



Food and Agriculture  
Organization of the  
United Nations

SUSTAINABLE  
DEVELOPMENT  
GOALS



working for Zero Hunger

# TRANSFORMING FOOD AND AGRICULTURE TO ACHIEVE THE SDGs

TECHNICAL  
REFERENCE  
DOCUMENT

20 interconnected  
actions to guide  
decision-makers

These guidelines are primarily directed towards decision-makers responsible for integrating the goals and targets of the 2030 Agenda for Sustainable Development into national policies and programmes. They will be of value to public and private actors, including investors, researchers and technical practitioners, involved in the broad area of food and agriculture, and rural development. Complementing FAO's Common Vision for Sustainable Food and Agriculture and its five principles, this publication presents 20 practical and interconnected actions with the aim of transforming food and agriculture and driving achievement across the Sustainable Development Goals (SDGs).

A summary of this technical reference document is available as a separate publication.

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
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# Glossary

AnGR	Animal Genetic Resources	DRRM	Disaster Risk Reduction and Management
ANR	Agriculture and Natural Resources	EMPRES	Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases
AOCC	African Orphan Crop Consortium	EPIC	Economic and Policy Innovations for Climate-Smart Agriculture
APFAMGS	Andhra Pradesh Farmer Managed Groundwater Systems	FAO	Food and Agriculture Organization of the United Nations
AqGR	Aquatic Genetic Resources	FFS	Farmer Field School
BEFS	Bioenergy and Food Security	FGR	Forest Genetic Resources
CAHWs	Community-based Animal Health Workers	FIES	Food Insecurity Experience Scale
CAA	Climate Change Adaption	FIWSNET	Famine Early Warning Systems Network
CAP	Common Agricultural Policy	FIRMS	Fisheries Resources Monitoring System
CFPR	Challenging the Frontiers of Poverty Reduction	FLRM	Forest and Landscape Restoration Mechanism
CFS	Committee on World Food Security	FLW	Food Losses and Wastes
CFS-FFA	CFS Framework for Action for Food Security and Nutrition in Protracted Crises	GASL	Global Agenda for Sustainable Livestock
CIP	Crop Intensification Program	GCF	Green Climate Fund
CLCPRO	Commission for Controlling the Desert Locust in the Western Region	GDP	Gross domestic product
CNFTPA	National Training Centre for Fisheries and Aquaculture Technicians	GEF	Global Environment Facility
CONOSIL	Confederacion National de Organizaciones de Silvicultores	GFIMS	Global Forest Fire Information Management System
CSA	Climate-Smart Agriculture	GHG	Greenhouse Gases
CSO	Civil society organization	GIAHS	Globally Important Agricultural Heritage Systems
DLIS	Desert Locust Information Service	GIEWS	Global Information and Early Warning System
DDR	Disaster Risk Reduction	GreeNTD	Green Negotiated Territorial Development
		HLPE	High Level Panel of Experts on Food Security and Nutrition

IAHBI	Integrated Agriculture and Health Based Interventions	NCCAP	National Climate Change Action Plan
ICA	Integrated Country Approach	NCCRS	National Climate Change Response Strategy
ICRAF	World Agroforestry Centre	NEPAD	New Partnership for Africa's Development
ICT	Information and Communication Technology	NGO	Non-governmental organization
IES	Incentives for Ecosystem Services	NSO	National statistical office
IFAD	International Fund for Agricultural Development	NTFPs	Non-Timber Forest Products
IPPM	Integrated Production and Pest Management	OECD	Organisation for Economic Co-operation and Development
ITPS	Intergovernmental Technical Panel on Soil	OFSP	Other Food Security Program
IWRM	Integrated Water Resources Management	PGR	Plant Genetic Resources
JFFLS	Junior Farmer Field and Life School	PGRFA	Plant Genetic Resources for Food and Agriculture
KORE	Knowledge sharing platform on Resilience	PO	Producer organization
LADA	Land Degradation Assessment in Drylands	PSNP	Productive Safety Nets Program
LEAP	Livestock Environmental Assessment and Performance Partnership	PSS	Pluralistic Service Systems
MAFF	Ministry of Agriculture, Forestry and Fisheries	PtoP	Protection to Production
MAPS	Mainstreaming, Acceleration and Policy Support	RA	Rapid Appraisal
MLS	Multilateral System	R&D	Research and development
NAP	National Adaptation Plan	RAS	Rural advisory services
NAP-Ag Guidelines	Guidelines FOR addressing agriculture, forestry and fisheries in NAPs	REDD+	Reduction of emission from deforestation and forest degradation
NASFAM	National Smallholder Farmers' Association of Malawi	RWEE	Rural Women Economic Empowerment
NBSAP	National Biodiversity Strategies and Action Plans	SDG	Sustainable Development Goals
		SFA	Sustainable Food and Agriculture

SFD	Social Fund for Development	UNFCCC	United Nations Framework Convention on Climate Change
SHARP	Self-evaluation and Holistic Assessment of disaster risk and climate Resilience of farmers and Pastoralists	UNICEF	United Nations Children's Fund
SLM	Sustainable Land Management	UNISFA	United Nations Interim Security Force
SMEs	Small and medium-sized enterprises	USAID	United States Agency for International Development
SOC	Soil Organic Carbon	VGGT	Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security
SOFA	State of Food and Agriculture	WEF	Water, energy and food
SSM	Sustainable Soil Management	WFP	World Food Programme
TAP	Tropical Agriculture Platform	WHO	World Health Organization
UNDAF	United Nations Development Assistance Framework	WUA	Water User Associations
UNDG	United Nations Development Group	YEAP	Youth Employment in Agriculture Programme
UNDP	United Nations Development Programme		
UNEP	United Nations Environment Programme		

# Foreword

In September 2015, world leaders committed to building a better future for humankind. They promised a planet free from the chains of poverty and hunger, liberated from debilitating inequality and discrimination, and founded on sustainable development in all its dimensions – social, economic and environmental. The plan – the 2030 Agenda for Sustainable Development – is brave and ambitious, balancing focus on people and planet, and including 17 Sustainable Development Goals (SDGs) for countries to shape strategies according to their own priorities.

The challenges the world faces today are immense, from drawn out crises and conflicts to the damaging impact of a changing climate to the gross distortion of rising hunger in an age of plenty. These challenges can be overcome but only by breaking with business-as-usual practices and by pursuing truly transformative paths. The increase in the number of undernourished people on the planet to 821 million and the rise in obesity to 1 in 8 of the adult global population, reported in the 2018 edition of the State of Food Insecurity and Nutrition in the World, is proof that we are off course to meeting our global goals by 2030, and underlines just how important it is to commit to action now. The clock is ticking, and it has never been more urgent to harness our collective strengths, to strike ground-breaking partnerships, and to prioritise policies that tackle root causes, integrate sectors and drive change.

The Food and Agriculture Organization (FAO) believes that adopting sustainable food and agriculture approaches can accelerate progress across multiple SDGs. With the aim of contributing to the transformative change necessary to delivering on our promises by 2030, the 20 interconnected actions presented here respond to these many challenges we face and offer policy-makers a

practical guide to Zero Hunger and to broader SDG achievement.

While major improvements in agricultural productivity in recent decades have contributed to satisfying the food demands of a growing global population, that progress has too often come with high social and environmental costs that compromise the future fertility of the planet. The fact that every third person today is malnourished reflects food systems that are out of balance. As agriculture – in the broadest sense – is the world's biggest employer, the shift to sustainability has great potential to revitalize rural landscapes and deliver inclusive economic growth.

This publication underscores the importance of addressing the SDGs in an integrated way, and of knitting the many sectors of agriculture and rural development into a country's broader development programme. Rural investment, strengthened farmers' co-operatives, public-partnerships, accessible policy forums and better coordination across ministries, all with a focus on people, their livelihoods and the environment, are key aspects to delivering the change we need.

FAO is committed to supporting countries as they work towards their development objectives. I hope that this publication will help policy-makers strike the path to achieving Zero Hunger and the 2030 Agenda.



**José Graziano da Silva**  
*Director-General*

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#### Overall leadership:

Maria Helena Semedo and Daniel Gustafson

#### Overall guidance:

Clayton Campanhola

#### Coordination:

Jean-Marc Faurès and Domitille Vallée

#### Editorial team:

Richard Allen, Tina Farmer, Diana Gutierrez,  
Amy Heyman, Sile Obroin

#### Contributors:

Alejandro Acosta, Shukri Ahmed, Festus Akinnifesi, Philippe Ankers, Stephan Baas, Uwe Barg, Edmundo Barrios, Caterina Batello, Lorenzo Giovanni Bellú, Simon Blondeau, Magdalena Blum, Dubravka Bojic, Ruhiza Boroto, Castro Camarada, Lucrezia Caon, Mona Chaya, Laura Ciccariello, Vito Cistulli, Michael Clark, Mariaeleonora Dandrea, Jacqueline Ann Demeranville, Charlotte Dufour, Christopher Emsden, Michael Euler, Marc Fantinet, Suze Filippini, Nicole Franz, Carlos Furche, Claudia Garcia, Juan Garcia Cebolla, Gualbert Gbehounou, Ileana Grandelis, Michael Hage, Matthias Halwart, Thomas Hammond, Maria Hernandez Lagana, Irene Hoffmann, Sanne Holtslag, Wilson Hugo, Marta Iglesias, Susan Kaaria, Kundhavi Kadiresan, Wadzanai Katsande, Domitille Kauffmann, Josef Kienzle, Dorjee Kinlay, Marco Knowles, Nina Koeksalan, Regina Laub, Sue Lautze, Szilvia Lehel, Gregoire Leroy, Phoebe Lewis, Paulo Lourenço Dias Nunes, Juan Lubroth, Qiang Ma, Attaher Maiga, Roman Malec, Vincent Martin, Alberta Mascaretti, Chikelu Mba, Mark McGuire, Marc Moens, Stefano Mondovi, Christiane Monsieur, Eliane Najros, Bernardete Neves, Divine Njie, Ana Ocampo, Hivy Ortiz Chour, Halka Otto, Suzanne Phillips, Lucie Pluschke, Anne-Sophie Poisot, Maryam Rahmanian, Vladimir Rakhmanin, Ewald Rametsteiner, Anna Rappazzo, Stephen Rudgard, Guido Santini, Marussia Scaramella, Beate Scherf, Kenichi Shono, Kasarin Sirisoondhornpaibul, Pasquale Steduto, Henning Steinfeld, Gerard Sylvester, Makiko Taguchi, Maya Takagi, Jordan Treackle, Carlos Vaquero, Ronald Vargas, Chiara Villani, Sylvie Wabbes Candotti, Natalia Winder Rossi, Peter Wobst, Julia Wolf, Xiangjun Yao Yurdi Yasmi.

# Executive summary

**F**ood and agriculture stand today at a crossroads. Looking back, major improvements in agricultural productivity have been recorded over recent decades to satisfy the food demand of a growing global population. But progress has often come with social and environmental costs, including water scarcity, soil degradation, ecosystem stress, biodiversity loss, decreasing fish stocks and forest cover, and high levels of greenhouse gas emissions. The productive potential of our natural resources base has been damaged in many places around the globe, compromising the future fertility of the planet.

Today, 821 million people are hungry, and every third person is malnourished, reflecting a food system out of balance. Distress migration is at levels unprecedented for more than 70 years as the social cohesion and cultural traditions of rural populations are threatened by a combination of limited access to land and resources and rising numbers of crises, conflicts and disasters, many as a consequence of climate change.

Looking ahead, the path to inclusive prosperity is clearly marked by the 2030 Agenda for Sustainable Development. Overcoming the complex challenges that the world faces requires transformative action, embracing the principles of sustainability and tackling the root causes of poverty and hunger to leave no one behind.

As the prime connection between people and the planet, food and agriculture can help achieve multiple Sustainable Development Goals (SDGs). Properly nourished, children can learn, people can lead healthy and productive lives and societies can prosper. By nurturing our land and adopting sustainable agriculture, present and future generations will be able to feed a growing population. Agriculture, covering crops, livestock,

aquaculture, fisheries and forests, is the world's biggest employer, largest economic sector for many countries, while providing the main source of food and income for the extreme poor. Sustainable food and agriculture have great potential to revitalize the rural landscape, deliver inclusive growth to countries and drive positive change right across the 2030 Agenda.

Feeding the 10 billion people projected to live on planet Earth in 2050 must aim to go beyond producing more with less to balancing the focus on quality and diversity, linking productivity to sustainability and addressing the needs of people.

Transforming food and agricultural systems will not happen by itself. Political commitment, significant economy-wide and sectoral change and radical shifts in policies, investments and partnerships are all prerequisites. These policy shifts need to look at the entire food system, with solutions found along the whole value chain.

To be effective, transformative policies and programmes have to be grounded on solid assessments and analyses of trends and drivers that affect present and future food systems. Prominent among these trends are population growth and urbanization, competition for natural resources, climate change, conflicts, crises and natural disasters, food losses and waste and transboundary pests and diseases. A theory of change is needed, where the links between policy objectives and instruments are clearly identified. This requires a good degree of consensus among the stakeholders regarding the issues and ways to address them.

A fundamental premise for delivering sustainable food and agriculture is the creation of an enabling policy environment and the need for

sectoral ministries to change the way they work and coordinate policies across government. The transition to more sustainable agriculture and food systems requires action that builds political alliances and coalitions with actors beyond food and agriculture.

Aligned to FAO's five principles of sustainable food and agriculture, this guide outlines 20 actions, each describing approaches, practices, policies and tools that interlink multiple SDGs, integrate the three dimensions of sustainable development – economic growth, social inclusion and environmental protection – and involve participation and partnerships among different actors. Context-specific but universally relevant, the actions are designed to support countries in selecting and prioritizing resources to accelerate progress. They identify sectoral synergies that can catalyse the achievement of national objectives and deliver results across multiple goals and targets of the 2030 Agenda.

The 20 actions offer countries a thread that knits the many sectors of agriculture and rural development with a country's broader development programme encompassing poverty eradication, job creation, national growth, urban regeneration and natural resource wealth. They are organized in five major areas, in line with the principles of sustainable food and agriculture, defined by FAO:

**1. Increase productivity, employment and value addition in food systems.** National agricultural strategies should promote production systems and technologies that increase output without an adverse effect on natural resources and biodiversity, enhancing farmers' resilience to climate change and input-use efficiency. Food production systems need to respond to fast population growth, change of diets among urban higher incomes, staple food demands from the large number of people facing nutrition insecurity and a natural resources base supporting agriculture under multiple threats. To achieve this will require four areas of action: (1) facilitate access to productive resources, finance and services; (2) connect smallholders to markets; (3) encourage diversification; and

(4) build producers' knowledge and develop their capacities.

## **2. Protect and enhance natural resources.**

Moving towards sustainable models of production in agriculture, forestry and fisheries requires specific attention to the management and sustainable use of the natural resources on which these activities rely, including soil, water, energy and biodiversity. Many opportunities and approaches exist to build greater synergies between enhanced resource conservation, increased productivity and income and improved livelihoods. They need to be explored and applied more systematically. Actions include: (5) enhancing soil health and restoring land; (6) protecting water and managing scarcity; (7) mainstreaming biodiversity and protecting ecosystem functions; and (8) reducing losses, encouraging reuse and recycling, and promoting sustainable consumption.

## **3. Improve livelihoods and foster inclusive economic growth.**

Inclusive growth is about turning economic expansion into broad-based improvements in living standards for all. It is about creating opportunity and improving livelihoods across and within societies. Some of the challenges are the rising income inequality within countries and between nations, which are driving a variety of economic and social ills. Adding to this, the knowledge, power and coordination gaps between actors, gender inequalities, the lack of recognition of small-scale producers and land users' rights and interests, the weak enforcement of existing policies and laws contribute to continued marginalization of smallholders, particularly for rural women. Steps to achieve this include: (9) empowering people and fighting inequalities using a rights-based approach; (10) promoting secure tenure rights for men and women; (11) using social protection tools to enhance productivity and income; and (12) improving nutrition and promoting balanced diets.

## **4. Enhance the resilience of people, communities and ecosystems.**

Resilience is a major factor in agriculture, fisheries and forestry.



Phenomena such as extreme natural hazards and market volatility, in addition to civil strife and political instability, or infectious epidemics, impair the productivity and stability of agriculture. These increase uncertainties and risk for producers. Decisions made under such conditions can have far-reaching consequences for households and communities. Gender-sensitive policies, technologies and practices that build resilience, reduce risk exposure and disaster impacts among producers and across the food chain are key to developing more sustainable food and agriculture.

Actions to mitigate this in agriculture include: (13) preventing and protecting against shocks; (14) preparing for and responding to shocks; (15) addressing and adapting to climate change; and (16) strengthening ecosystem resilience. In forestry, actions include reforestation, afforestation and restoration. They also include control of insects and pathogens, fire management, addressing invasive exotics.

