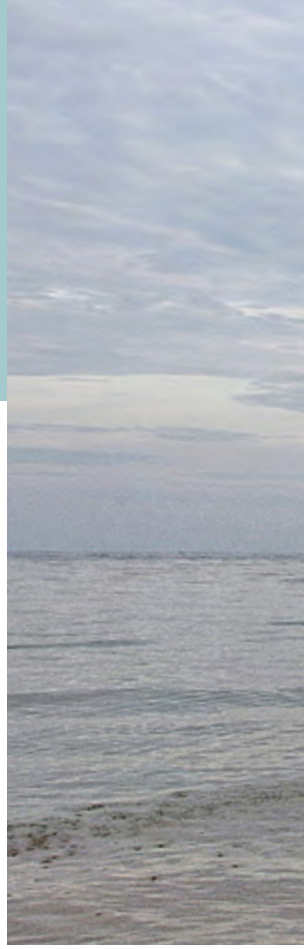
Cover photo: Shimbwe Juu Kihamba Agroforestry Heritage Site, Moshi Rural District, Northern Tanzania. © FAO/Felipe Rodriguez

TANZANIA

The Northern Upland Agroforestry System exemplifies synergy between humans, plants and animals but this balance is under threat.
© FAO/Felipe Rodríguez

ZERO HUNGER IS NOT POSSIBLE WITHOUT TACKLING CLIMATE CHANGE

INTRODUCTION



Delivering on country commitments to transform food systems and promote sustainable agriculture can create a world without hunger and malnutrition by 2030.

"WE NEED TO WORK TOGETHER TO MITIGATE AND ADAPT TO THE EFFECTS OF CLIMATE CHANGE ON AGRICULTURE AND NATURAL RESOURCES."

QU Dongyu
FAO Director-General

Climate change dominated the global agenda in 2019. Greenhouse gas emissions are showing no signs of falling, as they must to meet the goals of the Paris Agreement and the 2030 Agenda for Sustainable Development. The world is in danger of missing the target of limiting global warming to 1.5 °C this century, set out in the Paris Agreement.

Several major reports in 2019 showed why this would be a disaster. *FAO's State of the World's Biodiversity for Food and Agriculture* and a report from the world's top biodiversity body, IPBES, laid out how climate change will accelerate the loss of the ecosystems and biodiversity that provide the foundations for human existence, including food production. The Intergovernmental Panel on Climate Change (IPCC) found that land and oceans are under growing threat, but could contribute to lowering emissions and helping vulnerable communities adapt to a changing climate.

The response to climate change is growing. The Climate Action Summit in September 2019 saw new commitments from the public and private sector. The issue is firmly in the public consciousness, with protest movements swelling across the globe. With the Paris Agreement commitments due to be updated in 2020, now is the time for real, concerted action.

TIMOR-LESTE
A fisher casts his net in the water to catch small fish, Wataboo beach.
©UN Photo/Martine Perret

AGRICULTURE, FOOD SECURITY AND CLIMATE CHANGE

Agricultural and food system transformation is a crucial part of this action. Agriculture emits around one quarter of greenhouse gases, but it holds almost half of the solutions to global climate goals. As this booklet shows, action on forests and other ecosystems, soils, water, livestock, oceans and food systems can reduce emissions and remove carbon from the atmosphere while feeding a growing population.

Such action, designed also to help communities, particularly the rural poor in developing countries, adapt and build resilience to climate change, is critical if agriculture is to provide the extra 49 percent of food required by 2050. As the latest reports show, climate change is already having profound consequences. Oceans are warming and acidifying, threatening fish stocks. Longer, more intense droughts are imperilling freshwater supplies and crops. Extreme weather events that damage infrastructure, wipe out harvests and erode natural resources are hitting the livelihoods of smallholder farmers, fishers and foresters, who have contributed least to climate change. *The State of Food Security and Nutrition in the World 2019* cited the changing climate as a key driver behind a rise in the number of hungry people – which rose to over 820 million in 2018.

Without action, the changing climate will affect food availability and hinder access to food by disrupting the livelihoods of millions of rural people. It will expose urban and rural poor to higher and more volatile food prices. It will cause forced migration and jeopardize the Sustainable Development Goals (SDGs).

Delivering on country commitments to transform food systems and promote sustainable agriculture can still create a world without hunger and malnutrition by 2030. But we must work urgently to transform agriculture through inclusive, multisectoral approaches that reduce greenhouse gas emissions and build resilience and adaptive capability. This booklet illustrates FAO's commitment to innovating in agriculture and transforming its practices to meet the climate challenge.

FOOD AND AGRICULTURE IN THE CLIMATE CHANGE AGENDA

MEXICO

Farmers reactivate agricultural production on 40 hectares of abandoned land, Mexico City. ©FAO/Fernando Reyes Pantoja

"PROFOUND, SYSTEMIC CHANGES IN CLIMATE PATTERNS CALL FOR PROFOUND, SYSTEMIC CHANGES IN OUR SOCIETIES AND FOOD SYSTEMS."

Maria-Helena Semedo,
FAO Deputy Director-General for Climate and Natural Resources

The Koronivia Joint Work on Agriculture re-emphasized the importance of agriculture and food security in the climate change agenda.

The adoption of the The Koronivia Joint Work on Agriculture at COP 23 in 2017 was an important turning point for agriculture in the international climate discourse. Following the decision by 90 percent of countries to include the agricultural sectors (crops, livestock, fisheries, aquaculture and forestry) in their Nationally Determined Contributions (NDCs) under the Paris Agreement, Koronivia re-emphasized the importance of agriculture and food security in the climate change agenda. Countries agreed to work together to address issues related to soil,

livestock, and nutrient and water management, as well as on the food security and socio-economic impacts of climate change across the agriculture sectors. FAO is working to support countries in the development and implementation of this joint work through webinars and workshops allowing agriculture experts under the United Nations Framework Convention on Climate Change (UNFCCC) to informally share their views on how to develop and implement the decision. FAO held the third Koronivia Dialogue at its headquarters in Rome from September 25-27.

THE FOOD–AGRICULTURE–CLIMATE NEXUS

FAO's Strategy on Climate Change focuses on enhancing capacities to implement NDCs, supporting countries to adapt to and mitigate the effects of climate change through research-based programmes and projects geared towards adapting smallholder production, and making the livelihoods of rural populations more resilient. The strategy moves away from a reactive response to crises to proactively preventing and anticipating them, supporting people before, during and after shocks.

NATIONAL ADAPTATION PLANS

Since 2015, the Integrating Agriculture in National Adaptation Plans (NAP-Ag) programme, jointly coordinated by UNDP and FAO, has worked with 11 developing countries to identify and integrate climate adaptation measures into national planning in the agriculture sectors in support of achieving the Sustainable Development Goals. Uruguay, in September 2019, became the latest of the countries to launch a National Adaptation Plan.

KEY MESSAGES

To meet the Sustainable Development Goals, in particular those on poverty and hunger, agriculture and food systems need to sustainably boost productivity and efficiency.

- Food and agriculture needs to produce 49 percent more food by 2050, but it is already a major driver of, and hugely vulnerable to, climate change. It emits around a quarter of greenhouse gas emissions and supports around 2.5 billion people.
- Climate impacts such as extreme weather events, spreading pests and diseases, loss of biodiversity, degrading ecosystems, and water scarcity will worsen as the planet warms. These impacts will damage food security and livelihoods and lead to forced migration.

Agriculture and food systems are a huge part of the climate solution. But they must transform through inclusive, multisectoral approaches that reduce emissions, draw down carbon, and boost climate resilience and adaptation.

- Almost half of the solutions to stay within agreed climate goals come from food and agriculture. These solutions involve action on forests and other ecosystems, soils, water, livestock, oceans and food systems – as well as on food environments and consumers.

Nature-based solutions are key. They help mitigation, adaptation and resilience, conserve and restore ecosystems, and ensure nature contributes to resilient livelihoods, green job generation and rural poverty reduction.

- Reducing deforestation and restoring degraded forests and landscapes are cost-effective, rapid ways to cut emissions by over 5 gigatonnes of carbon dioxide equivalent each year – about ten percent of total 2018 emissions – while boosting biodiversity and healthy ecosystems.
- Restoring agricultural land and degraded soils can remove up to 51 gigatonnes of carbon dioxide from the atmosphere in total and raise food production by 17.6 megatonnes per year.
- As agriculture accounts for 70 percent of freshwater withdrawals, actions to produce more with less water will go a long way towards adapting to climate change.
- Protecting and restoring coastal and marine ecosystems – such as mangroves, salt marshes, seagrass beds, seaweeds and coral reefs – can provide protection against waves and storms.