#### 5. Adapt governance to the new challenges.

The economic, ecological and business environments in which all the foregoing changes have to take place require a fundamentally new approach to governance. A key insight of the 2030 Agenda is that objectives, such as ending poverty, making societies more resilient to climate change, and shifting to more environmentally sustainable patterns of production, consumption and growth, cannot be approached through traditional sectoral policies alone, but require holistic, integrated approaches that link action on multiple fronts. The transition to more sustainable agriculture and food systems requires action that focuses not only on promoting effective changes in practice, but also builds political alliances and coalitions with actors beyond food and agriculture.

Actions include: (17) enhancing policy dialogue and coordination; (18) strengthening innovation systems; (19) adapting and improving investments and finance; and (20) strengthening the enabling environment and reforming the institutional framework. While these are not necessarily new, the challenge lies in the need to consider the 20 actions in a more integrated way,

cushion the unavoidable trade-offs that must be considered, and seek to build on the synergies they offer – and which are often overlooked.

Consistent with the 2030 Agenda's call for transformation, many of the approaches presented in this guide cut across sectors and depend on government collaboration and stakeholder dialogue. They require policy-makers to recognize the need to manage trade-offs, and set out concrete measures for better aligning multiple objectives and incentive structures. They encourage both legal frameworks that recognize and secure rights of access for smallholders and local communities, and favourable policies to incentivize private sector engagement in sustainable market activities. Multistakeholder mechanisms and new forms of participatory governance structures will bolster policy ownership while helping to mobilize capacities, information, technologies and access to financial and productive resources.

Unlocking the potential of the private sector is fundamental to progress. Engaging with entrepreneurs and tapping into the know-how of the private sector, including agricultural producer organizations, cooperatives, small and medium-sized enterprises as well as international corporations, is a pre-requisite for implementation of the 2030 Agenda. More than just a source of financing, private sector partnerships promise technology development, knowledge transfer and innovation, job creation and alternative revenue streams.

Mainstreaming sustainable food and agriculture into national development strategies and action plans requires setting up a process and a functioning institutional structure. These, in turn, will develop more integrated programmes and policies, better interlink different goals and targets, monitor progress and identify and address barriers to change will be crucial to enable real transformation, signalling the way forward for sustainable food and agriculture to help countries realize their development objectives. While not intended as a standard, the process described in this document offers decision-makers the elements to forge ahead towards SDG implementation.



# Introduction

## SDGs: A TRANSFORMATIVE AGENDA

In September 2015, over 150 world leaders adopted a globally relevant, transformative agenda for sustainable development, and committed to work together to achieve 17 core goals by 2030 to benefit the generations of today and tomorrow.

New interlinked and indivisible global processes have come into action – the 2030 Sustainable Development Agenda, the Paris Climate Change Agreement and the Addis Ababa Action Agenda. The 2030 Agenda presents a paradigm shift in the world’s vision, approach and ambition for development. It is big, bold and complex. It calls on all nations to make our societies more inclusive, equitable, sustainable and responsive in their approach to development and climate change.

## ADDRESSING MULTIPLE GOALS AND TARGETS

The cornerstone of the 2030 Agenda is moving societies and economies along a sustainable development pathway while “*leaving no one behind*”. Food and agriculture<sup>1</sup> are the essence of the 2030 Agenda (figure 1), and implementing sustainable agriculture is a key driver to achieving many SDG targets. This includes ending poverty and hunger; ensuring sustainable use of natural resources; addressing inequalities; achieving gender equality and women’s empowerment; promoting sustainable production and consumption and healthy diets; reducing and removing the sources of vulnerability to conflict and crisis; mitigating and adapting to climate change; promoting accelerated and inclusive economic development; and building more just and peaceful societies.

The 2030 Agenda offers a comprehensive framework for countries to review their food and agriculture sectors. By putting sustainable food and agriculture at the centre of the SDG process, countries can better address the multiple goals and targets on which they are expected to deliver.



Figure 1: Food and agriculture at the centre of the SDGs  
Source: FAO, 2016

<sup>1</sup> In this publication, agriculture is understood as all activities related to crop and livestock production, forestry, fisheries and aquaculture.

Achieving interdependent targets requires coherent efforts by all stakeholders. Frameworks such as the Development Assistance Framework proposed by UNDAF (UNDG, 2017a) help coordinate the visions, strategies and actions of the different components of the society. They are required to exploit synergies and address trade-offs among different objectives, in view of effectively transforming societies and economies.

Building consensus among stakeholders on how to translate the vision of sustainable development into reality will need to be based on solid assessments and analyses, such as the Common Country Analysis (UNDAF, 2017b), in which cause-effect relationships linking policy instruments with policy objectives are clearly identified.

## TRANSFORMING FOOD AND AGRICULTURE

Agriculture is in a crunch: steady increases in agricultural productivity have not resulted in food and nutrition security for all. Amid great plenty, roughly 821 million people continue to suffer from hunger (FAO *et al.* 2018). Paradoxically, the majority of poor and undernourished communities live in rural areas and most rely directly, or indirectly, on agriculture for their livelihoods. They face a number of constraints that trap them into a vicious cycle of poverty and food insecurity.

Natural disasters and crises are also on the rise. About 60 percent of the world's hungry live in countries affected by conflict (FAO, 2017b), and the volatility of food prices also contributes to food emergencies. In an ever-expanding global food system<sup>2</sup>, tensions between national and international actors are likely to increase further. Emerging and reappearing infectious diseases of animals, crop diseases and pests are also on the rise, with some of these pathogens affecting public health directly, most of them curbing production efficiencies and taking a toll on food security.

Food production will still need to be boosted in many countries to keep pace with a growing population. Achieving higher levels of food and fuel production from a depleted natural

environment, without threatening it further, will require profound changes in agriculture and food systems. Practices need to become more resilient to increasing climate variability and change. Future improvements in agriculture and food systems will continue to rely on enhanced efficiency – producing more with less – but greater emphasis will be needed on the social and environmental dimensions of sustainability.

Taking action within agriculture and food systems requires a solid understanding of the trends and drivers that affect present and future food production, the livelihoods of the rural poor and the management of natural resources. They include: population growth, competition for natural resources, climate change, transboundary pests and diseases, conflicts, crises and natural disasters and food losses and waste (FAO, 2017a).

Moving food and agricultural systems along a sustainable pathway will not happen by itself. It requires long-term political commitment and significant economy-wide and sectoral change. Radical shifts in policies, investments and partnerships, and the capacity to scale up innovations, are a must. Investment in agriculture and rural development will need to increase in quality, quantity and diversity, if they are to deliver on inclusive economic growth, new employment opportunities, climate change mitigation, the sustainable use of natural resources, healthy diets, strengthening resilience and, ultimately, on ending hunger and extreme poverty.

There needs to be a careful review of the policies that impact food and agriculture, either directly or indirectly. Policy *shifts* will be needed in order to unlock the potential of producers, in particular family farmers, and provide them with opportunities to adopt more sustainable approaches that will in turn spur local and national economies. While these policies vary from one place to the next, they will

<sup>2</sup> A food system encompasses ecosystems and all activities required for the production, processing, transportation and consumption of food, including inputs needed and outputs generated by each of these activities. Within this system, value chains are composed of the full range of farms, enterprises and their value-adding activities, which produce agricultural raw materials and transform them into food products sold to final consumers and disposed of after use (FAO, 2014a).

typically concern sustainable production technologies, trade, marketing, labour, tenure regulations, decentralization and urban and rural development. Subsidies and cross-sectoral coordination mechanisms will play a key role in the process.

To intervene effectively, there is a need to look at the entire food system, from production to consumption and waste management, making these systems more efficient and inclusive, and thus reducing losses and waste. Solutions can be found along the entire value chain, and producers themselves can play an important role in providing better and healthier dietary opportunities to consumers, while the latter have an important role to play by adopting more sustainable consumption behaviours.

### BOX 1: AGROECOLOGY IN SUPPORT TO MORE SUSTAINABLE FOOD AND AGRICULTURAL PRACTICES

Approaches like agroecology can help countries achieve greater integration. By optimizing biological synergies that integrate crops, trees, livestock and fisheries and aquaculture, farmers that use agroecological practices will enhance ecological functions. This, in turn, will lead to greater resource-use efficiency and resilience. By managing ecosystem services that are frequently mobilized at the landscape scale, agroecology enhances territorial development. Over 30 countries have already developed public policies that support agroecology, promoting integrated sectoral approaches at the national level. These policies are essential to scaling up agroecology and have already done so in a number of countries. Policies for agroecology often include mechanisms for inter-ministerial cooperation in support of an integrated approach, innovative governance arrangements that involve family farmers and other food system actors in policy deliberations, and territorial approaches in support of context-specific and integrated solutions. Producer organizations that work with agroecology are increasingly organizing cross-sectoral alliances among farmers, pastoralists, fisherfolk, indigenous peoples, as well as with consumer organizations. Researchers in agroecology are at the forefront of developing the trans-disciplinary knowledge necessary to respond to the call for integration posed by the SDGs.

Source: Mendez et al. 2013; Wezel et al. 2015.

## A FOCUS ON SMALL-SCALE FOOD PRODUCERS AND FAMILY FARMERS

A series of FAO studies has shown that hunger and poverty can only be defeated through approaches that go beyond “business as usual” and by promoting sustainable agriculture. Fundamental to this transformation will be a genuine move towards more equitable income distribution both within and between countries, including more equitable access to assets for poor family farmers.

Agriculture is the prime entry point for any strategy aimed at reducing poverty, generating income, creating employment and boosting resilience to shocks. Rural areas are home to three-quarters of the world’s extreme poor whose livelihoods largely depend on agriculture. Representing more than 500 million – or almost 88 percent – of a total 570 million farms globally, family farming is the predominant mode of agricultural production in the world. Worldwide, 475 million smallholdings of up to two hectares account for more than 80 percent of all farms, but they cover only about 12 percent of the world’s farmland.

Most small-scale food producers, including herders, pastoralists and fishers, are poor. Inequalities are still pervasive between economic classes, rural and urban areas, regions, ethnic groups and gender. More than 70 percent of all child labour worldwide is in agriculture, corresponding to about 108 million girls and boys (FAO, 2011a). Three quarters of the world’s extreme poor live in rural areas, and the livelihoods of most of the population depend on agriculture, in particular small-scale farming of crop and livestock production, but also tree products, forestry, fisheries and aquaculture.

Approximately 120 million full-time and part-time workers are directly dependent on commercial capture fisheries value chains for their livelihoods. Ninety-seven percent (116 million) of these people live in developing countries. Among them, more than 90 percent (including almost 32 million fishers) work in the small-scale fisheries subsector (World Bank, 2012).

Actions that target smallholder<sup>3</sup> producers and family farmers can play a fundamental role in enhancing rural livelihoods, spurring entrepreneurial activity, job creation, both on- and off-farm, and providing economic opportunities in the areas where people live. Compelling evidence suggests that investing in agriculture – particularly in low-income countries – has a greater impact on reducing poverty than any other investment. Strengthening rural institutions and promoting collective action is critical to supporting the rights, interests and needs of smallholders who can be agents of change in achieving the SDGs.

To meet SDG 1 (no poverty) and SDG 2 (zero hunger) and to contribute to many others, transformational change must penetrate deeper: going beyond strengthening family farmers' access to markets and infrastructure to fostering research and development of quality and affordable sustainable technologies and enhancing financial services for small enterprises. Private initiatives must be encouraged by public investments that are geared to creating inclusive development. Targeted interventions that aim at increasing opportunities for poor and marginalized groups include designing and implementing social protection programmes to provide income to poor people, increase their saving-investment potential and enhance their material and immaterial asset-base (FAO, 2015).

## INVESTING IN RURAL LANDSCAPES

The future of food and agriculture lies in greater networks between small urban centres and surrounding rural areas, offering more, stable and diverse livelihood opportunities to populations, especially to youth. Building up and sustaining these networks will require a coordinated territorial approach that brings together different development stakeholders, facilitates integrated production systems and promotes the management of natural resources that underpin sustainable development<sup>4</sup>.

Creating economy-wide income-earning opportunities for those people remaining in agriculture as well as marginal farmers likely to leave the sector must be a fundamental part of any coherent strategy to lift people out of hunger and poverty. These strategies include setting up institutions and governance mechanisms

<sup>3</sup> Smallholders, including those that are family farmers – women and men – embrace those that are small-scale producers and processors, pastoralists, artisans, fishers, community closely dependent on forests, indigenous people and agricultural workers (CFS, 2016).

<sup>4</sup> FAO 2017b. The State of Food and Agriculture – leveraging food systems for inclusive rural transformations. FAO, Rome.

### BOX 2: THE CENTRAL ROLE OF FAMILY FARMING

Family farmers are usually well adapted to local ecologies, understand land capabilities and sustain the productivity of their resources (land, water, biodiversity) through capable techniques that are able to combine local knowledge with modern technology. If supported by an enabling policy environment, family farming has the capacity to cope with current and future challenges related to sustainable agriculture in its different dimensions, thus representing a key element for the development of sustainable food systems.

A coherent strategy aimed at strengthening family farming goes beyond agricultural policies. It includes the implementation of territorial development strategies to be tailored in accordance with local realities and strives to ensure that the rights and interests of family farming are recognized and strengthened in agricultural governance, planning and investment processes. Public intervention can be an important agent of development, safeguarding rural areas and strengthening the capacity of their economies to create new sources of income and employment in non-agricultural sectors. In this context, the development of effective, inclusive and participatory governance instruments, at local and national levels, are needed to support family farmers as they adapt and innovate to socio-political, market and environmental changes toward more sustainable and resilient livelihoods.

that ensure fair prices for inputs and outputs, particularly in rural areas, equitable fiscal systems and income distribution, universal access to basic services such as education, health, security, justice, transport and communications. This implies implementing territorial development plans, programmes and investment processes that are tailored to local realities to ensure the rights and interests of rural populations are recognized and strengthened. Effective, inclusive and participatory governance instruments at local and national levels are crucial to support rural populations, as they innovate or adapt to socio-political, market and environmental changes.

## WHO SHOULD USE THESE GUIDELINES?

This guide has been written primarily for decision-makers responsible for mainstreaming the implementation of the 2030 Agenda in their policies, interventions and programmes, as well as their advisors, professionals and experts working in the field of agriculture, forestry, fisheries and associated sectors. It is also meant to help guide public and private actors who invest in agriculture and other land-use sectors, including national and international financing institutions, agribusiness and local investors. It will also be of interest to researchers, academics and technical practitioners who play an important role in getting the food and agriculture community to participate in the 2030 Agenda.



# Steps for accelerating the food and agriculture to the

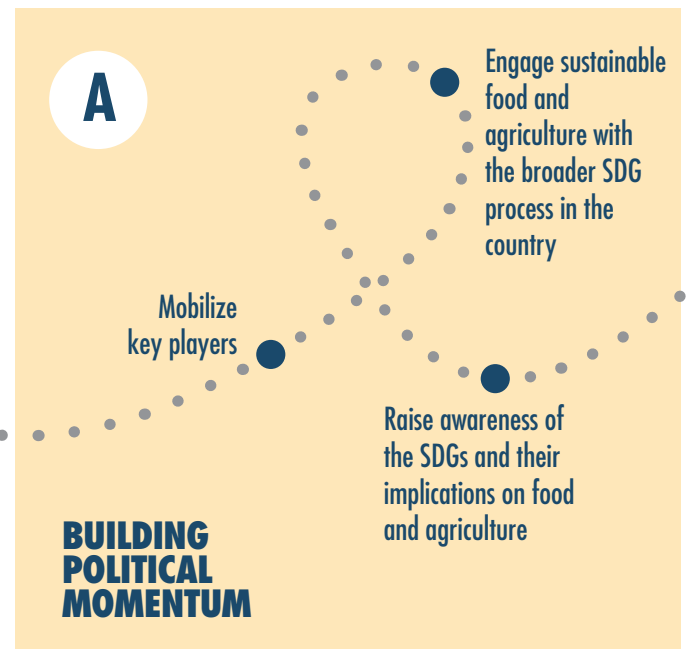
The 2030 Agenda offers a unique opportunity to place food and agriculture high on the national political and policy agenda, generate consensus on priorities, and build stakeholders' support and attract necessary resources.

The SDGs aspire to transformational change and present countries with a historic opportunity to define new development pathways that are more inclusive, dynamic, sustainable, climate smart and resilient. Each nation is unique and will have to find its own way to take advantage of this opportunity. While there are many ways of "domesticating" the 2030 Agenda and positioning food and agriculture in the national plan for sustainable development, the selected approach needs to be carefully consulted, strategized, supported and resourced.

There is no standard formula for getting the process right. It is a continuous, iterative and adaptive process of learning by doing to be undertaken in partnership with key players and stakeholders. There must be a functioning institutional structure to coordinate and support this effort, able to mobilize the expertise and capacities needed to sustain the process over time, ensure its implementation in practice, capture and analyse data for impact analysis, disseminate lessons learned, and identify next steps – while ensuring that no one is left behind.

This section proposes a set of steps, or building blocks, that could be considered by national policy-makers and other actors engaged in this process at country level. The absence of a linear sequence in the real world of policy-making and implementation has to be recognized. Separating this highly iterative process into these building blocks is just a convenient way of structuring the exposition and entering into action

mode. Annex 4 offers elements of actions to be considered as part of these steps. The document will be updated once experience is gained in adopting these steps at national level. It is therefore a living document that will be updated periodically.



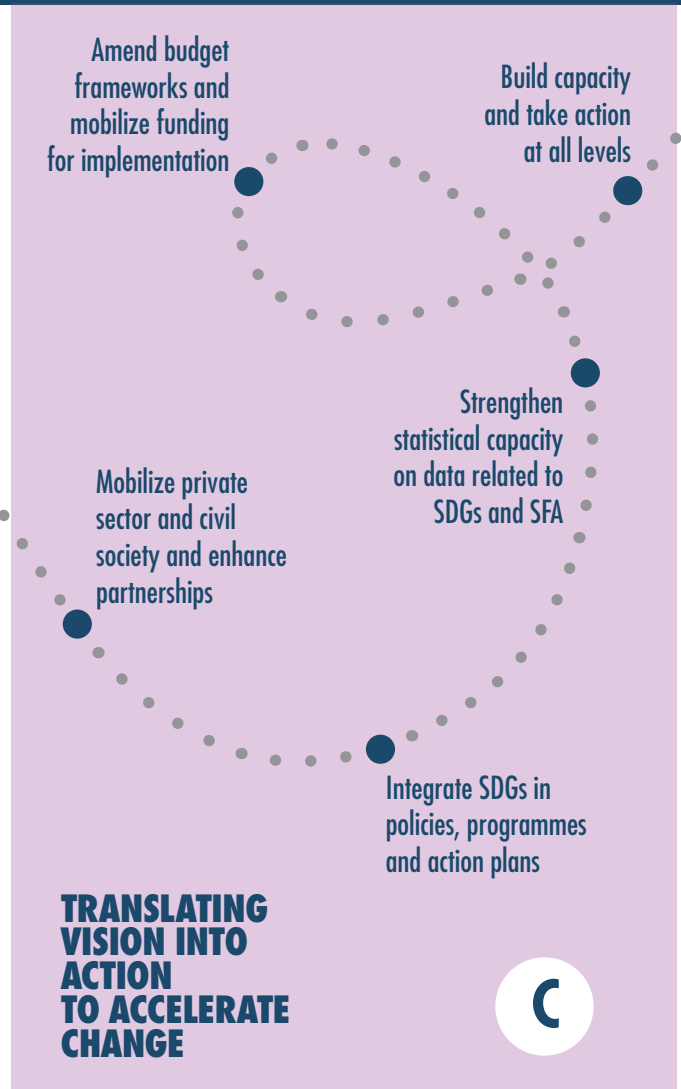
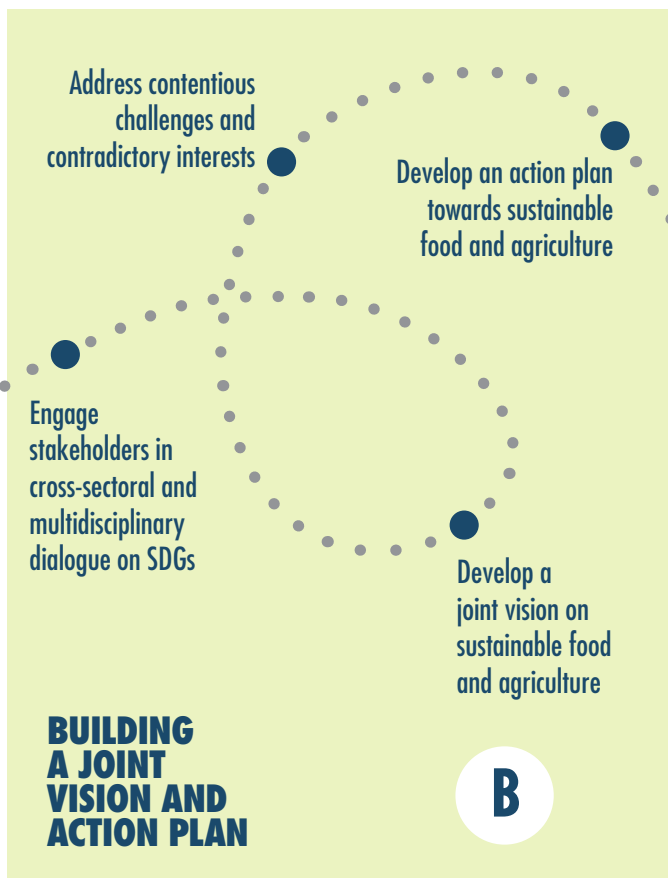
## A - BUILDING POLITICAL MOMENTUM

### 1. MOBILIZE KEY PLAYERS

Success in transforming agriculture will depend on mobilizing support from diverse social actors. The interlinkages of modern agricultural and food production systems make it largely impossible for any single sector or public agency to effectively influence the many actors who ultimately need to change their actions to enable adoption of more sustainable practices. The commonly agreed



# Contribution of sustainable SDGs



targets of the 2030 Agenda and the principles of the Common Vision on Sustainable Food and Agriculture (SFA) offer powerful suggestions for whom to involve and how.

Key players include line government institutions at national and lower levels; civil society actors, including in particular producers' organizations, specific interest groups, cooperatives, etc.; the private sector, including agribusiness representatives; academia and research institutions; in addition to development partners and the media.

A stakeholder analysis will help identify critical issues to be addressed and appropriate groups and institutions to be involved in the consultation process. The stakeholders' view of those initiating, organizing or supporting the process can strongly influence its success. The process should be gender sensitive and include the voices of women and men of all ages, in particular youth. Everyone needs to clearly understand the reason for initiating the process, be aware of its iterative nature and have some sense of why it is worthwhile to invest time and energy in it.

A multidisciplinary task force, composed of representatives of key government departments, and supported by a team of facilitators, is an effective way to initiate the process in a manageable way. The task force should include a limited number of participants who are committed to engaging in a multidisciplinary exercise on SDGs. Typically, they should cover areas such as crop and livestock production, fisheries and aquaculture, forestry, and natural resources management (land and water), in addition to the department of planning, and a representative of the office in charge of SDGs.

What is needed is to start engaging in dialogue “beyond the comfort zone” with potential future partners. Values and beliefs, interests and roles, experiences and expectations of different stakeholders on sustainability aspects in agricultural sectors and related food value chains are hugely diverse. It is, therefore, important to assess the main interests and identify the key parties. The lower the level of experience and interaction between particular groups, the more time and energy is needed to build shared understandings. In such circumstances, informal, *ad hoc* exchanges among subgroups can help build awareness and, eventually, a basis for trust.

## 2. ENGAGE SUSTAINABLE FOOD AND AGRICULTURE WITHIN THE BROADER NATIONAL SDG PROCESS

Countries have engaged in the SDG process in different ways and paces. In many countries, the United Nations Development Group has supported the launch of a nationwide SDG mainstreaming process. The reference guide to mainstreaming the 2030 Agenda for Sustainable Development (MAPS) offers implementation guidance that can serve as a reference in guiding governments and stakeholders in placing the 2030 Agenda at national and lower levels (UNDG, 2017b; UNDG, 2017c). Eight implementation guidance areas for mainstreaming the 2030 Agenda and adapting the SDGs to a national context are described, and tools are offered to help facilitate the process (see Table 1).

Table 1: The eight implementation guidance areas for adapting the SDGs to national contexts (UNDG, 2015)

1	Raising public awareness
2	Applying multistakeholder approaches
3	Adapting SDGs to national, subnational and local contexts
4	Creating horizontal policy coherence (breaking the silos)
5	Creating vertical policy coherence (glocalising the Agenda)
6	Budgeting for the future
7	Monitoring, reporting and accountability
8	Assessing risks and fostering adaptability

As indicated above, the sustainable food and agriculture domain offers a unique opportunity to accelerate the implementation of the SDG agenda as a whole. Yet, in many instances, the relevant ministries are not well equipped, or do not find a way to get engaged in the process in a meaningful manner. Advocating for the role of sustainable food and agriculture in achieving the SDGs, and ensuring its positioning in the national SDG debate is critical.

In some cases, the process of “domestication” of the 2030 Agenda will already have involved important agricultural sector institutions. When this involvement remains at a planning level only, a series of national stage consultations involving key players can help attract attention and identify entry points for engaging sustainable food and agriculture in the SDG process. In any case, it is important that the two processes be well aligned, to ensure that agriculture is part and parcel of the national SDG dialogue. In the countries engaged in a decentralization process, or already decentralized, the process gains momentum when implemented also at the lower level of decision-making.

## 3. RAISE AWARENESS OF THE SDGs AND THEIR IMPLICATIONS FOR FOOD AND AGRICULTURE

Awareness raising implies the development of a communication strategy that is targeted at different audiences. It is worthwhile considering a media campaign that involves the press, television, social media, Internet and sensitises different social actors

about the role of sustainable food and agriculture in national development agenda.

The process can start with one or a few initiators who raise awareness about an issue and build support for action among a wider coalition of stakeholders. The initiating actor can be a ministry in charge of agriculture together with ministries of planning, finance, rural development, health, labour, environment, or even foreign affairs (which often have lead responsibility for national implementation of the 2030 Agenda). Other stakeholders – both from government (transport, trade, social affairs, health and education) and outside (producers' organizations, civil society, private sector and academia) – need to be involved both for legitimacy and for outreach. United Nations country teams, international financial institutions and development partners can contribute with technical and managerial expertise and may provide critical financial support.

National level workshops are an effective way to bring together stakeholders, raise awareness on the link between sustainable food and agriculture and the broader SDG agenda and initiate a process towards better integration in the national development agenda.

## B - BUILDING A JOINT VISION AND ACTION PLAN ON SUSTAINABLE FOOD AND AGRICULTURE

A good way to spark engagement is to look at the ambitions of stakeholders – where they would like to be in future – and build a common, long-term vision to pursue. Rather than maintaining different actors on their positions, the construction of a joint vision forces them to look beyond their immediate interests and towards broader goals. Building a joint vision implies active and sincere engagement of stakeholders in a dialogue, using the SDGs as an entry point and exploring areas for transformative change.

Critical to the success of a joint vision and action plan will be the fact that stakeholders share a common view of the situation and of the issues at

stake and challenges to address. Evidence, both science-based and practical, needs to be internalized by the relevant stakeholders who consider it as credible (Campanhola and Pandey, 2018). A solid situation analysis, taking stock of all available knowledge, but presented in a synthetic way, will need to be established and serve as a basis for the stakeholder dialogue, joint vision and development of action plan.

### 4. ENGAGE STAKEHOLDERS IN CROSS-SECTORAL AND MULTIDISCIPLINARY DIALOGUE ON SDGs

Moving towards sustainable food, agriculture, fisheries and forestry requires putting in place a multistakeholder and cross-sectoral coalition, or partnership, to lead the process. Engaging in a dialogue with stakeholders is necessarily an iterative and ongoing process, and this is more so the larger the stakes involved. Dialogue on some issues or dimensions of sustainability is daily business for most stakeholders, from local to national levels. What is different in addressing the 2030 Agenda is that the higher level of ambition requires open-ended discussions between different sectors.

Entry points for a substantive dialogue on SDGs through SFA are many and include existing formal structures and processes at national level related to SDGs implementation, agricultural or rural development policies, poverty reduction or resilience strategies, programmes or action plans. Other useful entry points are similar subnational planning processes, including at municipal level, or revisions of relevant legislative frameworks or investment programmes. Entry points can also be more ad hoc technical round-table discussions on topics that span traditional sectoral boundaries. Selection of points of entry should be influenced by an estimate of the potential offered for engaging on an issue of high political salience, ideally significant at the national level.

Balancing participation of key players is critical. Those who have a legitimate stake and interest in the specific areas addressed need to be meaningfully involved. This includes representatives of those that impact and those that are affected, including the voices from relevant producers or business

groups. Special attention should be put on groups such as women and youth, as well as indigenous or ethnic minorities, who often belong to the most vulnerable and marginalized groups, who often are among the most affected, and whose perspectives are the least understood. It is also useful to involve “the missing middle”: those that operationally implement and execute rules and action plans such as staff from local or district public agencies. Also, some significant dimensions of economically, environmentally and socially sustainable agriculture and food systems often lack an adequately organized voice in the process. This is a role that civil society and producers’ organizations – to the extent they exist – aim to fill. As sustainability is about the future, the next generation’s interests need to be sufficiently represented too.

The difficulties in engaging different stakeholders in this dialogue should not be underestimated. A strong coordination mechanism, supported by a well-established and well-facilitated platform and a set of communication streams, will be needed all along the process. It will take time for actors with different intellectual experiences, cultures, viewpoints, and interest to progressively learn to listen to each other and seek convergences towards common goals. Such a process is often seen as one of the main bottlenecks requiring substantial efforts and resources, and needs to be supported and acknowledged at the highest possible political level. The Gambian Agriculture and Natural Resources (ANR) Platform illustrates the importance of carefully designed facilitative processes (Box 3).



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### BOX 3: BRINGING NON-GOVERNMENTAL STAKEHOLDERS INTO AGRICULTURE-NATURAL RESOURCES COORDINATION, ANR PLATFORM IN GAMBIA

Representation on the Working Group to implement the Gambian Agriculture and Natural Resources Policy was not inclusive. This was considered problematic as multiple actors and sectors are needed to address ANR issues. The Working Group was enhanced into a more inclusive platform which now has a range of government representatives from agriculture and natural resources sectors as well as private, civil society and intergovernmental organization actors.

The purpose of the platform convened by the National Environment Agency is to advance inclusive and cross-sectoral decision-making and outcomes that ensure sustainable agriculture and natural resource production systems that contribute to the well-being of the Gambian people. FAO provided support to strengthen negotiation capacities of the representatives of the Forest and Farm Producer Organizations to enable their full participation in ANR and enhanced ownership. This increased non-governmental actors’ comfort in engaging in policy dialogue. Debates and participatory tools, reference to local knowledge and communication in local language encouraged active participation of all players. These process tools also enhanced the governance and power sharing within the platform. Sustainability of the platform will be ensured through state funding, via sector ministries.

The platform was able to reach the following objectives: advance cross-sectoral decision-making and outcomes related to ANR; ensure the inputs and perspective from diverse actors in problem solving and decision-making related to ANR; shift ways of working and decision-making on ANR issues, and enhance the sustainability of cross-sectoral collaboration and decision-making through the diversification of funding. The work initiated in 2013 is still ongoing. (FAO and ICRAF, 2017).

## 5. DEVELOP A JOINT VISION ON SUSTAINABLE FOOD AND AGRICULTURE

The foundation for change is established if significant stakeholders can agree on a common vision (e.g. on achieving key SDG targets) and some principles (e.g. the five principles of SFA), reflecting shared values and beliefs. This should include shared principles of conduct (e.g. common but differentiated responsibilities of public and private partners). It also provides guidance on the strategic direction and can be formally adopted in policy or other strategic documents.

The development of the joint vision and the selection of the 2030 Agenda targets defines a country's ambitions for sustainable food and agriculture as part of a broader national development agenda. The 17 SDGs, their 169 targets and their many interactions represent a major challenge that needs to be addressed in a pragmatic way. Screening targets, understanding their relationship to agriculture and identifying limited principal linkages offer a way to focus on a reasonable number of objectives.

The 2030 Agenda requires that its goals and targets be considered as a whole, and that the interactions between them be acknowledged and addressed. In developing a joint vision, stakeholders must consider these interlinkages in order to address their goals in a holistic way. For example, a country or region subject to water scarcity may decide to focus on water use efficiency (SDG target 6.4) as one of its immediate objectives, recognizing that a comprehensive water resource management strategy will consider the balance of the local ecosystem (SDG targets 15.3/15.4), strengthening resilience, raising awareness and building human and institutional capacity for climate change mitigation and adaptation (SDG targets 13.1/13.3), strengthening local industry (SDG target 12.4), and protecting against the impacts of water shortages on poverty, agriculture and employment (SDGs 1/2/8).