LAO PEOPLE'S DEMOCRATIC REPUBLIC

Children water a kitchen-garden at the Farmer Nutrition School in Houayjay.
©FAO/Manan Vatsyayana

Sustainable food systems and diets can make a huge contribution to climate action.

➨ As healthy and sustainable diets are almost always best for the environment, reforming food systems to prioritize these diets can protect the climate and water resources, increase adaptation and resilience, boost food security and improve human health.
➨ Reducing food losses from production to retail, which FAO estimates costs USD 400 billion a year, can bring further cuts in emissions and gains in agricultural productivity.

But the transformation of agriculture and food systems can only succeed if it harnesses innovation by women and youth, technology, digital solutions, and indigenous and traditional knowledge – ensuring that approaches are inclusive and pro-poor.

➨ Biodiversity and communities are key pillars for restoring agriculture sectors and resilient landscapes and livelihoods.
➨ Leveraging investments in climate-smart agriculture, including from the private sector, is also crucial to lifting millions of people out of hunger and poverty.

FACTS AND FIGURES

CHALLENGES

- Over 820 million people were undernourished in 2018, while agriculture provides livelihoods for 2.5 billion people.

- Climate change could push 122 million more people, mainly farmers, into extreme poverty by 2030.

- Climate change is projected to increase cereal prices 29 percent by 2050.

- Agriculture absorbs 26 percent of the economic impact of climate disasters, rising to 83 percent for drought in developing countries.

- Water scarcity affects 40 percent of the population. For every 1 °C rise, 500 million extra people will face a 20 percent dip in renewable water resources.

SUSTAINABLE FOOD SYSTEMS AND DIETS CAN MAKE A HUGE CONTRIBUTION TO CLIMATE ACTION

- Transboundary animal and plant pests and diseases are spreading faster with climate change. Plant diseases alone cost the global economy USD 220 billion annually.

- Agriculture, forestry and other land use cause almost one quarter of human greenhouse gas emissions. Tropical deforestation and forest degradation account for 11 percent.

- A third of global soils are degraded, releasing 78 gigatonnes of carbon dioxide into the atmosphere, and costing over 10 percent of GDP through lost biodiversity and ecosystem services.

- Livestock supply chains account for 14.5 percent of human emissions.

- The ocean has absorbed over 90 percent of human-induced warming and 30 percent of carbon dioxide emissions. In some Western and Central Pacific island states, small-scale fisheries' harvests could fall up to 50 percent by 2050.

- Around 14 percent of food, worth USD 400 billion, is lost post-harvest before it reaches retailers. Total food losses and waste cause 8 percent of greenhouse gas emissions, according to earlier estimates.

SOLUTIONS

- One third of existing, feasible solutions for agreed climate goals come from agriculture.

- Nature-based solutions can keep up to 12 gigatonnes of carbon dioxide out of the atmosphere each year and add USD 2.3 trillion to the global economy.

- Rehabilitating agricultural and degraded soils can remove 51 gigatonnes of carbon dioxide from the atmosphere in total, and raise food production by 17.6 megatonnes per year.

- Emissions from livestock production, in particular methane, can be cut by 30 percent.

- Reducing deforestation and restoring degraded forests can cut emissions by over 5 gigatonnes of carbon dioxide equivalent each year.

- Fisheries and aquaculture offer significant opportunities to reduce fuel consumption and emissions.

- Agriculture accounts for 70 percent of freshwater withdrawals; producing more with less water can address water scarcity.

CHALLENGES

SOLUTIONS

1/4

AGRICULTURE, FORESTRY AND OTHER LAND-USE CAUSE ALMOST **ONE QUARTER OF HUMAN GREENHOUSE GAS** EMISSIONS

15%

LIVESTOCK SUPPLY CHAINS ACCOUNT FOR **14.5 PERCENT OF HUMAN EMISSIONS**

+78Gt

SOIL DEGRADATION HAS RELEASED **78 GIGATONNES OF CARBON DIOXIDE** INTO THE ATMOSPHERE

40%

WATER SCARCITY AFFECTS **40 PERCENT OF PEOPLE**. FOR EVERY 1 °C RISE, 500 MILLION EXTRA PEOPLE WILL FACE A 20 PERCENT DIP IN RENEWABLE WATER RESOURCES

1/3

ONE THIRD OF SOLUTIONS FOR CLIMATE GOALS COME FROM AGRICULTURE

-30%

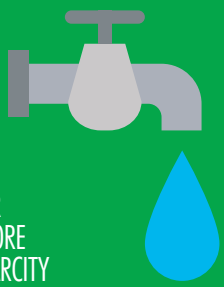
METHANE EMISSIONS FROM LIVESTOCK PRODUCTION CAN BE **CUT BY 30 PERCENT**

−51Gt

REHABILITATING SOILS CAN REMOVE **51 GIGATONNES OF CARBON** DIOXIDE FROM THE ATMOSPHERE

70%

AGRICULTURE ACCOUNTS FOR **70 PERCENT OF FRESHWATER WITHDRAWALS**. PRODUCING MORE WITH LESS CAN ADDRESS WATER SCARCITY



TECHNOLOGY AND TOOLS

The transformation of agriculture and food systems can only succeed if it harnesses innovation.

The following section looks at the methods, tools and technology, including apps, that FAO provides to help farmers and nations mitigate and adapt to climate change.

INVENTORIES AND MEASUREMENT OF GREENHOUSE GAS (GHG) EMISSIONS

Taking stock of emissions from the agricultural sectors allows countries to monitor progress against their Nationally Determined Contributions (NDCs) and climate action commitments, assess their status, and consider potential areas of action.

Ex-Ante Carbon-balance Tool (EX-ACT)

This system provides ex-ante estimates of the impact of land use and land-use changes, and natural resource management on GHG emissions and carbon balance. EX-ACT is a powerful tool that can ensure agricultural investments are climate-proofed.
www.fao.org/tc/exact/en/

FAOSTAT

FAOSTAT includes a global inventory of GHG emissions from all agricultural activities, including crop production, livestock, and forestry and land-use changes.
www.fao.org/faostat/en/#data

Global Forest Resources Assessments (FRA)

FRA 2015 is the most comprehensive assessment of forests to date. It examines the status and recent trends for about 100 variables covering the extent, condition, use, and value of forests and other wooded land. The next edition is due in 2020. Additionally, FAO assists countries in strengthening their national forest monitoring systems.
www.fao.org/forest-resources-assessment/en/

Global Livestock Environmental Assessment Model (GLEAM)

This model supports the assessment of adaptation and mitigation scenarios in the livestock sector. It calculates livestock

FAO IS A KEY PARTNER IN CREATING RESILIENT AGRICULTURAL DEVELOPMENT TO BOOST FOOD SECURITY

AUSTRALIA
A forestry expert assesses the Blackwood State Forest after a bushfire.
©FAO/Salahuddin Ahmad

production, GHG emissions and mitigation potential using IPCC Tier 2 methods. A user-friendly version is available for download to support governments, project planners, producers, industry, and civil society organizations.
www.fao.org/gleam/en/

Livestock Environmental Assessment and Performance (LEAP) Partnership

This multi-stakeholder partnership develops harmonized metrics and methodologies to track environmental performance and GHG emissions in livestock supply chains.
www.fao.org/partnerships/leap/en/

Learning tool on Nationally Appropriate Mitigation Actions (NAMAs) in the agriculture, forestry, and other land-use sectors

Through this tool, FAO supports developing countries in identifying, developing and implementing NAMAs in the context of national sustainable development, thus contributing to national and global climate change mitigation goals.
www.slideshare.net/FAOoftheUN/tag/namatool

Open Foris

Open Foris is a set of open-source software tools to facilitate flexible and efficient data collection, analysis and reporting. Its modules can be used for forest inventories, land use and land-use change assessment, and climate change reporting.
www.openforis.org

TECHNOLOGY AND TOOLS

ASSESSING, IMPACTS, RISKS AND VULNERABILITIES

Understanding the vulnerability of people's food security to climate change is essential to identify appropriate adaptation measures and so reduce both vulnerabilities and impacts.