While selecting among potential targets, countries are encouraged to develop their own theory of change and results framework, select the most relevant SDGs and targets (and other relevant regional and national targets), and choose national indicators at impact level<sup>5</sup>. This theory of change<sup>6</sup>

will pave the way towards the preparation of an action plan. It will make it possible to identify the pathway towards achievement of the selected SDG targets, and help to develop a comprehensive description on the expected linkages between what the proposed plan will do and how this will lead to achieving the desired goals. It will do this by first starting from the desired goals identified in the vision and then work back from these to identify the conditions that are needed to obtain the objectives.

## 6. ADDRESS CONTENTIOUS CHALLENGES AND CONTRADICTION INTERESTS

The SDG framework offers an opportunity to identify new ways of reframing contentious sustainability challenges. Sustainability issues in countries tend to be fairly well known, but institutional and economic interests are often too entrenched to permit solutions to be adopted that place the burden of change on one or another party. By reframing issues in broader terms, the process helps in building broader coalitions where non-zero sum solutions can be constructed with possible trade-offs.

Understanding and identifying power relations, opposing interests and blocked access to resources and information can contribute to finding suitable entry points for policy dialogue and support. It can also build the basis for negotiation, facilitate and guide partnerships and coalitions of support that can move the process forward. Regular information sharing and a good communication strategy are key to the actors' comfort making known their concerns and interests and opening up to possible options for collaboration, as illustrated in the case of South Sudan (Box 4).

<sup>5</sup> This is the proposal of the Secretary-General's Quadrennial Comprehensive Policy Review-mandated System-Wide Strategy Document to guide the action by United Nation system in support of the 2030 Agenda.

<sup>6</sup> As part of the theory of change, two products can be generated: 1. An outcome map; 2. A list of assumptions about change.

#### BOX 4: COMPETING CLAIMS TO NATURAL RESOURCES IN ABYEI, SOUTH SUDAN

The Abyei Area, as defined in the Permanent Court of Arbitration's Final Award in July 2009, represents the historical tribal land of the nine Ngok Dinka chiefdoms that was transferred to Kordofan in 1905. The area is the dry season, grazing land of the Missiriya tribe, which spends the wet season in the southern parts of Kordofan.

The Comprehensive Peace Agreement signed in 2005 between the National Congress Party and Sudan People's Liberation Movement, granted the Abyei Area a special administrative status and envisaged a referendum to decide on it. Sudan temporarily invaded Abyei in 2011, causing the displacement of the resident Ngok Dinka. Ever since, the parties have failed to establish a joint administration, leading to an indefinite postponement of the referendum and of the prospective future status of the Abyei Area. Meanwhile, a United Nations mission (UNISFA) has been put in charge of supporting the demilitarisation of the area and separate the Misseriya and the Ngok Dinka. Traditional dispute resolution and governance institutions, which broke down during the conflict, represent the institutional memory for more sustainable natural resources management. Engaging concerned stakeholders is difficult because, beyond the mistrust, there are also critical social and power balances that make it complicated to find the right entry point into the issue.

FAO has been engaged in facilitating the dialogue between the two tribes and used the Green Negotiated Territorial Development (GreeNTD) approach (FAO, 2016m) to support the negotiation process. The dialogue focused on access, use and management of natural resources, using animal health interventions (vaccination) as one of the initial trust-building component for the two main groups and facilitate further concerted actions among them. Based on the good relationship thus created with Dinka Ngok local authorities (SAARF), the Dinka Ngok Peace Building Committee identified FAO as a key actor to support their peace dialogue with the Mysseryia pastoralist community before their seasonal migration. In May 2016, a training on animal health and diseases control was carried out in the common market, targeting the Mysseryia Community-based Animal Health Workers (CAHWs). Soon after, 25 drug kits were distributed to the CAHWs and about 53 930 heads of livestock were vaccinated. To make this case sustainable other technical areas are being promoted, related or not with the livestock component.



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Developing sound evidence and using it for mutual understanding of given issues is of paramount importance in the process of identifying joint solutions. In many cases, there is poor or lack of agreement on the issues themselves, and on the possible impact of one or another solution, leading to differences of views on possible outcomes. Developing scientifically sound evidence is important but not sufficient. In many cases, the issues are complex, and science does not always provide the answers. In such cases, it will be necessary to find ways to come to common understandings of these issues and of the possible ways to address them.

## 7. DEVELOP AN ACTION PLAN AND STRATEGY TOWARDS SUSTAINABLE FOOD AND AGRICULTURE

Prioritisation is important in developing an action plan. It can mean sequencing actions in the short or medium term as an entry point, to be followed by cumulative steps toward the broader targeted transformation. The prioritised set of national targets should be linked to specific policies, which are then assessed for their overall coherence.

Identifying priorities does not mean choosing one target at the expense of another; it denotes identifying those areas lagging the most and catalysing resources, awareness and policy actions towards them to stimulate rapid progress.

Scenario-based exercises can be a useful tool to strategize, plan and troubleshoot. Stakeholders will often have different theories of change on an issue in addition to varying interests, and the process should ensure that stakeholders are properly identified and given the opportunity to present their diverse perspectives and ideas. This is particularly important for those stakeholders with weaker capacities and resources who may need special support to make their voices heard. The target-setting process should also include an assessment of existing strategic capacities needed for effective delivery of action to achieve the selected SDG targets in the context of pertinent national plans and sectoral strategies, identifying gaps, risks and possible mitigation measures.

The process can produce recommendations for developing necessary skills and capacities. It will be equally relevant to work on strategies to mobilize adequate public and private resources (finances, expertise and infrastructure) to implement the agreed targets and scenarios.

An important element of the action plan relates to the analysis of existing incentive mechanisms, and their identification is needed for sustainability of cross-sectoral approaches and to address the constraints to changes in practices. Only through such mechanisms can one expect that the world's producers will be placed in a position to contribute to sustainable food and agriculture.

It is important to link the action plan on the integration of SDGs in food and agriculture with the overall action plans and roadmaps that are being developed in countries (mostly under the guidance of the MAPS missions) in order to ensure consistency with the broader SDG nationalization process.

## C - TRANSLATING VISION INTO ACTION TO ACCELERATE CHANGE TOWARDS SUSTAINABLE FOOD AND AGRICULTURE

Making commitments and expressions of future intentions through policies, strategies, programmes and plans of actions are a key step. These commitments need to specify important characteristics of the implementation approach, assigning clear responsibilities in line with authority and capacities, and setting accountability expectations and rules. While government commitments will show the way, they will also be an incentive for other actors to make their own resolution towards the achievement of agreed goals.

Adapting governance arrangements needs persistence and flexibility. Implementing the SDGs in agriculture and food systems is prone to uneven progress and will include setbacks and failures. Different bodies need to experiment and learn from experiences in displacing existing rules, adding or revising specific governance arrangements and

instruments. Implementation pathways might need to be adapted as contexts evolve over time or might change, and direct and indirect effects of actions become evident. Setting up longer-term mechanisms for dialogue among stakeholders and exchange of experiences also helps in maintaining momentum and commitment.

Translating vision and ideas into sustained, strategic action to achieve goals that may be definitively achievable over 10-12 years can be very challenging. Many implementation problems are impossible to foresee, but some can be anticipated. This is why an iterative process between improving and updating the strategy for action and carrying out detailed planning will be needed. This iterative process will also consider multiple levels. Indeed, subnational actions can be a good starting-point to engage into change for the most contentious topics. Ideally, the translation effort could start at the level where territorial development is planned or convergence, intersectoral coordination is used for implementation. The level will vary with countries and with the extent of decentralization. It can be a region, province or district, for instance.

Both governmental and non-governmental stakeholders, acting individually and collectively, should actively contribute and adhere to their roles and responsibilities in the process of implementation. The five pillars of action provided in this document can guide their activity. External actors, United Nations agencies in particular, bringing expertise, technical support and for mobilizing financial resources, will be key. The importance of this collaboration is seen in light of the long-term nature of the 2030 Agenda, which needs to transcend partisan politics and electoral cycles and steer countries to success by 2030.

## 8. MOBILIZE PRIVATE SECTOR AND CIVIL SOCIETY, AND ENHANCE PARTNERSHIPS

The 2030 Agenda calls for the establishment of strong partnerships between government and other social actors (SDG 17). The means of implementation targets under SDG 17 and under each SDG are key to realizing the 2030 Agenda. The SDGs can only be met within the framework

of a revitalized Global Partnership for Sustainable Development, supported by concrete policies and actions as outlined in the Addis Ababa Action Agenda (UNGA, 2015).

While there have been various advocacy and initiatives to identify and disseminate SDGs, in which the public sector plays a leading role, it is often not easy for stakeholders to understand the role of the private sector and civil society in attaining the SDGs.

While it may be relatively easy to understand the economic drivers of the private sector in achieving the SDGs and targets, those related to agriculture, in particular, combine economic with social and environmental dimensions as well. As such, the role of the private sector needs to be clarified. Therefore, raising awareness, mobilizing the private sector and amending regulatory frameworks for funds, in line with the principles of sustainable food and agriculture will be of critical importance. This implies a greater role for the private sector, not only in producing wealth but also in increasingly engaging in the 2030 Agenda in all of its dimensions. This comprises a wide range of private sectors, from multinationals to SMEs, in line with their different roles, capacities and levels of power.

Building awareness and mobilizing non-state actors to contribute meaningfully to the SDGs through sustainable food and agriculture will require stronger capacities of all stakeholders. With this in mind, a dialogue between higher government authorities, producers' organizations, local action groups (both public and private) and the business community should be generated and facilitated during the years of implementation. To be effective, such a combination needs to operate in the context of platform(s) and process(es) that allows them to exchange their views, identify problems and challenges, business questions, to discuss possible solutions, and create an environment to enact integrated action plans.

## 9. INTEGRATE SDGs INTO POLICIES, PROGRAMMES AND ACTION PLANS

The first step towards translating vision into action will be to develop a policy review to assess critical



gaps. Most of the policies and strategies developed at a national level, in particular those developed before 2015, do not consider SDGs. In many cases, even more recent policies remain essentially sectoral and struggle to address SDGs in a more integrated way.

The key priorities identified will then need to be incorporated into sectoral policies and strategies, and operational plans will need to be developed. This effort is needed across scales at sector level. At this stage, it will be important to set up mechanisms to clarify the institutional arrangement for enhanced coordination, mandates, scope and procedures. At a decentralized level, the SDGs will be an opportunity for enhanced cross-sectoral coordination. More systematic adoption of territorial approaches to decentralized planning will help incorporate key priorities for sustainable food and agriculture into local planning levels where implementation occurs and policy measures have an impact.

## 10. AMEND BUDGET FRAMEWORKS AND MOBILIZE FUNDING FOR IMPLEMENTATION

Accelerating progress towards sustainable food and agriculture in support to the SDGs will require a review of public and private funding and budgets that reflect the priorities as they arise from the planning exercise. This is often a delicate exercise, as it implies changes in budget allocations, with subsequent shifts in the distribution of roles, responsibilities, and balance of power between ministerial departments. While accelerating progress towards achieving the SDGs will require radical changes in the way public finance is governed, there will probably be the need to adopt a stepwise approach that helps support the necessary institutional and organizational setup. A starting-point could be through 'thematic financial accounting' to understand whether the levels of expenditures and budgets allocated to achieving SDGs such as water (SDG 6) and land degradation (SDG 15) are commensurate with the needs.

International resource partners also have an opportunity to contribute to progressing towards sustainable food and agriculture by better aligning

their country support with these new priorities. This is why their involvement from the start is important. Some important sources of funding, including the Global Environment Facility, the Green Climate Fund and international and regional development banks can play a strategic role in leading the financial community towards better SDG mainstreaming in agricultural programmes through transformative projects.

## 11. STRENGTHEN CAPACITY AT ALL LEVELS

In many cases, public officials in ministries related to agriculture who in charge of planning have little knowledge of the 2030 Agenda and associated goals, or of their implication in their own work. Awareness raising and capacity development among key policy and planning staff in line ministries is required to help mainstream SDGs in sectoral policies and plans. This effort is needed across scales at the levels where implementation occurs and policy measures have an impact.

Earlier stages of the proposed process have focused on building awareness at a national level, among key national stakeholders and across the public at large. Significant effort must be made in the implementation phase to convey the messages associated with the mainstreaming of the SDGs in sectoral programmes across all agencies, not only at national but also at decentralized levels, including local action groups, to address SFA and the SDGs. At each level, there is a need to define gaps in capacities (functional and financial) – from government to local municipalities, including technical departments. In particular, capacity development and strengthening of governance at the municipal level is key to the success of the process. It is also important to strengthen capacities and SDG knowledge of the private sector, civil society organizations (CSOs), academia and other actors.

Incentive mechanisms should be put in place to foster inter-agency cooperation and coordination, a situation that is rarely observed in countries. Combined incentive packages should also be promoted to support a stepwise process of change.

## 12. STRENGTHEN STATISTICAL CAPACITY ON DATA RELATED TO SDGs AND SFA

For the first time in history, the 2030 Agenda offers a full-results framework that should be able to help track progress towards the 169 SDG targets through 230 indicators. Targets lie at the very heart of the 2030 Agenda, and monitoring progress through the indicators associated with these targets plays an important role in achieving the SDGs. The task of SDG monitoring and reporting has been assigned to the United Nations Statistics Commission at a global level, whereas national statistical offices (NSOs) are expected to play a key coordinating role at national level.

SDG monitoring and reporting represents both a tremendous challenge and an opportunity for NSOs. In many countries, NSOs lack the skills and the financial capacities to measure progress through these new indicators. Adopting relevant SDG indicators will require a major adjustment in the national and agricultural statistical competence. Both capacity development and financial support will be needed for countries to be able to rise up to the challenge. This also includes support to countries in their efforts of preparing their Voluntary

National Reviews (VNRs) or National SDG Progress Reports.

The support that NSOs need is twofold: (1) increasing knowledge among NSOs on the SDGs, and clarifying their role in the process; (2) facilitating their dialogue with the government to go beyond formal consultations and being fully engaged in the process. In many countries, there is a pressing need to strengthen national data, statistical and information systems on data related to SDGs and SFA. This often requires boosting various groups, as the capacity to monitor the achievement of SDG targets often lies in different departments.

The collaboration and linkage between NSOs in charge of coordinating SDG monitoring and line agencies will need to be strengthened. This is important to ensure that the indicators that are being produced are effectively used in policy-making and to ensure that those in charge of implementing the 2030 Agenda have a clear idea of the basis on which progress will be measured. Monitoring progress and achievements, and reporting through established mechanisms will help adapt strategies and financial arrangements according to needs.





## SDGs

### SDG 1

No Poverty

### SDG 2

Zero Hunger

### SDG 3

Good Health and Well-Being

### SDG 4

Quality Education

### SDG 5

Gender Equality

### SDG 6

Clean Water and Sanitation

### SDG 7

Affordable and Clean Energy

### SDG 8

Decent Work and Economic Growth

### SDG 9

Industry, Innovation and Infrastructure

### SDG 10

Reduced Inequalities

### SDG 11

Sustainable Cities and Communities

### SDG 12

Responsible Consumption and Production

### SDG 13

Climate Action

### SDG 14

Life Below Water

### SDG 15

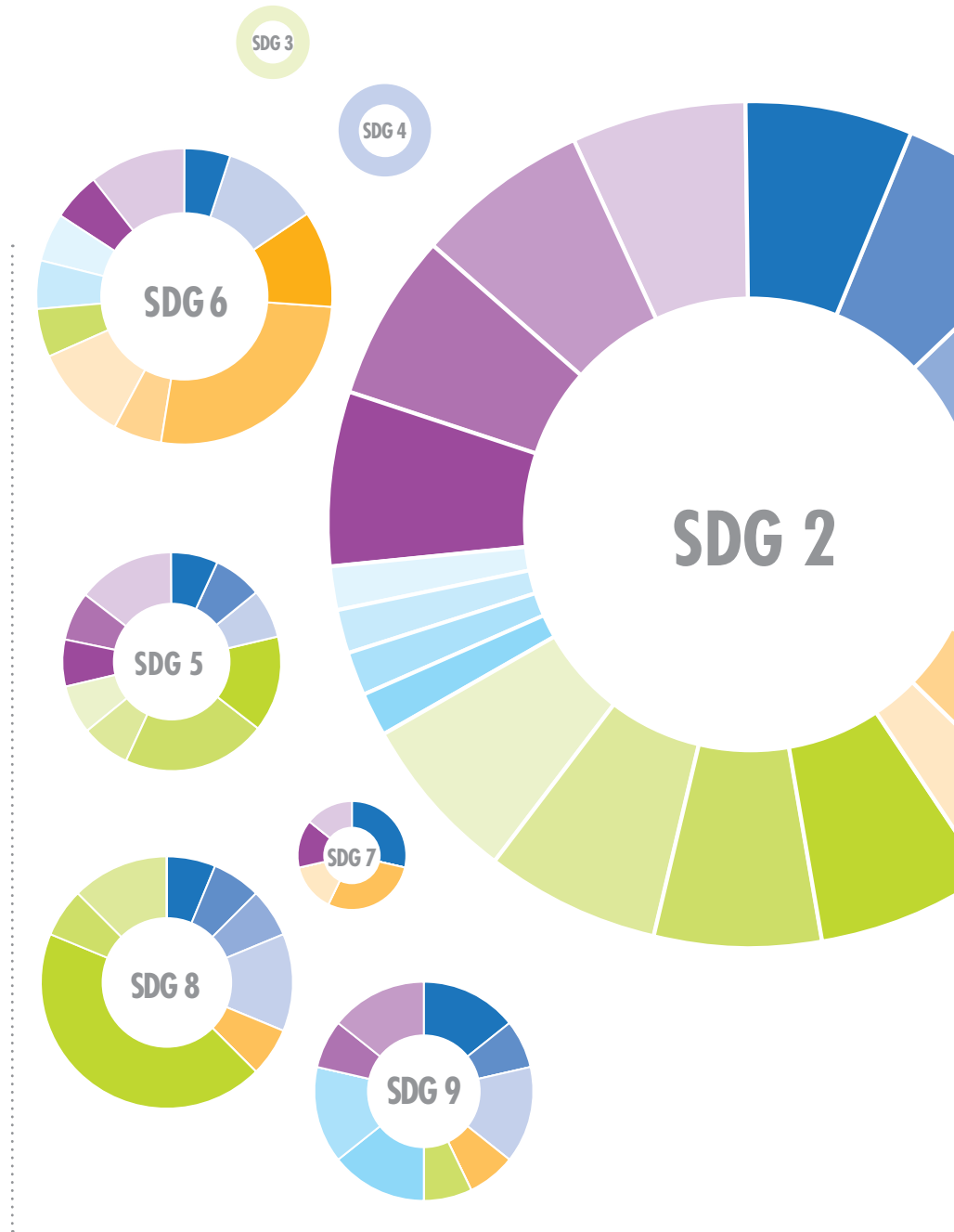
Life on Land

### SDG 16

Peace, Justice and Strong Institutions

### SDG 17

Partnerships for the Goals



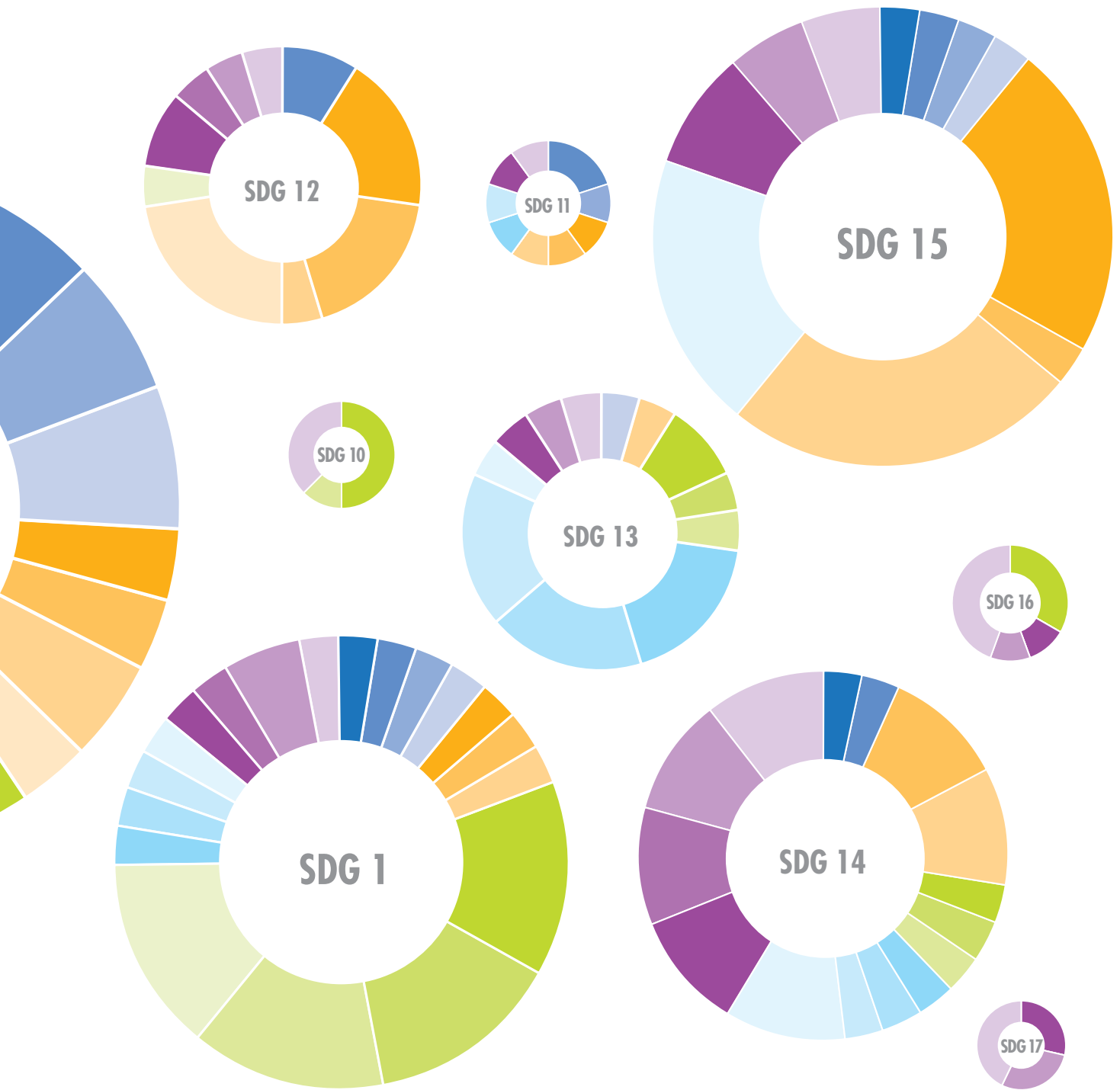
## ACTIONS

- 1** Facilitate access to productive resources, finance and services
- 2** Connect smallholders to markets
- 3** Encourage diversification of production and income
- 4** Build producers' knowledge and develop their capacities

### Principle 1

- 5** Enhance soil health and restore land
- 6** Protect water and manage scarcity
- 7** Mainstream biodiversity and protect ecosystem functions
- 8** Reduce losses, encourage reuse and recycle, and promote sustainable consumption

### Principle 2



- 9** Empower people and fight inequalities
- 10** Promote secure tenure rights for men and women
- 11** Use social protection tools to enhance productivity and income
- 12** Improve nutrition and promote balanced diets

Principle 3

- 13** Prevent and protect against shocks: enhance resilience
- 14** Prepare for and respond to shocks
- 15** Address and adapt to climate change
- 16** Strengthen ecosystem resilience

Principle 4

- 17** Enhance policy dialogue and coordination
- 18** Strengthen innovation systems
- 19** Adapt and improve investment and finance
- 20** Strengthen the enabling environment and reform the institutional framework

Principle 5

TABLE 2: How the different areas for action contribute to sdg targets (numbers between brackets indicate the specific sdg target to which the actions contribute. See annex 2 for more details)

Action Areas (Pillars)	Increase productivity, employment and value addition in food systems	Protect and enhance natural resources	Improve livelihoods and foster inclusive economic growth	Enhance the resilience of people, communities and ecosystems	Adapt governance to new challenges
SDG 1: No Poverty	MAJOR (1.4)	CONTRIBUTING (1.4, 1.5)	MAJOR (1.1, 1.2, 1.3, 1.4, 1.5)	CONTRIBUTING (1.5)	MAJOR (1.a, 1.b)
SDG 2: Zero hunger	MAJOR (2.1, 2.2, 2.3, 2.4)	MAJOR (2.4, 2.5, 2.a)	MAJOR (2.1, 2.2, 2.3, 2.4)	MAJOR (2.4)	MAJOR (2.1, 2.3, 2.4, 2.a)
SDG 3: Good health and well being			CONTRIBUTING (3.4)		
SDG 4: Quality education	CONTRIBUTING (4.3, 4.4)				
SDG 5: Gender equality	CONTRIBUTING (5.b)		MAJOR (5.1, 5.5, 5.a)		CONTRIBUTING (5.a, 5.b, 5.c)
SDG 6: Clean water and sanitation	CONTRIBUTING (6.3, 6.4)	MAJOR (6.3, 6.4, 6.5, 6.6, 6.a)	CONTRIBUTING (6.4)	CONTRIBUTING (6.4, 6.6)	CONTRIBUTING (6.5, 6.a)
SDG 7: Affordable clean energy	CONTRIBUTING (7.2, 7.3)	CONTRIBUTING (7.2, 7.3)			CONTRIBUTING (7.2, 7.3)
SDG 8: Decent work and economic growth	CONTRIBUTING (8.2, 8.6, 8.10, 8.a)	CONTRIBUTING (8.4)	MAJOR (8.3, 8.5, 8.6, 8.7, 8.8, 8.10, 8.b)		
SDG 9: Industry, innovation and infrastructure	MAJOR (9.3, 9.b, 9.c)	CONTRIBUTING (9.1)	CONTRIBUTING (9.1)	CONTRIBUTING (9.a)	CONTRIBUTING (9.3, 9.a, 9.b)
SDG 10: Reduced inequalities			MAJOR (10.1, 10.2, 10.3, 10.4)		CONTRIBUTING (10.2, 10.3, 10.4)
SDG 11: Sustainable cities and communities	CONTRIBUTING (11.4, 11.a)	CONTRIBUTING (11.4)		CONTRIBUTING (11.5)	MAJOR (11.5, 11.a)
SDG 12: Sustainable consumption and production	CONTRIBUTING (12.1, 12.3)	MAJOR (12.2, 12.3, 12.4, 12.5, 12.6, 12.c)	CONTRIBUTING (12.5)		CONTRIBUTING (12.1, 12.6)
SDG 13: Climate action	CONTRIBUTING (13.3)	CONTRIBUTING (13.1)	MAJOR (13.1, 13.3)	MAJOR (13.1, 13.2, 13.3, 13.b)	MAJOR (13.2)
SDG 14: Life under water	MAJOR (14.b)	MAJOR (14.1, 14.2, 14.5, 14.c)	CONTRIBUTING (14.b)	CONTRIBUTING (14.5, 14.b)	MAJOR (14.4, 14.6, 14.c)
SDG 15: Life on land	CONTRIBUTING (15.2)	MAJOR (15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.8, 15.9, 15.a, 15.b)		CONTRIBUTING (15.1, 15.3, 15.4, 15.5, 15.9, 15.a, 15.b)	MAJOR. (15.9, 15.a, 15.b)
SDG 16: Peace, justice and strong institutions			CONTRIBUTING (16.5, 16.6, 16.7)		MAJOR (16.3, 16.5, 16.6, 16.7)
SDG 17: Partnerships for the goals					MAJOR (17.1, 17.14, 17.17)

## INCREASE PRODUCTIVITY, EMPLOYMENT AND VALUE ADDITION IN FOOD SYSTEMS

National agricultural strategies should promote production systems and technologies that increase output without adverse effect on natural resources and biodiversity, enhancing producers' resilience to climate change and input-use efficiency. Food-production systems need to respond to fast population growth, change of diets among urban higher incomes, staple food demands from the large number of people facing nourishment insecurity and a natural resources base supporting agriculture under multiple threats.

Four areas of actions are needed to achieve this: (1) facilitate access to productive resources, finance and services; (2) connect small-scale producers to markets; (3) encourage diversification; and (4) build producers' knowledge and develop their capacities.

### 1. FACILITATE ACCESS TO PRODUCTIVE RESOURCES, FINANCE AND SERVICES



#### CONTRIBUTES TO SDGs:

1 2 5 6 7 8 9 14 15

Productive and sustainable agriculture implies access to rural infrastructure (roads, markets, land and water transportation, etc.), as well as to appropriate technologies and services, and opportunities for value addition and non-farm employment. In addition, basic infrastructure (such as telecommunication, storage capacity, transformation, access to modern tools to generate energy, schools, health centres, etc.) need to be available to all for both on-farm and off-farm economic activities to develop and an inclusive rural transformation to occur.

In many places, producers, in particular smallholder family farmers, still lack access to productive resources and services such as agricultural land, pastures, farm assets and technologies, water, seeds and breeds, fertilizers, pesticides, herbicides, finance, advisory support, education and health services.

The same applies to other small-scale producers, including fisheries actors for whom access to marine and freshwater resources and post-harvest related resources and services (e.g. processing facilities with clean water, refrigeration etc.) are essential conditions for successful business development.

Together with poor market access, these bottlenecks lower their capacity to enhance agricultural productivity, limit their income and prevent them from participating actively in the local economy, often locking them into a vicious cycle of poverty. It makes them vulnerable to shocks and even pushes them to engage in unsustainable natural-resource management behaviour. This is particularly the case in remote areas such as mountain regions or coastal areas, where the majority of the productive resources mentioned above are lacking and the vulnerability of the population is greater than in lowlands (FAO, 2015c). For many smallholder operators, their lack of access to finance, transport and markets often make participation in value chains difficult. This is especially true in the case of women producers, entrepreneurs or workers, who face gender-based discrimination in access to productive resources

### Productive technologies are the basis for rural transformation

Intervention should promote inclusive access to specific productive technologies and capacity development that enhance the employability and entrepreneurial capability of different categories of rural people (IFAD, 2016). Achieving this highlights the need for decentralized access – at farm, production unit or community level – to technologies appropriate to the specific circumstances along the entire chain of products that allow producers to add value to commodity output (e.g. micropasteurization) and prolong the integrity of produce beyond traditional harvest periods (e.g. microstorage) when local markets are flooded with excess supply. By decentralising access to technologies, in addition to reducing the community's reliance on distant markets and intermediaries, local food systems can be strengthened, while still sending higher-value products, or certified ones, to more privileged markets, such as urban centres.

Solutions lie both with the public and the private sectors, as is illustrated with the fish value chain in Bangladesh (Box 5). The public sector can invest in institutional capacities and infrastructure, better research-extension-producer linkages and sound policies to stimulate adoption of technologies that improve productivity and lower costs, all of which boost agricultural incomes. The private sector has the role of securing supply chains for sustainable technologies and mechanisation options. Equipment and machinery require servicing and spare parts, as well as trained operators and mechanics. The providers offering technologies and services should ideally run their businesses as private-sector entrepreneurs.

### Affordable and reliable seeds and planting materials foster enhanced crop productivity

Producers' access and use of quality seeds and planting materials of suitable crop varieties is essential to enhance crop productivity. In many countries, the lack of adequate seed policies reduces the opportunities for farmers to access quality seeds.

The average adoption rates of improved crop varieties is about 30 percent in sub-Saharan Africa (Independent Science and Partnership Council of CGIAR, 2014). In the same region, it is also estimated that up to 90 percent of seeds of staple

#### BOX 5: THE "QUIET REVOLUTION" OF THE FISH VALUE CHAIN IN BANGLADESH

The fish value chain in Bangladesh is evolving very rapidly in all its sectors. This "quiet revolution" affects the farm and input-supply segment – which represents 60 percent of the sector's total value added – in addition to the remaining 40 percent, which is composed mainly of rural and urban wholesale, retail and logistics segments. Hernandez *et al.* (forthcoming) estimate that in the past decade the aquaculture sector's volumes and participants have tripled thanks to capital investments by hundreds of thousands of smallholder producers and small and medium-sized businesses along its value chain.

This process included the diversification, and specialization beyond carp fish, in farming more commercial species, such as the tilapia and pangasius catfish, which have boosted yields. One major positive effect has been a gradual reduction in the price of farmed fish, which is an important contribution to food security. The sector's growth has been mainly oriented toward the domestic market, as very little of Bangladesh's farmed fish is exported. However while the investments of millions of producers and enterprises were a major driver of this growth, public policy had a facilitating role, particularly through early investments in fish seed production, electricity supply and rural roads.



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crops used by producers are sourced from informal supply (McGuire and Sperling, 2016). This is a result of inadequate capacities for research and development, suboptimal extension services, that fail to create awareness in farmers about the performance and advantages of new varieties, costly and slow crop varietal release and registration mechanisms, poverty and a general lack of incentive to invest in inputs that enhance productivity.

Informal seed systems themselves have many strengths, such as lower production costs, enabling access to locally adapted crops for many farmers that require less use of external inputs, such as water, fertilizer and pesticides. They also provide seeds that have cultural and nutritional importance in local contexts. While the availability of seed in remote areas may be an issue, these informal seed systems do not enforce intellectual property rights and therefore ensure that seeds are affordable for farmers. Wherever feasible, these informal systems also need to be strengthened and supported (see Box 6). On the other hand, formal seed systems offer quality assurance and information of variety performance.