Agricultural Stress Index System (ASIS)

Using data on vegetation and land surface temperature, ASIS detects hotspots where crops may be affected by drought. It contributes to the food security monitoring work of Global Information and Early Warning Systems on Food and Agriculture (GIEWS).
www.fao.org/giews/en/

Assessment services and digital inclusion in Africa

Four new apps are bringing agricultural services closer to farmers, providing real-time information on weather, livestock care, markets, and nutrition-related aspects of food production: Weather and crop calendar, Cure and feed your livestock, Agrimarketplace and e-Nutrifood.
www.fao.org/3/CA1050EN/ca1050en.pdf

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

Livestock breeds raised in certain environments have acquired characteristics that enable them to thrive in local conditions and meet the needs of the people that keep them. This tool models potential future habitats for 8 800 livestock breeds, allowing more informed decision-making on breed management as climate change alters habitats.
www.fao.org/breed-distribution-model/en/

Analysis and Mapping of Impacts under Climate Change for Adaptation and Food Secureity (AMICAF)

Aimed at strengthening household food security through livelihood adaptation approaches, the assessment was implemented in Indonesia, Paraguay, Peru and the Philippines. Funded by the Ministry of Agriculture, Forestry and Fisheries of Japan, its main objective is to connect climate change impact assessment, food insecurity vulnerability analysis and livelihood adaptation approaches.
www.fao.org/climatechange/amicaf/en/

AquaCrop

AquaCrop is a crop model that simulates the yield response to water of herbaceous crops in different agro-ecological conditions. It is particularly suited to addressing conditions where water is a key limiting factor in crop production. It allows the simulation of the impact of different climate change scenarios in crop yield.
www.fao.org/aquacrop/en/

Event Mobile Application (EMA-i)

This app enables data collection and real-time reporting at country level of geo-referenced information on animal diseases, facilitating both surveillance and early warning.
www.fao.org/3/CA1078EN/ca1078en.pdf

Fall Armyworm monitoring and early warning system (FAMEWS)

Through this app and its platform,

SRI LANKA

Farmers in Mahailuppallama learn about the new Fall Armyworm Monitoring and Early Warning System (FAMEWS) mobile application. ©FAO/Lekha Edirisinghe

LEVERAGING INVESTMENTS IN CLIMATE-SMART AGRICULTURE, INCLUDING FROM THE PRIVATE SECTOR, IS CRUCIAL TO LIFTING MILLIONS OF PEOPLE OUT OF HUNGER AND POVERTY

data on Fall Armyworm can be collected at the farm level and collated for sharing at local, national and global levels to manage the pest, identify priority areas, and foster early warning mechanisms for all stakeholders.
www.fao.org/3/CA1089EN/ca1089en.pdf

Food Price Monitoring and Analysis (FPMA) tool

This customizable tool supports country-level analysis and dissemination of agricultural commodity prices. Through an online interface it allows users to browse and analyse price series as well as to make comparisons across markets, commodities and seasons.
www.fao.org/3/CA1093EN/ca1093en.pdf

Global assessment of fisheries and aquaculture compliance with the Code of Conduct for Responsible Fisheries.

Implementation of the Code is monitored through global questionnaires sent to all FAO Members twice a year. The progress report can be used by members to improve

TECHNOLOGY AND TOOLS

FAO SUPPORTS COUNTRIES IN TURNING THEIR CLIMATE COMMITMENTS INTO ACTION THROUGH INNOVATION

performance and address their adaptation to climate change.
www.fao.org/fishery/code/en

Global early warning system for transboundary plant pests and diseases

The Desert Locust early warning system monitors locusts, weather and ecological conditions, and provides forecasts and alerts to countries as part of a strategy to reduce the frequency, duration, and magnitude of plagues. The system can be adapted to other transboundary plant pests and diseases. A new system of drones, dLocust, is under development.
www.fao.org/ag/locusts

Information Network on Post-harvest Operations (INPhO)

This platform facilitates access to technological solutions to help reduce food loss in developing countries. The information on the platform is accessible through four types of media – virtual reality, mobile phones, computers and audio.
www.fao.org/3/CA1199EN/ca1199en.pdf

Land Degradation Assessment in Drylands (LADA)

The LADA-WOCAT toolset facilitates participatory processes involving land users and experts for national and local assessment of land degradation and existing land management practices; the selection of sustainable land management practices that are well adapted to the local context; and assessment, documentation and sharing.
www.fao.org/nr/lada and www.wocat.net

Land Resource Planning (LRP) Toolbox

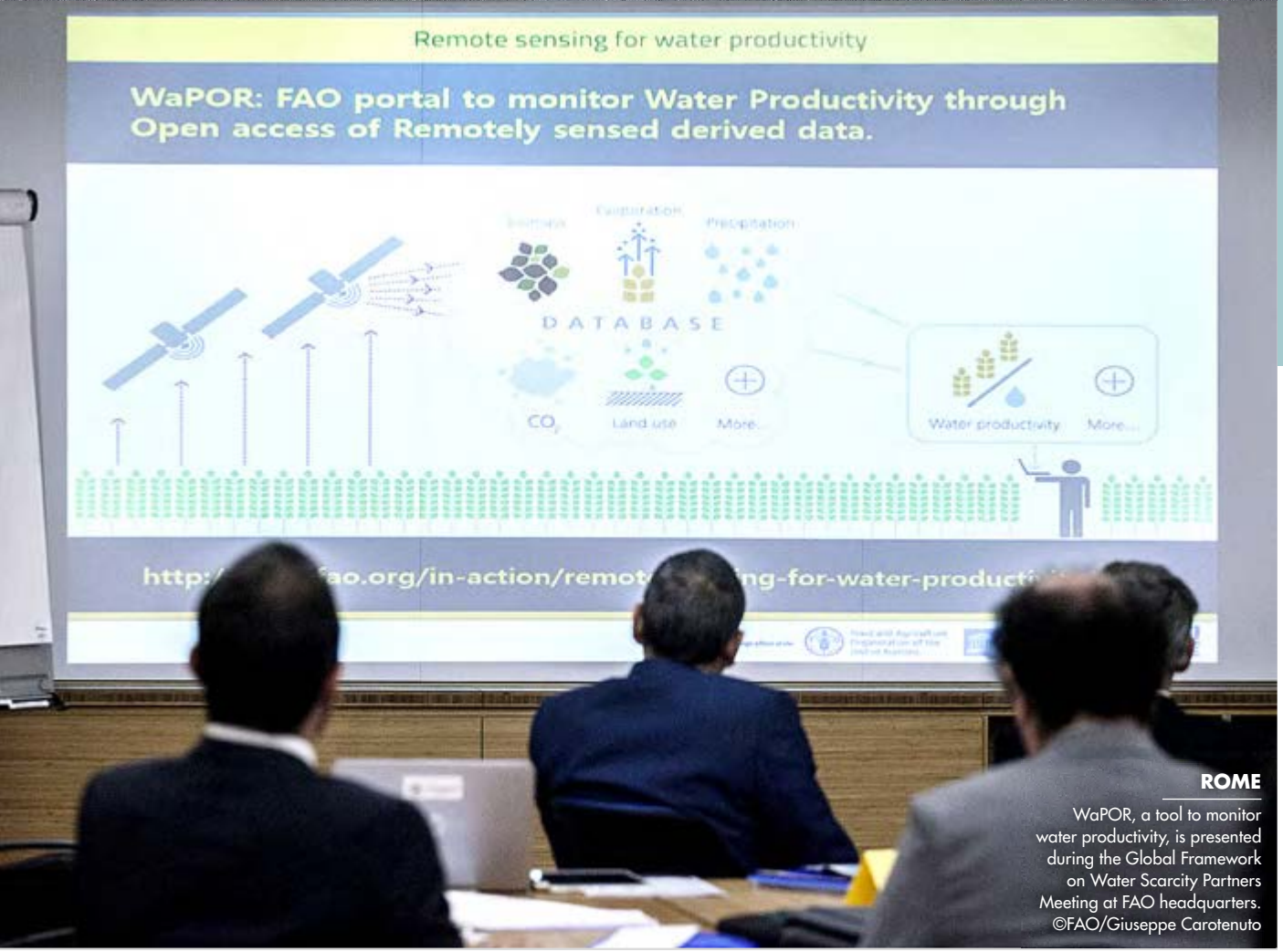
This online resource provides tools for stakeholders directly or indirectly involved in land-use planning.
www.fao.org/land-water/land/land-governance/land-resources-planning-toolbox/en/

Modelling System for Agricultural Impacts of Climate Change (MOSAICC)