A national seed policy can guide government action. It defines roles and responsibilities for seed production and trade (formal and informal sectors) and directs targeted training and capacity development. FAO's voluntary guide for national seed policy formulation (FAO, 2015k) aims to support countries in addressing these issues.



## BOX 6: STRENGTHENING SEED SYSTEMS IN CENTRAL AMERICA

The “Seeds for Development” project implemented through farmers field schools in six countries of Central America over five years, supported small-scale farmers to adopt new varieties from a range of landraces. The project supported the creation of 29 smallholders seed enterprises that produced 6 000 tonnes of bean seed and 754 tonnes of maize seed with quality control.

The true measure of success is in the quality because farmers who planted those seeds doubled their yields, producing enough beans to provide food for more than 458 000 families and enough maize for more than 188 000 families. Looking to the future, governments’ recognition of the importance of this smallholder seed sector has set the stage for continued improvement in policies to support seed production and improve links to the research centres to promote ongoing breeding programmes. Today the members of the seed-producer associations continue to work together, focusing on ways to continue increasing the quality of their seeds and, in turn, the crop yields of the farmers who plant them.

## Mechanization and advanced inputs are essential for the transformation of farming systems

Access to appropriate mechanization technologies at farm level and along the food value chains is an important element of progress towards sustainable agriculture intensification. In many countries, the lack of adequate farm power, in addition to the availability of appropriate implements that suit the purpose of smallholder farmer’s needs, is a major constraint to stepping up production. Land shortage is also a major factor limiting increases in smallholder output. By using only manual labour, a farmer can just work a limited plot and grow enough food to feed on average three other people. In the case of animal traction, the result doubles, while with a tractor it increases to 50 or more. Appropriate mechanization can lead to improved labour and energy efficiency, which enhances sustainability and productive capacity. With demand for machinery increasing – even on small farms – rental markets and shared use

through farmer cooperatives have become key to a successful mechanization process. In parts of East Asia, the use of farm machinery has increased sevenfold since 1985, facilitated by the development of rental markets. Smallholder use of more efficient farming practices would also be enhanced through the availability of farming equipment adapted to their specific needs (FAO, 2017c).

Increasing levels of mechanization does not necessarily mean expensive investments in tractors and other machinery. It is often a gradual process. Sustainable mechanization should be promoted jointly with the application of different forms of power sources (manual, animal, fuel and solar) that are used in conjunction with appropriate tools, implements and machines. Farmers need to choose the most adequate technology and power source depending on their circumstances (agricultural, financial and social) and the work to be carried out.

The level and manner of mechanization should meet the needs of different categories of producers along the value chains in an effective and efficient way. Another positive feature is that by focusing on the specific needs of women, in particular, it is possible to identify proper technologies that can diminish their toil and heavy workload. Moreover, mechanization and its use of advanced technologies has a potential of attracting the rural youth back to agriculture. It can lead to more market-oriented and profitable farming solutions, thus helping to address the issue of rural-urban youth migration.

Mechanization also spurs new opportunities for rural employment, such as equipment manufacturing, repair and provision of mechanization services (especially machinery-hire services as illustrated for Kenya and Zambia – Box 7), and it is an important element in the package of actions needed to transition to more sustainable agricultural models. One key area of mechanization is for the post-production technologies, for example, in post-harvest handling, manufacturing with agroprocessing and distribution. In most developing economies, agroprocessing – a subset of manufacturing that processes raw materials and intermediate products derived from agriculture, including from fisheries, forestry, and livestock – plays a prominent role in adding value within the

manufacturing sector. Products include the areas of food, beverages, tobacco, textiles and clothing, wood and furniture, paper and rubber. Such products can be processed locally within small-scale units provided good access to markets are secured. Agro-industry – particularly in the food and beverages subsector – may be an important source of employment for those exiting agriculture.

It is therefore important for both the public and private sectors to play a role and to support efforts to leverage the potential for mechanization and transformation on-farm and off-farm as a means to expand agricultural productivity, especially in developing countries.

#### BOX 7: MECHANIZATION THROUGH HIRE SERVICES IN KENYA AND ZAMBIA

In Kenya, a farmer used hire services during maize harvesting and this saved his family labour time. It freed up his time for other farm work, to seek job opportunities elsewhere in addition to tending to family matters, like childcare. Women smallholder farmers that accessed power services could change their social perspective. They attached a social value to the technologies of services – not just to what the service could do. For example, services can provide for mobility, an opportunity for women to leave the farm, interact with others in addition to access to health and school services, etc.

In Zambia, an FAO project on scaling up conservation agriculture devised an electronic voucher system which registers family farmers, in addition to hire-service providers, in a database. Hire-service providers are credited with the value of the electronic voucher once they have completed work on the farmer's land. A clear advantage is that it acts as a 'brokerage' facility between demand and supply for productive services.

The opportunity of creating "hiring services around technology" can be integrated into farmer field schools and can form part of related awareness-raising initiatives within the broader community, like rural radio programmes, and create agribusiness opportunity for young people.

## Financial resources are a key driver for rural development

Rural finance encompasses a range of services, including agricultural finance, which is dedicated to activities such as agricultural input supply, production, distribution, wholesale, processing and marketing. Agricultural value chain finance takes account of those inter-linked processes from production to consumption and uses them to increase efficiency and lower risk in lending. Finally, microfinance provides financial services for poor and low-income people by offering smaller loans and savings services, while accepting a wider variety of assets as collateral. 'Warrantage' is an example of microfinancing that is well suited to local conditions in places such as the Niger (Box 8).

### BOX 8: INCLUSIVE FINANCE FOR PRODUCER ORGANIZATIONS IN THE NIGER

FAO has been working with The Government of the Niger and other development partners since 2009 to promote the development of financial instruments targeting producers' organizations (POs). The programme developed and strengthened a network of 783 cooperative input shops directly managed by the POs. Through this vast network, well-priced and good-quality inputs are reaching over half of the agricultural villages of the Niger. As a result, the yields of sorghum and millet have increased by 100 and 81 percent, respectively.

A credit-guarantee fund was established in 2013 with eight producer federations representing 176 000 smallholder farmers. To maximise the fund's potential, FAO has ramped up a capacity development programme to increase producers' access to agricultural credit. Three of the federations have accessed commercial credit to fund economic activities such as producing and marketing potatoes, and five POs have implemented their investment plans with their own resources.

The project helps smallholder farmers through their organizations to enter into a negotiating dialogue with the banks, increasing their bargaining power and access to credit. This has stimulated a mutual-learning process, improving the capacity of lenders to design and deliver loans to smallholder farmers. It also reduces the risk of losses in the case of failure.

A starting-point (IFAD, FAO and WFP, 2013) for developing appropriate financial services is by tackling the constraints limiting their development for smallholder families, including women and youth, and small agribusinesses. Improving access to rural finance for these players would require assisting them in managing their expenditures in a more strategic manner. It also enables them to make longer-term investments in productive and income-enhancing assets, while increasing their resilience and adaptability to economic, social and climatic shocks.

Increasing the availability and quality of these services in rural areas is hindered by a number of binding constraints across the three levels of financial markets – macro, meso and micro – as well as in terms of demand and supply. On the demand side, average potential clients have, for example, low levels of financial education; they are geographically dispersed over large areas; their loan requirements are too small to be of interest to commercial lenders; and they usually lack the typical forms of collateral (clear title to land, mainly) requested by loan providers. In many cases, they also lack the skills and knowledge to prepare sustainable agricultural and rural-investment projects and business plans. Tools such as FAO's "Rural invest"<sup>7</sup> can help build the necessary capacities.

On the supply side, formal financial service providers (such as commercial banks and microfinance institutions) tend to eschew servicing rural value chains. This is a consequence of scarce data and knowledge on agricultural-market dynamics; a widespread lack of expertise on the design of specific and profitable financial services for rural contexts; and a diffused ingrained bias that lending to rural markets is usually an unprofitable and an excessively risky activity. These are just few of the key factors that contribute to a widespread financing gap in rural areas in many developing countries. A disparity that manifests itself not only in the insufficient levels of provision of financial services, but also in the scarce flexibility and innovation of the services that are actually provided.

<sup>7</sup> Rural Invest, developed by FAO, is a free, multilingual toolkit comprising training courses, manuals and custom software to support the preparation of successful rural development projects.

This rift in formal financial provision is often filled by value chain actors (e.g. input suppliers, processors, wholesalers), who act as informal providers of working capital and other financial services for producers and other players, to ensure the continued functioning of the system.

Insurance plays an important role in boosting productivity by helping to reduce risks associated with agriculture. Adverse events such as drought, excessive rains, hurricanes, animal diseases or pest invasions cause heavy losses to producers. They cannot easily be prevented from occurring, but they can be better predicted and arrangements can be made to mitigate their impact. Agricultural insurance in crops, livestock, aquaculture, fisheries and forestry is geared to covering losses from events that are beyond the control of producers. While agricultural insurance has traditionally targeted commercial farmers, many programmes are now designed to better address smallholder producers in developing countries.

To overcome these constraints, three types of actions are needed: (1) knowledge management, dissemination on successful rural finance innovations and good practices, and for the design of specific financial services; (2) training and capacity building on a wide variety of rural finance-related aspects (e.g. financial market assessment, value chain financing, agricultural insurance) for both public and private stakeholders (e.g. financial service providers, ministries of agriculture and finance, central banks and regulatory agencies, producers and their organizations); and (3) technical assistance in order to ensure the quality and integrity of the design of rural finance and investment-related components (such as the establishment of a credit guarantee fund, refinancing facility or an insurance scheme).

Among the different areas of support and research work covering rural finance, it is important to highlight digital innovations, which can help overcome some of the typical constraints to rural financing (e.g. mobile credit, savings and insurance); the design of financial risk-management arrangements, which build on the unique specificities of different value chains and contexts to provide more sustainable services; and the development of financial services that are tailored on the specific needs of the most vulnerable minorities in rural contexts (e.g. women and youth).

The establishment of technical-assistance facilities, which act as a support to investment funds, can play a significant role in this context. These grant-funded facilities finance and manage various technical services to enhance the financial return, the risk sharing and the development impact of investments in the rural and agricultural sectors.

### BOX 9: DEVELOPING SMART AGRICULTURAL INSURANCE SYSTEMS IN THE CARIBBEAN

Agricultural insurance represents one of the most challenging financial products to implement in rural contexts in a sustainable manner, especially in countries that are particularly affected by natural hazards and other climate-change related factors. Experience has shown that the design and implementation of agricultural insurance schemes in these contexts becomes possible only when there is close coordination between public and private actors at the design and execution stages. With this premise, FAO is currently developing a project focused on supporting the establishment of public-private insurance programmes in three Caribbean countries (Jamaica, Grenada, and Saint Vincent and the Grenadines). The objective is to strengthen the expertise and competence on agricultural insurance in these countries, support them in the identification of the most adequate commercial company to act as a counterpart in the insurance coverage (in addition to the actual design and implementation of the mechanism), and, finally, provide awareness raising and capacity building to local smallholders on the benefits and implications of subscribing such a policy. (FAO, 2015l)

## 2. CONNECT SMALLHOLDERS TO MARKETS



### Contributes to SDGs:

1 2 5 8 9 11 12 14 15

Agricultural production is part of larger economic, social and natural systems, especially as it shifts from subsistence to more market-oriented output. A value chain approach provides an effective framework to ensure production is considered as part of a broader agricultural or food system. Agricultural and food value chains consist of five

stages: primary production, aggregation, processing, distribution and consumption. Value chains are dynamic systems that are market driven and governance sensitive (FAO, 2014a).

Placing agricultural production in a value chain context allows one to see that its performance is in large part driven by factors that are either further upstream or downstream in the value chain. These factors include the various inputs that go into the value chain operations such as seeds and packaging materials, financial and non-financial services; and the wider business-enabling environment (regulations, public infrastructure, research and development (R&D) organizations, sociocultural traditions, etc.) within which the value chain operates.

This broadening of perspective allows the identification of leverage points (for instance policies, incentives, service providers, market systems and associations linked to farming) on which to act in order to improve productivity and income. Root causes for underperformance are also better understood when they are analysed through a value chain approach.

A fundamental part of any strategy towards more productive and sustainable agriculture is to improve access to markets for farmers and other rural people with higher inclusiveness, efficiency and competitiveness. This includes access to markets for agricultural as well as non-agricultural goods, as the non-agricultural component of rural economies expands. However, it is important to acknowledge that different kinds of markets offer different benefits or drawbacks to producers and that each has varying infrastructure requirements (see Box 10). For example, direct sales generally provide a greater share of revenue going directly to the producer but usually restrict producers to their local markets. International commodity markets often offer lower margins for smallholders and are likely to be more risky. Access to contract farming offers interesting marketing opportunities for producers but need to be scrutinized in terms of risk sharing mechanisms.

In a rapidly urbanising world, better integration between cities and their regions offer market opportunities to producers in the surrounding areas, in particular for fresh products such as vegetables, dairy products or fish (Bai, Zhang and Reardon, 2017).

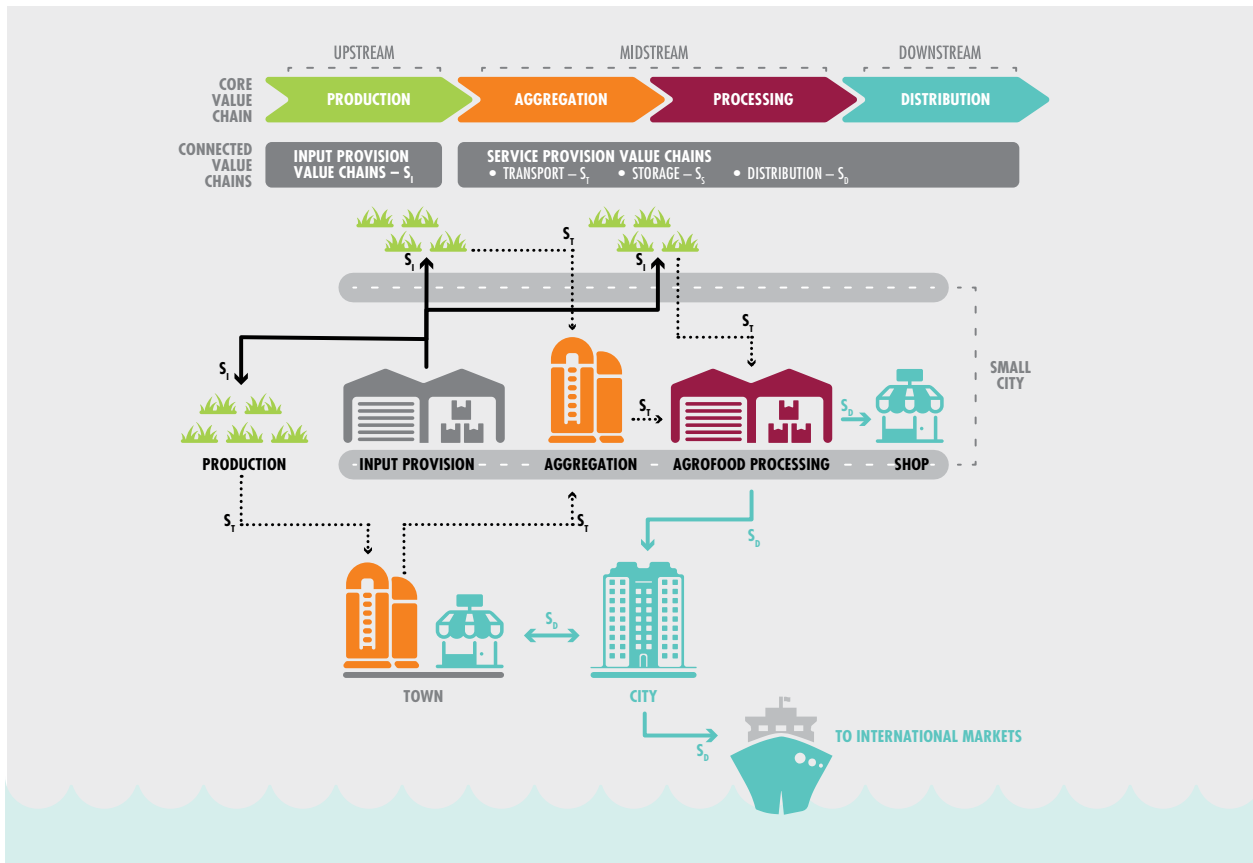
### BOX 10: INFRASTRUCTURE THAT BUILDS “NESTED MARKETS” FOR SMALLHOLDERS.

Investments in infrastructure are more effective when they support models of production and marketing that are appropriate to smallholders and when investments are also made in securing tenure rights (HLPE, 2013). Many small producers have undertaken initiatives to develop new products and services that add value per unit of resources and market those products in novel ways. The construction of new infrastructure, along with new institutional arrangements that link producers and consumers, stimulates the development of new market segments that are nested in general market infrastructure (van der Ploeg, 2008). A comparative analysis in Europe, Brazil and China found that emerging nested markets have similar infrastructure features, which focus on local and regional markets, and build on common pooled resources, which might include water, fishing grounds, common land and jointly exploited forests (van der Ploeg *et al.*, 2012). In Brazil, for example, the transport time and costs for individual farmers and drivers have been reduced through infrastructure that provides nodes for self-organized transportation of products (Ecovida, 2007). Research on the infrastructure needs of smallholders has shown the importance of local slaughterhouses (European Innovation Partnership AGRI Focus Group, 2015), farmers’ markets (Kirwan, 2004), and internet-based marketing systems (Milone, 2009). In 2016, the Committee on World Food Security made important recommendations for connecting smallholders to markets, underscoring the importance of public investments to develop or improve infrastructure specifically targeted at smallholders (CFS, 2016).

*Source: adapted from FAO, 2017c.*

In a rapidly urbanising world, better integration between cities and their regions offer market opportunities to producers in the surrounding areas, in particular for fresh products such as vegetables, dairy products or fish (Bai, Zhang and Reardon, 2017).

Figure 3: Food system value chains linking rural areas and small cities - Source: FAO, 2017c



The private sector is the main actor in organizing production, processing and marketing of agricultural products. Governments should establish the conditions that create an enabling environment for private-sector activities. For example they can improve efficiency and increase access to markets for rural people, especially smallholders and family farmers, by providing the appropriate macroeconomic framework in addition to the necessary infrastructure, regulation and public goods, such as roads, suitable policy and legal environments. The significant role public procurement and institutional markets play should not be overlooked. They not only support family farmer access to markets, but also ensure that marginalized consumers have access to affordable and nutritious food in areas, or periods, of market failure, such as in school feeding programmes (FAO, 2017j). The Committee on World Food Security (CFS, 2016) in its policy recommendation on connecting smallholders to markets highlighted, for example, the opportunity for the public sector to implement well-targeted institutional procurement programmes for public institutions, food assistance

and school feeding where smallholders are linked to structured demand for food and agricultural products and where consumers can access sufficient, safe, healthy, nutritious and diverse food produced by smallholders.

There are also opportunities to expand overall market access for vulnerable groups, particularly for marketing sustainable-food products (e.g. those that are nutritious and produced using sustainable agricultural practices). This also includes promoting the development of markets for sustainable or certified products (FAO and INRA, 2018). Improving the aggregation, processing, distribution of food products along the value chains (including storage and conservation of food products) to retain and generate additional value (including nutritional) also holds substantial growth potential.

International trade plays a significant role as it offers market opportunities for agricultural products, but also increases risks. Exploring the potential of trade for sustainable production and

understanding the effect of its restrictions and distortions in agricultural markets, including the elimination of the sector's export subsidies, is key to healthy, sustainable and well-functioning international agricultural markets.

Agricultural markets can also advance important social development goals. Consumers and other players like global value chain actors are increasingly concerned about employment conditions along the supply chain. Addressing decent employment, and in particular child labour, in production and processing may therefore be necessary for those who export or aspire to export, to high value markets such

as Europe, Japan or North America (Box11). Some countries also have legislation allowing legal action against companies that import products made using child labour, highlighting the chain responsibility among businesses. Other potential challenges related to export such as complying with food-safety standards and minimum residue levels for pesticides may also be linked to occupational health and safety issues for workers in production and processing. Business-to-business approaches are increasingly requiring demonstration of due diligence efforts by value chain actors (OECD-FAO, 2016; OHCHR, 2011).

#### BOX 11: MALAWI PRODUCERS' ORGANIZATIONS AND MEDIA WORKING TOGETHER TO ELIMINATE CHILD LABOUR

Thanks to a strong partnership with local media, the National Smallholder Farmers' Association of Malawi (NASFAM) – an agricultural PO that has been sensitive towards child labour prevention over the years – committed to increase the effort against work conducted by children in agriculture by producing and broadcasting a dozen radio programmes on national media channels. Radio listeners, most of them from rural communities, were given the opportunity to submit their questions and views on how to reduce children's involvement in heavy and hazardous tasks and how to get them to attend school. In addition, NASFAM dedicated its 2015 thematic calendar to the topic "child labour in agriculture", with messages, throughout the year, dedicated to smallholder farmers. The 6 000 NASFAM clubs throughout the country received at least one copy of the calendar, saw a dedicated video and discussed it. Extension workers targeted in particular remote villages where child labour is rampant and important for key agricultural sectors such as tea, coffee, fisheries and cattle herding. (FAO, 2016c).



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### 3. ENCOURAGE DIVERSIFICATION OF PRODUCTION AND INCOME



Contributes to SDGs:

1 2 8 11 15

More diversified production systems at field and landscape levels bring multiple benefits. Diversification plays an important role in terms of income generation, nutrition, soil and plant health, the conservation of biodiversity and resilience to shocks. The cultivation of a diverse batch of crops and varieties, for instance, increases resilience and reduces exposure to pests, diseases or extreme-weather events. When diversified production systems are in place, failure in one activity can be compensated or mitigated by other sources of income. Diversification is needed, but markets do not necessarily reward farmers for doing so. Low consumer demand for less mainstream products, as well as market obstacles such as food safety issues, sometimes make diversification unrewarding for smallholders. These are challenges that must be addressed through targeted policies and research.

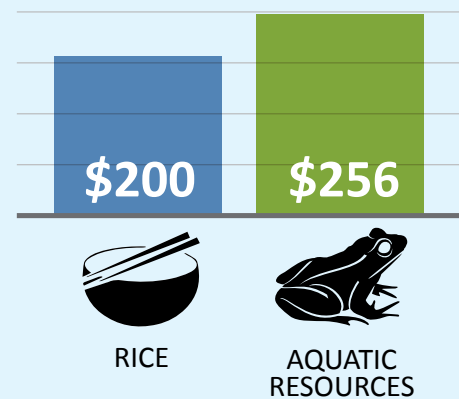
These obstacles may change with time. There is increasing demand for diversified food products. Changes in consumption patterns taking place in global agri-food systems (driven by urbanization, rising incomes, etc.) lead to growing demand for varied, higher-value food products, which in turn stimulates demand and provides an outlet.

Diversification can help improve efficiency and productivity. There is an increase of resource efficiency when more than one product is generated in the same plot of land. There are several well-established agricultural practices, such as intercropping through the joint planting of annual crops that grow well together, like maize and beans. Others include perennial plants through the combination of annual crops and pastures (e.g. agropastoralism), annual crops and trees (e.g. agroforestry), and annual crops, trees and pastures that also involve livestock production (e.g. agrosilvopastoral systems). The establishment of on-farm fish ponds or combining paddy rice with aquaculture has also contributed to increasing income and better nutrition as a result of greater protein intake in some countries (Box 12).

#### BOX 12: LAO PDR: MORE INCOME FROM THE SAME LAND BY COMBINING RICE AND FISH PRODUCTION

To formulate policies that support rice production, policy makers need to be informed of innovative methods and technologies. In particular, South and South East Asian countries – where much of the world’s rice is produced – have applied many innovations of FAO’s ‘Save and Grow’ campaign in their national food security programmes. Today, millions of rice farmers have adopted these practices, which have addressed many of their challenges. Some techniques such as Sustainable Rice Intensification (SRI) allow farmers to cultivate rice better in rainfed areas, such as in northeast Thailand, which are increasingly affected by drought, and in major irrigated rice areas of China, Pakistan and India, where, by 2025, water supply is forecasted to be insufficient to meet demand. In Lao PDR, FAO projects supported farmers in transforming the rice sector into a dynamic and competitive one using sustainable practices. Farmers found they could produce rice with better and fewer inputs such as certified seeds which resulted in higher yields and profits. In flooded rice fields, farmers learned of the importance of goods and services produced by rice ecosystems while engaging in sustainable rice-fish farming practices. Rice paddies are rich and have diverse ecosystems with abundant fish, crabs and other aquatic species that are essential for food security and nutrition of rice farming families.

For rural farmers, the monetary value of aquatic resources in rice fields was found to be more than the average value of rice consumed per person per year:



Source: FAO Regional Rice Initiative Aquatic Resources Promotion Trials, Lao PDR, 2013-2017



Agricultural diversification also contributes to plant health by lowering pest incidence levels as a result of reducing the ability of pests to find their target crops. Similar practices of pasture rotation are also used to lower incidence of livestock-disease burdens, some with public health consequences.

### BOX 13: DIVERSIFYING PRODUCTION FROM AGROFORESTRY IN THE CHIAPAS, MEXICO

Agroforestry, which in some cases has been used for thousands of years, has been increasingly recognized and practiced as an agricultural system diversification option that can simultaneously contribute to income generation, food security and the conservation and sustainable use of biodiversity and ecosystem services – improving soil quality and biodiversity and reducing climate pressure. For example, in Chiapas, Mexico, coffee grown in agroforestry systems with heavy shade (60 to 80 percent) was 2 °C to 3 °C cooler than those under light shading (10 to 30 percent) and lost 41 percent less water through soil evaporation and 32 percent less through plant transpiration, thus reducing the water loss and consequently increasing soil resilience to drought.

Crop yields in agroforestry systems are comparable with, and more stable than, those obtained with synthetic fertilizers (Hall *et al.*, 2006) and release less greenhouse gas emissions.

*Source: adapted by Barrios E. and Borelli S. from multiple references (Prabhu *et al.*, 2015, Lin, 2010, Hall, N.M. *et al.* 2006 Sileshi, G. W. *et al.*, 2014; Nasielski, J., *et al.*, 2015).*

Diversification has the potential to create more and better jobs in both agriculture and off-farm sectors. Increasing the diversity of productive activities during different periods of the year helps avoid employment intervals that are often also combined with food security and nutrition gaps. Promoting economic diversification is crucial to help poor rural people face food price volatility, particularly in remote areas, such as mountain regions. Food accounts for as much as three-quarter of the expenditures of poor households in some countries. Given their limited access to credit and

savings, an increase in food prices has a large impact on their immediate consumption (Ivanic and Martin, 2008).

Diversifying incomes, including off-farm, helps build resilience, addresses risks at household level and reduces vulnerability to shocks through the stabilization of revenue. It helps to cope with risks and shocks related to climate change and natural disasters. In particular, the non-farm sector has a role to play in building resilience to climate change through income diversification, enterprise and job creation in other areas. (Box 14: Kyrgyzstan).

### BOX 14: TRADITIONAL HANDICRAFTS DIVERSIFY RURAL INCOMES IN KYRGYZSTAN

In the remote Batken Province of Kyrgyzstan, FAO is helping poor rural women diversify their incomes while promoting and preserving traditional handicraft techniques and motifs. Made by hand from natural materials, handicrafts can preserve and develop folk traditions while becoming an integral part of modern life.

Through specific training, participants have learned new product designs and quality requirements for hand-woven carpets, felt objects, textiles, woodcarving and more. The aim was to improve product appeal and marketability in Europe and other parts of the world by using updated product designs, new colours and higher-quality decorations.

For centuries, rural women in Central Asia have been producing handmade woven and felt carpets, embroidery on textile and felt, pillows and other natural home decor items. In Kyrgyzstan, the handicraft sector serves as a source of income for thousands of poor families in the countryside. Folk crafts make a significant contribution to the economy of households. The knowledge and skills these rural women have gained through training are helping them diversify their income, better access local and international markets, and increase their family budgets.

*Source: FAO Regional Office for Europe and Central Asia.*

Integration and diversification help supply the nourishment needs of rural households, contributing to food security, nutrition and dietary diversity, especially when promoting local and indigenous varieties of food, which often have better nutrient content than major commodities. This is particularly true for poor rural people, who are more vulnerable to the negative effects of high and volatile food prices because they are typically net buyers of food (Ivanic and Martin, 2008).

Diversification can contribute to soil health and the conservation and sustainable use of soil biodiversity. The natural resource base and ecosystem services are the foundation of all food and agricultural systems. Agriculture provides habitats for wild species and creates aesthetic landscapes also in communities as illustrated in Bolivia, Nicaragua and Senegal (Box 15).

More integrated farming will be a vehicle for creating terrestrial carbon sinks. This transition to sustainable, biodiversity-rich, nutrient-sensitive and climate-resilient agriculture and food systems will draw to scale up proven and best-fit innovations tailored to specific socio-environmental situations and rural contexts.

## 4. BUILD PRODUCERS' KNOWLEDGE AND DEVELOP THEIR CAPACITIES



### Contributes to SDGs:

1 2 4 5 6 8 9 13 15

Transforming agriculture and food methods means evolving towards knowledge-rich systems of output in which producers and value chain actors make best use of their skills and capacities. Research, education and innovation are key elements achieving this.

At the level of the farm or production unit, top-down and technology-oriented systems of extension (e.g. blueprint models of technology package) are progressively being replaced by integrated, market-oriented and producers-driven, multistakeholder processes, and participatory services and innovations. This involves men and women producers and their organizations as full partners in situation analysis and problem identification, as well as in redefining research and advisory services agendas. This implies the development of approaches and mechanisms that involve different categories of

### BOX 15: SCHOOL, HOME, COMMUNITY AND MICROGARDENS IN BOLIVIA, NICARAGUA AND SENEGAL

In 2008, FAO's microgardens programme won UN-HABITAT's Dubai Award for Best Practice to Improve the Living Environment. Experiences from Bolivia, Nicaragua and Senegal illustrate some of the interventions and their impact. In the El Alto municipality of La Paz, Bolivia, FAO supported a microgarden programme for low-income families. Some 1 500 households were trained in organic cultivation of fruit, vegetables and herbs in small low-cost greenhouse units measuring 40 square metres. The units provide fresh vegetables all year round for home consumption and sale through neighbourhood markets. The result was a general improvement in child nutrition and family savings, which were spent on eggs and meat.

In Nicaragua, a project started in 2010 aimed to create in and around the capital, Managua, 500 microgardens and 12 demonstration and training centres in neighbourhoods and schools. In collaboration with Nicaragua's Institute of Agricultural Technology, it provides drip irrigation systems and training in intensive vegetable production for low-income beneficiaries, expected to number 9 500. Beneficiaries will also be trained in operating and maintaining infrastructure, including low-cost greenhouses and tunnel seedling nurseries.

In collaboration with Senegal's Ministry of Agriculture, FAO helped introduce microgarden technology and start community gardening centres in low-income areas of Dakar and the city of Pikine. More than 4 000 residents, most of them women, have started microgardens, which produce on average 30 kg of vegetables annually per square metre, sufficient to satisfy family needs and provide a surplus for sale.

producers where actions are prioritized on the basis of participatory multistakeholder processes.

Producers must be placed at the centre of agricultural innovation processes. Pilot projects should focus on participatory mechanisms, identifying barriers to the adoption of innovation and develop incentives to scale up promising technologies. Platforms are needed where different actors can understand each other and find solutions to common problems together. The Farmer Field Schools (FFS) and similar approaches fostering peer-to-peer exchange (such as the Dimitra Clubs of community listeners) are means of mobilizing the rural poor and improving their access to services and infrastructure. They also constitute platforms for different stakeholders (extension agents, researchers, producers and traders) to connect and learn to collaborate (Box 16).

The mandate of extension and advisory services has been enlarged and now includes issues such as food security, climate change adaptation, nutrition, gender and health. They growingly need to be transdisciplinary, pluralistic and better connected to research.

Recent decades have seen the emergence of more pluralistic agricultural extension and advisory services. Rural services are being delivered to producers from a variety of sources, including the public sector, private agents, civil society organizations and non-governmental organizations (NGOs). A survey of 100 non-public advisory service (Gómez, Mueller and Wheeler, 2016) show that the diversity of suppliers provide the opportunity to capitalize on the comparative advantage of different types of providers. For example, downstream organizations, which assist in distribution of agricultural produce to processors and final consumers, are more effective at achieving goals related to product quality, while upstream ones, which work in the supply of inputs, are more effective at achieving goals related to technology adoption. Organizations that were successful overall, across different roles, were more likely to be those that provided outside support to the value chain through consultancy services and certification. Private businesses had more innovative extension approaches and were more active in fostering the

use of information and communication technology (ICT). NGOs were much more likely to address social development objectives in their extension approach, and while they had a positive impact on marginalized groups and on technology adoption, they were not as effective in improving market access.