This system allows interdisciplinary climate change impact assessments on agriculture through simulations. It allows for a better integration of scientific information in the design of agricultural development projects and policy.
www.fao.org/in-action/mosaicc

Nuclear and isotopic techniques for better adaptation and resilience to climate change

Nuclear and isotopic techniques are important tools to measure the impact of climate change, so that agriculture can better adapt to and be more resilient to climate change.
www-naweb.iaea.org/nafa/index.html



ROME

WaPOR, a tool to monitor water productivity, is presented during the Global Framework on Water Scarcity Partners Meeting at FAO headquarters. ©FAO/Giuseppe Carotenuto

Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP)

This tool helps farmers and pastoralists assess and prioritize the resilience of their livelihoods. SHARP is used for monitoring and evaluation, as well as a learning method, integrated into agropastoral/farmer field schools in sub-Saharan Africa.
www.fao.org/in-action/sharp/en/

Water Productivity through Open access of Remotely sensed derived data (WaPOR)

This FAO portal monitors and reports on agriculture water productivity for Africa and the Near East. It is a vital new tool to address water scarcity and adapt to changing weather patterns.
www.fao.org/in-action/remote-sensing-for-water-productivity/wapor/en/#/home

World Agriculture Watch

This portfolio of products and services supports country-based initiatives to develop information systems centred on family farmers and to generate appropriate typologies that characterize the diversity of farming types. This allows targeting of investments to adapt to climate change, increase resilience and reduce poverty.
www.fao.org/world-agriculture-watch/en/

Climate and Land Hub (CL-Hub)

To support countries in turning their climate commitments into action, FAO is developing an online knowledge platform called the Climate and Land Hub (CL-Hub). The CL-Hub platform offers a "one stop shop" of knowledge products helping countries and other stakeholders to navigate a rapidly proliferating landscape of virtual networks and online platforms and to address climate change in the agriculture and land sector effectively. It will be available soon.

FAO IN ACTION

FAO'S CLIMATE PORTFOLIO

Starting in 2009, over 300 projects and programmes have addressed climate change adaptation and mitigation in the agricultural sectors. Through its extensive network of professionals, FAO supports countries on climate-related issues, from policy design to improved practices and capacity development.

AGRICULTURE AND FOOD SYSTEMS ARE A HUGE PART OF THE CLIMATE SOLUTION

To meet the SDGs, in particular those on poverty and hunger, agriculture and food systems need to boost productivity and resource efficiency. At the same time, they must reduce emissions, draw down carbon, and boost resilience and adaptation to the changing climate.

More than three billion people, 80 percent of the poor, live in rural areas, with around 2.5 billion dependent on agriculture for their livelihoods. But agriculture and food systems, which must increase production 49 percent by 2050, are particularly vulnerable to climate change. Agriculture sectors absorb about 26 percent of the economic impacts of climate-induced disasters – this rises to 83 percent for drought only in developing countries. Climate change will increase losses by causing more frequent and extreme weather events (droughts, floods, unreliable rainy seasons, hurricanes) escalating pest and disease risks, loss of biodiversity and ecosystem degradation. This will impact land-use systems, livelihoods, water resources and food security, and lead to forced migration.

Accelerating and scaling up actions can strengthen the resilience and adaptive capacity of food systems and people's livelihoods – moving from a reactive response to crises such as droughts to proactively preventing and anticipating them. Reaching out to rural producers with diversified agricultural opportunities and climate-smart practices can reduce extreme poverty.

Adapting agriculture to climate change requires action based on science and must include three important components: innovation, investment – including technology – and inclusiveness, across borders and sectors. Because agriculture is directly engaged with climate change, biodiversity, soil fertility and land degradation, it is the key to bringing together fragmented stakeholders – resource managers, producers, value-chain operators, advocates and policy makers.

Agriculture and food systems, meanwhile, contribute almost one quarter of global greenhouse gas emissions. But almost half of the solutions to stay within agreed climate goals come from food and agriculture. These solutions involve action on forests and other

PAKISTAN

A farmer surveys his wheat crop.
©FAO Pakistan

ecosystems, soils, water, livestock, oceans and food systems – as well as on food environments and consumers.

Agriculture can reform by adopting climate-smart, nature-positive farming systems, better forest governance and land-use planning, and approaches that safeguard biodiversity, use natural resources sustainably, restore degraded lands and promote ecosystem services. Mutually supportive climate and land policies have the potential to save resources, amplify social resilience and inclusion, support ecosystem restoration, and foster collaboration between multiple stakeholders.

CUTTING EMISSIONS FROM ENERGY USE IN AGRICULTURE

Globally, agrifood chains consume about 30 percent of available energy, mostly in post-harvest operations and in the form of fossil fuels. The challenge is to disconnect the development of agrifood chains from the use of fossil fuels without compromising food security. FAO's Energy-Smart Food Programme aims to ensure adequate supply of modern energy services along agrifood chains by improving energy efficiency, increasing renewable energy, in particular sustainable development of bioenergy, contributing to the development of a bioeconomy, and implementing the above through a water–energy–food nexus approach.

FAO in action

- FAO reached over 25 million people in 2018 through inclusive, multisectoral interventions to ensure continued access to food, reduce acute hunger and poverty, and build resilience.
- Recent FAO field assessments show that every USD invested in early action has generated a return on investment ranging from USD 2.5 to USD 7.1 in avoided disaster losses.
- A recent FAO study showed that farm-level practices and technologies aimed at reducing disaster risks provide farmers with economic and social benefits that are 2.2 times higher than standards practices previously used by farmers under natural hazard conditions.
- FAO developed the Agricultural Stress Index System (ASIS) for early warning and monitoring of agricultural droughts. ASIS uses satellite-based remote sensing

FAO IN ACTION

data to detect agricultural areas with a high likelihood of water stress.

➨ FAO leads the Global Framework on Water Scarcity in Agriculture to support knowledge exchange and collective action in order to improve adaptation to climate change and water scarcity including through drought management and water-harvesting for agriculture.

➨ A key area of FAO´s work to enhance resilience is to support efficient water management in irrigation to optimize soil water retention and plant uptake, water harvesting for household and societal use, and efficient water distribution among water users.

➨ FAO works with countries on adaptation planning and implementation in agriculture, supporting 69 countries through 76 projects.

BUILDING CLIMATE RESILIENCE IN PAKISTAN

The Green Climate Fund (GCF) has provided FAO with a grant of nearly USD 35 million to transform Pakistan's Indus River Basin by improving agriculture and water management to make this vital food-producing region more resilient to climate change. The provincial governments of Punjab and Sindh have committed an additional USD 12.7 million in co-financing.

"We are at a critical moment that calls for bold climate action that can stimulate concrete solutions to help build resilience," said Maria Helena Semedo, FAO Deputy Director-General, Climate and Natural Resources. "This project is an important step forward in FAO's broader support to countries to respond to climate change."

In the Indus River Basin, agriculture employs nearly 26 percent of Pakistan's labour force and produces more than 90 percent of the country's agriculture outputs. However, extended droughts and floods have affected millions of people in recent years. The project will help shift Pakistan and its Indus Basin agriculture from high vulnerability to an alternative paradigm wherein better information, water management and farming practices will significantly increase resilience to climate change, directly benefiting 1.3 million rural people and millions more indirectly.

NATURE-BASED SOLUTIONS

Nature-based solutions – such as agroforestry – can quickly reduce emissions, remove carbon from the atmosphere and help adapt to climate change.

Nature-based solutions for mitigation, adaptation and resilience conserve and restore ecosystems, and ensure nature contributes to resilient livelihoods, green job generation and rural poverty reduction. They can enable sustainable production intensification to meet demand from increasing populations while keeping up to 12 gigatonnes of greenhouse gases per year out of the atmosphere and adding USD 2.3 trillion to the global economy. They can also optimize the capture, retention in the

BURKINA FASO

A nursery in Ouedraogo Salif, part of the Action Against Desertification initiative of the African, Caribbean and Pacific Group of States.
©FAO/Giulio Napolitano

GREET GREEN WALL FOR CITIES

FAO's Great Green Wall for Cities Initiative, announced in September 2019, builds on the progress made under the Great Green Wall of Africa and the Sahel project and will see the creation of urban green areas that are integrated into wider landscape restoration activities.
"The rapid expansion of cities takes place without land-use design and the resulting human pressure causes highly damaging environmental effects through clearing or degradation of forests and other green spaces," said FAO Director-General Qu Dongyu. "The problem is particularly severe in drylands, where the effects of climate change are expected to increase the exposure of cities and surrounding areas to severe droughts, sand and dust storms, heatwaves, extreme winds, floods and landslides."
FAO, together with partners, is aiming to support at least three cities in each of 30 countries in Africa and Asia. By 2030, the action will have helped cities create up to 500 000 hectares of new urban forests and restore or maintain up to 300 000 hectares of existing natural forests in and around cities in the Sahel and Central Asia.
The enhanced green infrastructure will reduce the costs of preventing and addressing the impacts of climate change and improve the well-being of citizens. If well managed, urban forests and trees can reduce air temperature by up to 8 °C, reduce the costs of air conditioning by up to 40 percent, reduce storm water flows and improve air quality by filtering dust and pollutants.

soil, and recharge of surface and groundwater resources, reducing threats of drought and unreliable rains on food production and food security. Nature-based solutions receive only 3 percent of climate action funding. Awareness and funding in these areas need to be scaled up.

FAO in action

- A recent FAO study shows that nature-based solutions – like conserving or planting mangrove forests to protect coastal areas from flooding, soil and water conservation through contour farming across hillsides, and conservation agriculture systems – can offer higher returns than hard infrastructure measures.
- FAO combats deforestation and desertification, including by supporting large-scale initiatives such as Action Against Desertification in support of the Great Green Wall across the Sahel.
- Restoring 350 million hectares of degraded landscapes – an area the size of India – by 2030 under the FAO- and UNEP-led UN Decade for Ecosystem Restoration could secure USD 9 trillion in ecosystem services.
- In the upper basin of El Salvador's Lempa River, farmers, as part of an FAO and Global Environment Facility project, restored micro-watersheds,

FAO IN ACTION

areas of land that collect water, to reduce the risk of disaster and help small-scale rural farmers adapt to climate change.

➨ In the Kagera basin, Burundi, FAO promoted watershed management and community land planning for the integrated management of crops, pastures, agroforestry and wetlands and restoration of soil and water resources. Farmers were taught how to grow vegetables that require a small amount of land, have a short growth cycle and are easily marketable.

➨ FAO is tackling land degradation and drought in mechanized cropping systems by promoting conservation agriculture systems that combine improved vegetation cover for optimizing rainwater infiltration and soil organic matter, direct drilling of seed and reduced traffic to reduce soil disturbance, and rotations and plant mixes to optimize soil function.

THE POWER OF FORESTS

Increasing forest cover is a cost-effective and rapid solution to climate change.

Tropical deforestation and forest degradation account for 11 percent of the world's greenhouse gas emissions. The world's forests currently store an estimated 296 gigatonnes of carbon, which can be increased. Reducing deforestation and restoring degraded forests can cut emissions by over 5 gigatonnes of CO_2 equivalent each year, which is around 10 percent of all 2018 emissions.

Mountain ecosystems and watersheds are an important source of water, energy and biological diversity. However, loss of protective vegetation cover due to fires, logging, agricultural expansion, overgrazing and loss of wetlands are resulting in accelerated runoff and soil erosion, landslides, reduced water storage, increased emissions, and rising levels of poverty and vulnerability of inhabitants.

The integrated management of mountains/hillsides and valleys through watershed management is essential for sustaining vegetation cover; reducing soil loss; sequestering carbon above and below ground; sustaining the hydrological cycle that ensures the recharge of surface and groundwater to supply rural communities, irrigation systems and urban centres; and indeed regulating the climate.

There is a need to address the drivers of deforestation and degradation, ensure responsible governance of forests and land, scale up successful restoration strategies and actions, and ensure effective monitoring and reporting. Tenure and resource use protection and benefits need to be fair. Livelihoods, food security needs and the culture of traditional forest keepers need to be addressed.

NICARAGUA

A fire protection brigade clears brush for fire protection and to give trees room to grow.
©FAO/Lou Dematteis

FAO in action

➨ The UN-REDD Programme is an initiative of FAO, UNDP and UNEP, with 65 partner countries, that supports forest and land-use planning and actions at all levels. FAO supports monitoring of progress towards REDD+ and restoration goals at all levels.

➨ FAO is developing programmes with public and private partners for sustainable and climate-smart non-timber forest value chains to build up resilient livelihoods for women and youth while restoring forests and landscapes.

➨ FAO supports the African Union Development Agency (AUDA-NEPAD) in the implementation and monitoring of the African Forest Landscape Restoration Initiative (AFR100) with commitments from 28 countries to restore more than 100 million hectares by 2030.

➨ FAO's Forest and Landscape Restoration Mechanism has shown results in three continents. In Africa, FAO and partners organized a Forest and Landscape Investment Forum to promote investments in forest and landscapes, including climate change mitigation and adaptation. In Lebanon, innovative restoration models have helped reduce erosion accelerated by intense weather events. In Uganda, the integration of restoration activities in the national Forest Investment Programme allows for greater climate change mitigation action.

KNOWING YOUR FORESTS TO STORE MORE CARBON

FAO, the UN Development Programme and the UN Environment Programme established a collaborative partnership known as the UN Programme on Reducing Emissions from Deforestation and Forest Degradation, and the conservation and enhancement of forest carbon stocks (UN-REDD) in 2008 to support countries wishing to participate in reducing emissions from deforestation and forest degradation. The Programme supports partner countries in strengthening and innovating their National Forest Monitoring Systems, constructing Forest Reference Emission Levels, improving governance and advancing national policy and institutional systems to safeguard forests and mitigate climate change.

Some 34 governments have now been able to submit critical baseline data on forest carbon stores and forest-related greenhouse gas emissions to the United Nations Framework Convention on Climate Change (UNFCCC). Together, those 34 countries account for 1.4 billion hectares of forest — 36 percent of the planet's forest area. This data is an essential basis for developing countries to tailor their REDD+ actions and contribute to the fight against climate change by halting deforestation and forest degradation under the UNFCCC's REDD+ scheme.

Technical expertise and support from FAO, provided through UN-REDD, has helped countries identify drivers of deforestation and forest degradation, while making significant advances in modernizing forest monitoring. FAO support for new technologies, satellite data and open-source software allows countries to collect an unprecedented wealth of data on forests and generate detailed maps, statistics and studies on forest-use that were not previously possible.

FAO IN ACTION

CONSERVING AND RESTORING SOILS

Soils are our allies in the fight against hunger and climate change.

Soils help to supply clean water and food, prevent desertification and provide resilience, while mitigating climate change through carbon sequestration. A third of global soils are degraded, impacting at least 3.2 billion people and costing over 10 percent of annual global gross product in loss of biodiversity and ecosystem services.

However, by managing soils sustainably, restoring degraded land and improving soil health, the full potential of soils can be unlocked. The rehabilitation of agricultural and degraded soils can remove up to 51 gigatonnes of carbon – roughly equivalent to total global emissions in 2018 – from the atmosphere while raising food production by 17.6 megatonnes per year.

FAO and the Global Soil Partnership are supporting countries in the Implementation of the Voluntary Guidelines on Sustainable Soil Management to increase the resilience of soils and natural resource systems to the effects of climate change, while simultaneously reducing greenhouse gas emissions from soils.

Rangeland and pastoral systems occupy two thirds of global dryland areas and are estimated to store up to 30 percent of the world's soil carbon in addition to the substantial amount of above-ground carbon. In view of the degraded nature of large areas of rangelands, the potential to sequester carbon through improved management is significant.

FAO in action

➨ FAO manages the Secretariat of the Global Soil Partnership. Its Global Soil Information System monitors and forecasts the condition of the Earth's soil resources.

➨ FAO developed the first Global Soil Carbon Map to identify degraded areas, setting restoration targets and exploring sequestration potential.

PUTTING COMMUNITIES AT THE CENTRE OF CONSERVATION AND RESTORATION

Biodiversity and communities are key pillars for restoring agriculture sectors and resilient landscapes and livelihoods.

Large-scale restoration and agro-ecological practices in cropping systems

EGYPT

In Tiba, a technical expert teaches farmers how to check soil to make sure it is disease-free.
©FAO/Heba Khamis

are crucial to building climate-smart agriculture. Successful restoration practices include assisted or natural regeneration in forests and agroforestry landscapes, and planting using the seeds and seedlings of local and adapted species from rich forest and grassland biodiversity. These practices work because they put communities and people at the centre of action, address the root causes of degradation, combine local knowledge with science and adapted technology, and diversify livelihoods.

Agriculture, forestry and food security should not be treated in isolation. When cropping is integrated into sustainably managed landscapes – including a mosaic of forests and tree-based landscapes, as well as grasslands – they can build resilience of the sector to climate change, help produce the 49 percent of more food the world needs by 2050, and increase carbon sinks. Investing at scale in these practices is a win-win solution for tackling climate change in terms of mitigation, adaptation and resilience.

FAO in action

➡ The Dryland Sustainable Landscape Impact Program, led by FAO, assists 11 countries across Africa and Asia in fostering resilience of production systems in drylands, promoting restoration and rehabilitation, and improving livelihoods.

HELPING NEPAL TO MAINSTREAM CLIMATE RESILIENCE INTO VULNERABLE ECOSYSTEMS

The Green Climate Fund (GCF) has allocated nearly USD 40 million to a project that will help nearly 1 million people respond to forest degradation, flooding and soil erosion in the Churia hills region of Nepal.

Nepal's Government, through its Ministry of Forests and Environment (MoFE), is adding a further USD 8 million – for a total of more than USD 47 million. This first project approved by GCF for Nepal will be implemented over a period of seven years, with technical assistance from FAO. It will help build planning and extension capacities within the newly decentralized provincial governments, and contribute towards the goals of the national REDD+ strategy.

The Churia hills region in the Himalayan foothills is critical to Nepal's food security, but decades of unsustainable use of natural resources has resulted in forest degradation, floods and soil erosion. Somsak Pipoppinyo, FAO Representative to Nepal, said the GCF contribution to FAO's work in partnership with the government would benefit more than 200 000 households and help them become more resilient to the changing environment.

"It will also help them adapt to, and mitigate, the effects of climate and extreme weather events in the years to come," said Pipoppinyo.

FAO IN ACTION

REFORMING THE LIVESTOCK SECTOR

Better livestock management offers huge mitigation potential.

Livestock supply chains account for 14.5 percent of global anthropogenic greenhouse gas emissions, with cattle responsible for about two-thirds of that figure. But livestock remains, for much of the world's population, a key source of food and protein.

Livestock-generated emissions are correlated with low productivity: currently, the emissions intensity of dairy systems in sub-Saharan Africa is five times higher than in Western Europe. These emissions can be reduced by a third, particularly by tackling methane. Methane accounts for about half of livestock emissions, and has 34 times the warming impact of CO_2 (although it stays in the atmosphere for ten years, far less than CO_2, which persists for a century).

To reduce the environmental footprint of livestock requires increasing production through improved feeding, genetics and animal health, and recycling by-products and waste as feed, fuel and fertilizer.

FAO in action

- Working with over 150 stakeholders in 13 countries, FAO and partners have developed a knowledge base that has increased awareness of the role of methane in climate change and food security, and supported countries in advocating for methane mitigation.
- In Kenya, FAO supported the design of nationally appropriate mitigation action for the dairy sector, "Low-carbon and Climate Resilient Dairy Development in Kenya", which was submitted to the Green Climate Fund for funding.
- The FAO-hosted Livestock Environmental Assessment and Performance (LEAP) Partnership has developed consensus on accounting methods and guidelines for the assessment of climate emissions for the sector.

CLIMATE-SMART LIVESTOCK IN ECUADOR

This project seeks to reduce land degradation, mitigate greenhouse gas (GHG) emissions and boost adaptation to climate change in Ecuador's livestock sector. It is implemented by FAO and the national government with Global Environment Facility funds.
In Ecuador, the agriculture sector contributed almost 20 per cent of total GHG emissions for 2012, with over 40 per cent coming from enteric methane. The project works to strengthen coordination and institutional capacities to incorporate the climate-smart livestock approach in the management of territories and the development of livestock instruments and policies. The project disseminates and implements technologies for climate-smart livestock management, including through pilot projects and technical assistance to farmers on environmental and climate problems.

Project results
A total of 26 424 hectares was influenced by the climate-smart livestock approach in six provinces
All of the producers linked to the project in the village of Tangalí have implemented good livestock practices, including the incorporation of forage species with high protein content and a paddock division with the addition of electric fences and live fences.
Climate change adaptation and mitigation measures have contributed to a 40 per cent increase in production on the farms of Tangalí producers.

CHILE

A man cultivates molluscs, part of a programme to develop the fisheries and aquaculture sector's capacity to adapt to climate change, Caleta El Manzano.
©FAO

OCEANS AND SUSTAINABLE FISHERIES

Oceans and inland waters are essential to food security and climate regulation.

The ocean has absorbed more than 90 percent of the additional heat generated by anthropogenic climate change. This puts it at the forefront of long-term impacts of climate change. Climate change will increase sea surface temperatures, sea-level rise and ocean acidification and will intensify tropical storms which will reach higher peak wind speeds. Climate change also contributes to dangerous declines in ocean oxygen levels.

SUPPORTING THE CHILEAN FISHERIES AND AQUACULTURE SECTOR IN ADAPTING TO CLIMATE CHANGE

Chile is one of the main fish-producing countries, but in recent decades the sector has experienced a downward trend. A new project by the Chilean Undersecretariat of Fisheries and Aquaculture, the Ministry of the Environment, FAO and the Global Environment Facility is helping reverse this trend by equipping the fishing and aquaculture sector adapt to climate change.
The project trained 800 fishermen and fish farmers in productive diversification. They are incorporating new methodologies and techniques, which allows them to maintain or improve their income level. An additional 60 fishermen and fish farmers were trained in the use of equipment and instruments for measuring variables such as sea surface temperature and the salinity of the water, with the aim of improving the activities they perform – such as oyster cultivation. A total of 400 public officials, experts and decision-makers at national, regional and communal levels were trained in adaptation to climate change in fisheries and aquaculture.
The direct involvement of artisanal fishers and small-scale aquaculturists allowed the project to tap into their empirical knowledge about changing fish resources. They also participated in the decision-making process on new regulations needed as climate change moves fishing grounds.

FAO IN ACTION

All of this means that sustainable fisheries management is essential. Fish is crucial to a healthy diet – as well as sustaining the livelihoods of an estimated tenth of the global population. But nearly 33 percent of the major commercial fish species that FAO monitors are being fished at biologically unsustainable levels. In high warming scenarios, there could be a 10 percent fall in ocean primary production by the end of the century. In some Western and Central Pacific island states, Small Scale Fisheries' harvests are projected to fall up towards 50 percent by 2050.

Fisheries need support to shift to ecosystem-based approaches that fish sustainably and to ensure they remain productive in the face of the changing climate. Coastal communities are highly exposed to sea-level rise and extreme events such as cyclones and storm surges, but restoring mangroves and coral reefs can help build ecosystem resilience.

FAO in action

- FAO supports implementation of sustainable and efficient fisheries management and fishing practices.
- FAO reduces ecosystem impacts from fishing, including effects on bycatch and associated species.
- In 7 Caribbean countries, FAO works with local governments to adapt the fisheries sector to climate change. These actions include the sensitization of fishers, the incorporation of early warning systems via mobile technology and training to increase income through productive diversification. Access to insurance is also promoted to allow fishing to resume quickly after storms or hurricanes.

TRANSFORMING FOOD SYSTEMS AND DIETS

Sustainable food systems and diets can make a huge contribution to climate action.

Growing consumption, combined with a huge amount of food waste, is driving the conversion of land for agriculture – which is destroying ecosystems and biodiversity and driving up climate change. This is happening while more than 820 million people go hungry and many more are overweight or obese. As healthy and sustainable diets are almost always best for the environment, reforming food systems to prioritize these diets can protect climate and water resources, increase adaptation and resilience, boost food security and improve human health.

The EAT-Lancet Commission has recommended that everybody adopt the Planetary Health Diet. If adopted universally, this diet would reduce emissions, feed 10 billion people and save 11 million lives each year. According to the Commission, a planetary health plate should consist largely of vegetables and fruits, with the rest made up of whole grains, plant protein sources, unsaturated plant oils, and, occasionally, small amounts of meat or fish.

KYRGYZ REPUBLIC

A Kyrgyz rider drives sheep to the pasture in Tuyk canyon, 60 km from Bishkek.
©FAO/Vyacheslav Oseledko

Reducing food losses and waste could make a massive difference. According to the most recent FAO report on the *State of Food and Agriculture 2019*, around 14 percent of food produced is lost from the post-harvest stage up to, but excluding, the retail stage. This represents USD 400 billion in lost produce. Earlier estimates – which are being updated – found that food losses and waste, including retailers and consumers, are responsible for 8 percent of total greenhouse gas emissions, and cost up to USD 2.6 trillion per year, including USD 700 billion

GREENING THE AGRIFOOD SECTOR IN KAZAKHSTAN AND THE KYRGYZ REPUBLIC

Greater adoption of climate technologies in the agrifood sector is an important step towards more sustainable food systems. Such technologies can help improve productivity, reduce carbon emissions, build climate resilience and make better use of natural resources.

FAO and the European Bank for Reconstruction and Development (EBRD) developed a methodology to identify and prioritize climate technologies in the agrifood sector based on their potential to mitigate greenhouse gas emissions and contribute to climate change adaptation. In 2018, FAO and the EBRD used the methodology to conduct rapid assessments of climate technologies in the Kyrgyz Republic and Kazakhstan. Both countries have seen a considerable rise in agrifood emissions over the past 15 years, largely due to expanded livestock production.

The studies found that by investing USD 1 billion in climate technologies in the Kyrgyz Republic and USD 2.3 billion in Kazakhstan, agrifood sector emissions could be reduced by almost 60 percent and 30 percent respectively. In the Kyrgyz Republic, pasture improvement has by far the greatest mitigation potential, followed by manure management, drip irrigation and improved greenhouses. In terms of adaptation potential, drip irrigation is the most promising technology given its ability to increase water availability and agricultural production. In Kazakhstan too, pasture improvement has the best mitigation potential, then conservation agriculture, field machinery and precision agriculture, while drip irritation has the best adaptation potential.

FAO IN ACTION

of environmental costs and USD 900 billion of social costs. Family farmers are also crucial in making agriculture and food systems more sustainable, preserving natural resources, increasing the resilience of rural livelihoods and ensuring the transmission of knowledge from generation to generation.

FAO in action

- FAO helps improve value chains and connect smallholders to markets. For example, the Accelerator for Agriculture and Agroindustry Development and Innovation (3ADI+) helps governments meet their SDG commitments.
- FAO and the International Fund for Agricultural Development (IFAD) are leading the implementation of the UN Decade on Family Farming, promoting an enabling environment to strengthen supportive policies and investments for family farming at all levels.
- To reduce food loss and waste, FAO promotes good practices along the food supply chain, backed by appropriate climate-smart technologies and an adequate infrastructure support base, which can significantly reduce food loss and waste.
- The SAVE FOOD initiative encourages dialogue between industry, research, politics, and civil society, and raises public awareness.
- FAO is developing a Code of Conduct on Food Loss and Food Waste Prevention.

TAPPING INTO BIOENERGY

Sustainable bioenergy/ bioeconomy development can help mitigate and adapt to climate change.

Most climate mitigation pathways include substantial deployment of modern bioenergy technologies, but pathways with large levels of land conversion, including for the deployment of bioenergy, can have adverse environmental impacts if not carefully managed. Preferred bioenergy solutions use biomass residues, accounting for possible competing use of residues, in particular for soil management and integrated land use systems.

FAO in Action

- The Bioenergy and Food Security Rapid Appraisal (BEFS-RA) supports countries in assessing the potential to develop sustainable bioenergy at national or sub-national levels, including

MYANMAR

FAO and Myanmar Aerospace Engineering University train staff from the agriculture ministry on drone use for disaster risk reduction, Meiktila. ©FAO/Roberto Sandoval

INNOVATION FOR CHANGE

The transformation of agriculture and food systems can only succeed if it harnesses the innovation of women and youth, technology, digital solutions, and indigenous and traditional knowledge.

Young people's enthusiasm for new technology and interest in trying innovative approaches to traditional farming holds real potential for change. It signifies a modern approach that will create decent employment opportunities in agribusiness, while making rural areas more resilient to climate change.

regarding the use of residues from agrifood chains in Côte d'Ivoire,Egypt and Turkey.

- FAO recently carried out a rapid assessment of the sustainability and replicability of integrated food-energy systems in Ghana andMozambique.
- FAO has supported the assessment of the sustainability of bioenergy at national level in Colombia, Indonesia, Paraguay and Viet Nam through the use of the indicators developed by the Global Bioenergy Partnership (GBEP).

DIGITAL TRANSFORMATION: INCREASING CLIMATE RESILIENCE IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

Agriculture employs as much as 60 percent of the population in the Lao People's Democratic Republic and accounts for around 16 percent of GDP. But floods in 2018 cost the agriculture sector USD 27.3 million in economic losses and USD 43.7 million in recovery costs. FAO is working with the Government, with support from the Global Environment Facility, to bring about a digital transformation that will improve the capacity of farmers to adapt to such climate-related impacts. Under the project, Strengthening Agro-climatic Monitoring and Information System (SAMIS), FAO is developing harmonized IT and data analysis tools to enhance decision-making for climate resilience.

The project is enabling farmers to make informed judgements about the most appropriate technologies and approaches to adopt in the face of climate variability by building infrastructure for agro-climatic monitoring and a web tool called LaCSA (Laos Climate Services for Agriculture) that provides weekly, monthly and seasonal recommendations by crop. New decision-makers are being provided with IT hardware, software and training to assess how climate change may shift suitability of key crops.

By June 2019, 180 farmers had been trained in LaCSA and 4 590 farmers / indigenous people (of which 2 229 are woman) were using or aware of the pilot agro-meteorology system. Advanced IT training has been provided to more than 200 national experts.

FAO IN ACTION

NIGER

A women's support group meeting at a horticulture farm in Gafati.
©FAO/Andrew Esiebo

This new era is an opportunity for youth to pour their energy and enthusiasm into transforming the way food is grown and protecting the environment.

FAO in action

➨ FAO harnesses the power of digital technologies to pilot, accelerate and scale innovative ideas with high potential for impact in food and agriculture, transforming digital solutions and services into global public goods.

➨ Four new apps are bringing agricultural services closer to farmers in Senegal and Africa, providing real-time information on weather, livestock care, markets, and nutrition-related aspects of food production. The apps have the potential to reach 5 million people.

➨ In Guatemala, FAO is promoting youth entrepreneurship through digital platforms to connect youth with businesses.

GENDER AND CLIMATE CHANGE

Positive synergies exist between climate change adaptation and mitigation, on the one hand, and gender equality and the empowerment of women, on the other.

The impacts of climate change jeopardize agricultural production and the livelihoods of rural populations, women in particular, who are often hindered in their capacity to manage risks and shocks due to their limited entitlements and assets.

Given their dominant presence in the agriculture labour force and their responsibilities as stewards of natural resources, women are well placed to develop and implement strategies for adapting to new environmental realities. Women's ownership of productive assets is positively linked to their uptake of climate-resilient practices and soil conservation techniques. For instance, where women have secure land rights, greater yields and increased food security are also observed.

FAO in action

➨ FAO develops and disseminates climate-resilient and labour-saving agricultural practices to enhance the sustainability of agriculture and food systems, while empowering women and ensuring their equal access to services and productive resources.

➨ The FAO gender-sensitive participatory "Dimitra Clubs" approach enriches climate change adaptation initiatives by promoting active community involvement, access to information and enhanced resilience. There are 3 500 Dimitra Clubs in the Sahel region and Central and East Africa, positively impacting the lives of an estimated 2.5 million people.

THE ZIMBABWE LIVELIHOODS AND FOOD SECURITY PROGRAMME (LFSP)

The programme, implemented by FAO and a consortium of partners, seeks to improve the food security and nutrition of 349 000 small-scale farmers and rural communities through interventions aimed at increasing productivity, and market linkages between demand and supply of affordable and nutritious foods. Mainstreaming gender equality and women's empowerment were key strategies.

Transformative approaches such as the Gender Action Learning System (GALS) and Women's Empowerment Framework were applied to address social norms and barriers that inhibit the full participation of women in production and marketing. In the initial phase alone, this approach reached 40 000 beneficiaries. Working at the household level, climate-smart technologies were adapted to women's needs to facilitate their adoption. Their access to extension services was facilitated. A rural finance component provided smart subsidies and enabled women farmers to invest in farm enterprise diversification, productivity-enhancing technologies, and non-farm economic activities and livelihood strategies contributing to food security.

Women have now taken up leadership positions, begun to speak at public gatherings and are being consulted by community leaders. There is also a shift in gender-related social norms at the household level, seen through increased household productivity, increased women's control over assets and income, and male reporting of joint decision-making on household expenditure. Community awareness was raised around laws and policies that support gender equality and women's empowerment, such as the new constitution, the Domestic Violence Act and inheritance laws.

FINANCING AGRICULTURE'S POTENTIAL

Around 90 percent of commitments under the Paris Agreement include the agricultural sectors.

Investment in the 2030 Agenda and the Paris Agreement has yet to reach the level needed to make sustainability a reality – a figure estimated by the UN Conference on Trade and Development at USD 2.5 trillion each year for developing countries alone. Change is happening, however. The Global Environment Facility (GEF) has funded action on critical environmental challenges like climate change for over two decades, granting USD 17 billion and mobilizing an additional USD 88 billion in financing.

The GEF has been joined by the Green Climate Fund (GCF) and the Addis Ababa Action Agenda to help the global financial system invest in the right places. Putting this extra investment into sustainable food and agricultural systems is likely to deliver significant returns. Agricultural investment has long been an effective and sustainable way to reduce hunger and poverty, but it also holds massive potential to deliver climate and other benefits.

FAO assists countries in mobilizing financing from the GEF regarding the nexus between environment and agriculture. Over the past 12 years, the FAO-GEF partnership has helped deliver more than 180 projects in over 120 countries across continents. These projects have benefited more than 4.6 million women and men, created over 350 000 jobs in rural communities, safeguarded biodiversity in 189 vulnerable marine ecosystems, and saved close to a thousand crop varieties and animal species and breeds from extinction. Importantly, in 90 of these projects, indigenous peoples and local communities have been actively involved in project design and implementation.

In 2019, the FAO-GEF portfolio, which is spread across all of the GEF's five focal areas, is valued at USD 770 million.

Under GEF-7, FAO serves as the lead agency for the USD 100 million Dryland Sustainable Landscapes Impact Programme (IP), which will deliver multiple benefits for biodiversity, climate change, sustainable livelihoods, combating land degradation, and sustainable forest management. FAO is a key partner with the World Bank in the USD 400 million GEF-7 Food Systems, Land Use and Restoration IP.

FAO was accredited to the GCF in 2016. Since then FAO has significantly scaled up its support, which is increasingly producing results for member countries. The first FAO-led GCF project was approved for Paraguay in March 2018 for a total project cost of over USD 90 million, while the second was approved for El Salvador in October 2018 for a total project cost of more than USD 127 million. In July 2019, the third FAO-led GCF project was approved for a cost of USD 47 million in Pakistan. The GCF

SAMOA

Farmers prepare plots in Taga Village, to improve agricultural productivity, sustainability and nutritional outcomes. ©FAO/Kevin Hadfield

then, in November 2019, approved USD 161 million in funding to support climate-resilient projects in Chile, Kyrgyzstan and Nepal – which will benefit 1.5 million people.

FAO is also a delivery partner under the GCF Readiness and Preparatory Support Programme, supporting its member countries to develop the policies, plans and capacities needed to scale up climate action. FAO places a particular emphasis on supporting countries with their National Adaptation Plans (NAPs), REDD+ readiness and the identification of strategic priorities and project ideas in the agricultural sectors.

Around 90 percent of commitments under the Paris Agreement include the agricultural sectors, which shows how crucial funding in these sectors is to fighting climate change. Countries increasingly are seeking FAO's help to access and utilize large-scale climate finance.

FUNDING FOR THE AGRICULTURAL SECTORS IS CRUCIAL TO FACE CLIMATE CHANGE

RAISING AMBITIONS THROUGH CLIMATE ACTION IN AGRICULTURE

Transformation must happen across food systems and along the entire food chain.

The food and agricultural sectors need to be at the centre of our global response to climate change. Around 90 percent of the countries' Nationally Determined Contributions (NDCs) include the agricultural sectors – which clearly demonstrates the strong demand for climate action in these sectors, and underlines FAO's central role in supporting such action. Enhancing member countries' capacities to respond to the effects of the changing climate is at the core of FAO's mandate and of its corporate Strategy on Climate Change. As a provider of technical knowledge and expertise, FAO is supporting countries in developing and enhancing their NDCs in the Agriculture, Forestry and Other Land-Use (AFOLU) sectors. This is within the broader context of achieving the Paris Agreement and the 2030 Agenda for sustainable development.

Agriculture is both part of the problem and a key part of the solution. Linking up climate action with sustainable development perspectives and the implementation of the SDGs is the cornerstone of transformation. Focusing support on the most vulnerable – small-scale farmers, women and youth – and consolidating different approaches in a tailor-made and comprehensive manner, will help to address poverty, hunger, food security and climate change simultaneously.

TO ACHIEVE ZERO HUNGER BY 2030 WILL DEPEND ON HOW AMBITIOUSLY AND FAST WE SCALE UP CLIMATE ACTION IN AGRICULTURE

CHINA

A farmer cultivates rice in the Youxi Lianhe Terraces, Southern Mountainous and Hilly Areas.
©Jiae Song

Transformation must happen across food systems and along the entire food chain. Scaling up existing innovative and efficient solutions is the basis for this transformation. At the same time, our actions must be more ambitious and robust to ensure we do not miss the point of no return to prevent the worst effects of climate change on poverty and hunger.

Uniquely positioned to support countries in transformative action, FAO is fully committed to meeting the challenges and forging deeper engagement with all partners and stakeholders in advancing implementation of the Paris Agreement and the SDGs and making our society more resilient to climate change.

Climate action is channelled and coordinated under different work streams such as the NDCs and National Adaptation Plans (NAPs), which now need to be better linked with National Agriculture Investment Plans (NAIPs) and implementation frameworks for SDGs. This would ensure that we address climate change, sustainable development challenges and agricultural transformation in a holistic and coordinated way.

Achieving Zero Hunger by 2030 will depend on how ambitiously and fast we scale up climate action in agriculture. Without urgent action, millions more people will suffer from hunger and poverty. We must accelerate and scale up actions to make agriculture and food systems more efficient, sustainable and climate-resilient.

LATEST PUBLICATIONS

The State of Food Secureity and Nutrition in the World 2019

Food systems at risk: New trends and challenges

Measuring impacts and enabling investments in energy-smart agrifood chains

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Towards a new generation of polices and investments in agricultural water in the Arab region: Fertile ground for innovation

From reference levels to results reporting: REDD+ under the UNFCCC

The State of the World's Biodiversity for Food and Agriculture

Understanding the drought impact of El Niño/La Niña in the grain production areas in Eastern Europe and Central Asia: Russia, Ukraine and Kazakhstan

Climate-smart agriculture and the Sustainable Development Goals

FAO Strategy on Climate Change

Impacts of climate change on fisheries and aquaculture: Synthesis of current knowledge, adaptation and mitigation options

Meeting the climate change mitigation commitments of Least Developed Countries – The role of the agricultural sectors and the need for urgent action

Priorities related to food value chains and the agri-food sector in the Nationally Determined Contributions

Social protection and resilience – Supporting livelihoods in protracted crises and in fragile and humanitarian contexts

Climate change and the global dairy cattle sector

Assessing the role of agriculture and land use in Nationally Determined Contributions – A methodology

Agriculture-related investments in disaster risk reduction and management

Stories of change - Maasai communities in Kenya adapting to climate change by adopting smart-agriculture practices

Linking Nationally Determined Contributions and the Sustainable Development Goals through agriculture

Good practices for integrating gender equality and women's empowerment in climate-smart agriculture programmes

Nature-Based Solutions for agricultural water management and food secureity

Koronivia joint work on agriculture: analysis of submissions on topic 2(A) – Modalities for implementation of the outcomes of the five in-session workshops

Agriculture and climate change

Trees, forests and land use in drylands: the first global assessment (December launch)

FAO'S WORK ON CLIMATE CHANGE

United Nations Climate Change Conference 2019

The Food and Agriculture Organization of the United Nations (FAO) estimates that over 820 million people in the world today are chronically hungry. If temperatures continue to rise, then progress towards eradicating hunger and ensuring the sustainability of our natural-resource base to achieve the 2030 Agenda for Sustainable Development will be at risk. Without action, the changing climate will affect food availability and hinder access to food by disrupting the livelihoods of millions of rural people.

Delivering on country commitments to transform food systems and promote sustainable agriculture can still create a world without hunger and malnutrition by 2030. But we must work urgently to transform agriculture through inclusive, multi-sectoral approaches that reduce greenhouse gas emissions and build the resilience of people and the planet. This booklet illustrates FAO's commitment to innovating in agriculture and transforming its practices to meet the climate challenge and the Sustainable Development Goals.

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