### BOX 16: FARMER FIELD SCHOOLS TO STIMULATE INNOVATION

For the last 35 years, FAO has promoted FFS, an approach it first developed in South-East Asia, as an alternative to the prevailing top-down extension method. This approach, which had played an important role in the past, failed to work in situations where more complex and counter-intuitive problems existed, such as pesticide-induced pest outbreaks.

In a typical FFS a group of 20 to 25 farmers meets once a week throughout the season in a local field setting under the guidance of a trained facilitator. Farmers experiment with and observe key elements of the agroecosystem by measuring plant development, taking samples of insects, weeds and diseased plants, and constructing simple experiments or comparing characteristics of different soils.

FFS is not limited to plant protection and has been applied to investigate a wide range of topics and situations, such as management of soil fertility and water resources, leading to higher yields, improved soils, reduced pesticide use, and rational use of other inputs. It is also a valid approach to address questions related to livestock or integrated aquaculture agriculture systems and commercialisation. FFS can be used to solve any complex problem affecting smallholders in given contexts.

FFS promotes field-based experimentation, critical thinking, group organization and decision-making, thereby increasing the likelihood that producers will eventually 'own' and adopt, or adapt, improved practices. By promoting collaborative work and group decisions, FFS impacts social cohesion, individual and community empowerment, and even gender dynamics in households. FFS are now active in over 90 countries, with support from dozens of national and development partners. (FAO, 2016a).

To avoid duplication of efforts, public financial support, appropriate policies, technical backstopping and coordination are needed. The public sector can channel its limited resources to coordinate the roles of different actors and to complement privately run services – for example, to reach specific producers. Public services also play a key role in addressing issues like sustainable-resource management or nutrition and health.

Governments also need to ensure that the advisory services provided by the private sector and civil society are sound and feasible, not only in their technical aspects but also economically, environmentally and socially. This is key to avoid broadening the gap between rich and poor, those that can access private services and those who cannot. Public support to the formation of POs plays a central role in providing services and giving voice to producers' concerns. In this way, advisory services become more demand-driven (FAO, 2014c). Given the plurality of today's rural advisory approaches, it is important to understand which type of advisory service provider is suitable for different categories of producers and who bears the cost of the service. For example, smallholder producers in rural areas will require external support as they will usually not be able to pay the costs of advisory services, while market-oriented producers may be willing to pay for services that meet their needs. The example of India (Box 17) shows how private suppliers may create innovative cost-recovery mechanisms for their services.

Capacity development related to the reduction of emission from deforestation and forest degradation (REDD+) addresses institutional needs of developing countries to estimate and reduce emissions in the forestry sector. It also focuses on improving country systems of data collection (e.g. national forest monitoring systems), supporting multistakeholder engagement in the REDD+ process, as well as on issues related to governance, policy, legal framework and land tenure.

Often return on investment is high in R&D, but overall funds have remained consistently weak, in particular in low-income countries. Investing in agricultural R&D and rural advisory services (RAS) is an important essential for boosting productivity in a sustainable way. In this context, a continuous long-term public commitment to agricultural research is fundamental.

All countries need a certain level of domestic-research capacity because technologies and practices can rarely be imported without some adaptation to local agroecological conditions. Investment requirements in RAS depend largely on poverty and malnutrition levels, access to information (radio, mobile and Internet) and the structure and relative importance of the rural population (Blum and Szonyi, 2014). Countries with higher poverty rates need greater investments in research and advisory services, in particular public services.

### BOX 17: PRIVATE SECTOR ADVISORY SERVICES IN INDIA

The e-Choupal initiative, which was developed by an Indian food conglomerate, aims at linking the firm directly with farmers in order to facilitate the supply of production inputs and the procurement of outputs, such as soybeans, wheat, coffee and prawns. Since 2000, the company has installed computers with Internet access in rural villages to deliver real-time information and customised knowledge that help producers to better align output with market and consumer demand. This has helped farmers raise their quality standards and find the best price for their produce. The system helps facilitate access to higher-quality inputs at a lower cost. It also creates a direct marketing channel, which, by eliminating wasteful intermediation and handling, reduces transaction costs and makes logistics more efficient. E-Choupal preserves the identity of different product types through a "farm gate to dinner plate" supply chain. The costs of the e-Choupal platform are recovered through various business models, such as service charges, margins from distribution of products and embedded charges in transactions. Farmers pay a nominal registration fee.

Research and advisory services also need to be better tailored to the multiple dimensions of sustainability. They often focus excessively on productivity and do not sufficiently incorporate considerations of resilience, profitability, access to markets, social inclusiveness and environment. Engaging women and youth effectively, and ensuring that they have access to advisory services, are central to guaranteeing effectiveness.

Targeting is required to address the specific needs of different categories of producers, taking into consideration the diversity of conditions in which they live. Current agricultural R&D investments are not sufficiently demand driven, are fragmented and lacking in synergy, both between their stakeholders and between each other.

Innovation should also focus on agricultural production systems that generate better jobs and more decent work opportunities, strengthening the understanding and awareness on the prospects for rural employment in the context of greener food systems, promoting the adoption of environment-friendly activities in agriculture and developing specific trainings in the use of sector technologies. An increase in green jobs could foster opportunities in more employment-intensive technologies and management and preservation of ecosystems.

Training and education approaches for the youth are more effective when they focus not only on agriculture in the strictest sense, but also on "sustainable socio-economic entrepreneurship", which includes the development of human skills (e.g. cultural, social, technical, organizational and economic) and the linking of agriculture to industry and services. The Songhai Centre, FAO Junior Farmer Field and Life School (JFFLS) and Dimitra Clubs have developed such an approach. Special measures may be needed to ensure that youth are able to participate in training, in particular girls. Agribusiness skills and entrepreneurship can be developed through specific programmes, such as in Egypt (Box 18).

### BOX 18: AGRIBUSINESS DEVELOPMENT THROUGH ENTREPRENEURSHIP FOR YOUTH EMPLOYMENT, FAYOUM, EGYPT

FAO partners with several agricultural technical schools in Fayoum, Egypt to educate, develop and assist young agriculture students or graduates that have demonstrated entrepreneurial promise.

The project aims at building the capacity and social capital to create new micro and small enterprises along the value chain, for example for poultry production. Since the project focuses on providing women an equal opportunity in agribusiness entrepreneurship, they represent 60 percent of the participants.

To connect students with potential investors, a financial fair was held in which they were able to present their business plans to stakeholders from the the agriculture and banking sectors in order to widen their network and receive constructive feedback.

*Source: FAO Regional Office for the Near East  
[www.fao.org/neareast/news/view/en/c/1069173](http://www.fao.org/neareast/news/view/en/c/1069173)*

Youth openness to innovation and ICT needs to be harnessed within the broader frame of intergenerational transitions and rejuvenation of farming. Modern ICTs in particular have high appeal to young, rural individuals. The Internet is becoming an increasingly important medium, including in the poorest regions, to access information and allow producers to be better connected. It has also been instrumental in the development of new training techniques, for extension services, for accessing markets and funding. In various developing countries, rural information centres, such as the Ndola Youth Resource Centre in Zambia, have been set up to improve access to modern ICTs (Box 19).



**BOX 19: SHAPING FUTURE AGRICULTURE THROUGH ICT IN SENEGAL AND RWANDA**

FAO is working to grant full and timely access to high-quality information for smallholders and family farmers in Senegal and Rwanda to improve their productivity. Together with national governments and local developers, FAO is developing four mobile applications to provide rural people with useful data and services that are usable by producers. These digital services will benefit some 40 000 farmers, including women and youth.

The “e-Nutrifood” app provides advisory services that take into account nutritious food production and post-harvest practices. A second app gives up-to-date information on best practices in livestock management. Next up is an app that provides data such as real-time weather forecasts and crop calendars. The last one aims to bring together farmers and suppliers in agri-marketplaces to share information and feedback on topics such as the best providers of raw materials, as well as help forge partnerships and facilitate inclusion in value chains.

ICT applied to agriculture, the largest economic sector in most African countries, can support economic growth and poverty alleviation in the continent by helping farmers sell products at a higher price, boost income, access time-sensitive information and knowledge on innovative approaches for business growth, improved nutrition practices and productivity.

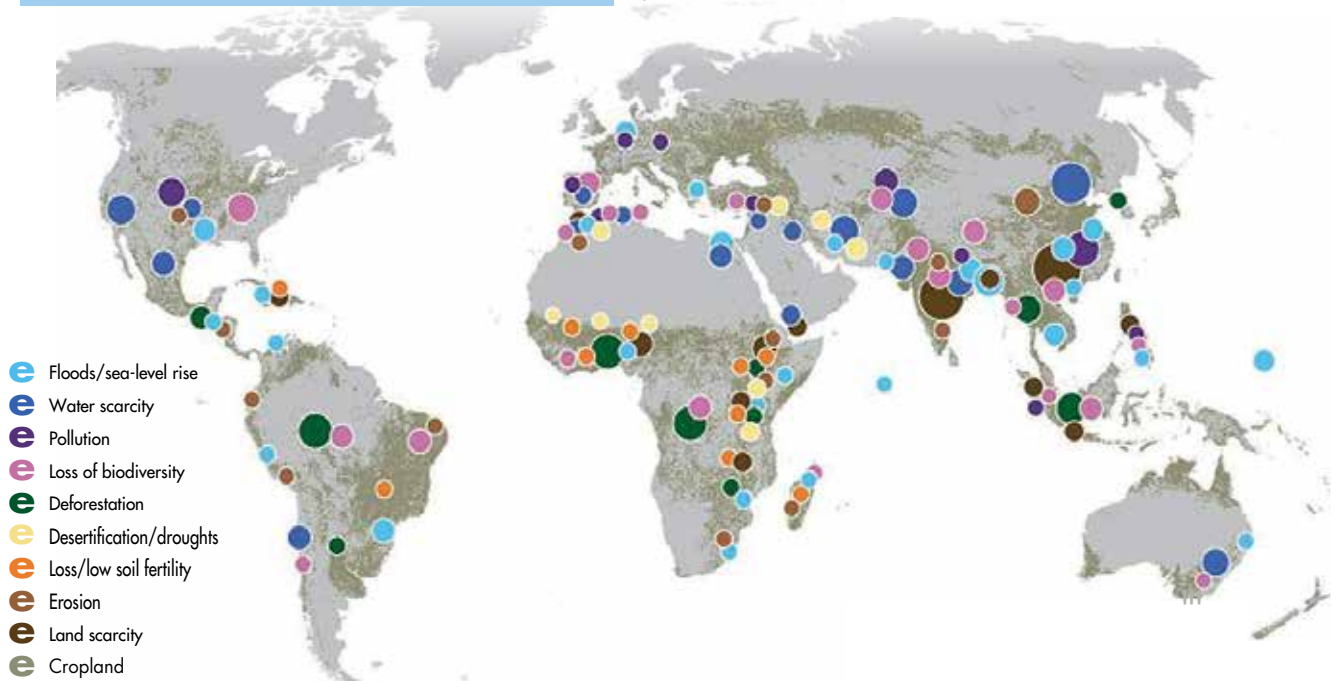
Source: FAO. <http://www.fao.org/in-action/africa-digital-services-portfolio/en/>

**PROTECT AND ENHANCE NATURAL RESOURCES**

Moving towards sustainable models of production in agriculture, forestry and fisheries requires specific attention to the management and conservation of the natural resources on which these activities rely, including soil, water, energy and biodiversity, including genetic resources.

Many opportunities and approaches exist to build greater synergies between enhanced resources conservation, increased productivity and income, and improved livelihoods, and they need to be explored and applied more systematically. Watershed management, for example, provides a framework for understanding the interactions between various land-use systems and the underlying natural resource base and for identifying solutions that balance competing needs and generate simultaneous benefits for people and the environment. The ecosystem approach to fisheries and aquaculture recognizes both its human dimensions (including social, economic and institutional objectives and factors) as well as the need to focus on issues of aquatic biodiversity conservation to ensure sustainability of capture

Figure 4: Schematic overview of risks associated with main agricultural systems - Source: FAO, 2011b



fisheries and aquaculture resources (FAO, 2003). Similarly, the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication endorsed by the FAO Committee on Fisheries in 2014 recognise the interrelatedness of environmental, economic and social sustainability and provide related guidance for the sector's development and governance (FAO, 2015i).

## 5. ENHANCE SOIL HEALTH AND RESTORE LAND



Contributes to SDGs:

1 2 6 11 12 15

Healthy soils are a condition for productive agriculture. They also contribute to the production of healthy food and therefore better nutrition. Similarly, soil carbon storage is a key mitigation strategy resulting from increased soil health and land restoration. Soils represent the fundamental basis of agriculture, but in many places unsustainable land-use practices and human pressures on resources are reaching critical limits. Climate change is a further strong driver of soil deterioration.

The loss and degradation of productive soils is a threat to agriculture itself, as well as to other land users. In 2015, FAO and the Intergovernmental Technical Panel on Soil (ITPS) identified ten major threats to soils functions (FAO and ITPS, 2015)

The ten major threats to soil erosion:

- soil erosion;
- organic carbon change;
- nutrient imbalance;
- salinization and sodification;
- soil sealing and land take;
- loss of soil biodiversity;
- contamination;
- acidification;
- compaction; and
- waterlogging.

Soil management is sustainable if the supporting, provisioning, regulating and cultural services provided by soil are maintained or enhanced without significantly impairing either the soil functions that enable those services or biodiversity (FAO and ITPS, 2015). Sustainable soil management (SSM) encompasses a package of practices aimed at reversing degradation and increasing soil health.

The Voluntary Guidelines for Sustainable Soil Management, endorsed by FAO Council in 2016 (FAO, 2016k), provide a set of technical and policy recommendations on SSM. They present generally accepted, practically proven and scientifically based principles to promote SSM and guidance on how to translate these principles into practices for farming, pastoralism, forestry or more general natural resource management.

SSM seeks to achieve the following results:

- minimal rates of soil erosion by water and wind; intact soil structure, and stable physical context for movement of air, water, and heat, as well as root growth;
- sufficient surface cover (cover crops, residues, etc.) to protect the soil (Box 20);
- stable, or increasing soil organic matter, and ideally close to the optimal level for the environment;
- availability and flows of nutrients are appropriate to maintain, or improve, soil fertility and productivity, and to reduce their losses to the environment;
- soil salinization, sodification and alkalisation are prevented, or minimized;
- water is efficiently infiltrated and stored to meet the requirements of plants and ensure the drainage of any excess;
- contaminants are below levels which would cause harm to plants, animals, humans and environment;
- soil biodiversity provides a full range of ecological functions;
- soil management systems for producing food, feed, fuel, timber, and fibre rely on optimised and safe use of inputs; and soil sealing is minimized through responsible land-use planning.

### BOX 20: IMPACT OF MUCUNA COVER CROPPING ON SOIL PROPERTIES AND CROP YIELD IN THE PACIFIC ISLANDS

*Mucuna Pruriens* is a legume plant that provides a thick ground cover. It is usually grown for up to six to 12 months as a fallow crop before being slashed down for use as mulch on the soil surface, or tilled into the soil. Increased biological activity in soils is attributed to *Mucuna*, which has been shown to improve the nitrogen supplies to the soil and to subsequent crops. *Mucuna* fallow was seen to improve soil's physical properties, increase soil total organic carbon, phosphorus, potassium and earthworm count in comparison with a bare fallowed treatment (e.g. in Fiji), and increase the population of free-living nematodes while suppressing the population of parasite nematodes. (FAO, 2016d).

One of the best indicators of soil health is its organic carbon content. Soil organic carbon (SOC) varies according to local conditions, but in most cases a decrease in SOC indicates a drop in soil health. Instead, increasing SOC mostly translates into more productive, healthier soils. SOC plays an important role in key processes, such as soil response to fertilizers. Excessively low levels of SOC usually translate into low-yield results to fertilizers (Rusinamhodzi *et al.*, 2013). Thus a good soil nutrient balance can only be achieved in combination with good levels of SOC.

Nitrogen is an essential element for the synthesis of biomass, in particular for the proteins that condition the growth and development phases of

### BOX 21: AGROECOLOGY AND SOIL HEALTH ARE IMPORTANT FOR RESILIENT AGRICULTURAL SYSTEMS

The adaptation of ecological concepts and principles through agroecology is a significant strategy that can contribute to addressing sustainability concerns. Gliessmann (2015) defines agroecology as the integrative study of the ecology of the entire food system, encompassing ecological, economic and social dimensions. Different levels of food system change can convert conventional agricultural production and food systems to agroecological food systems such as: (1) increasing the efficiency of practices and resources and substituting external inputs and practices with alternative ones; (2) transforming agricultural production systems to be more stable and resilient; (3) strengthening markets that support agroecology; and (4) building an enabling environment for more sustainable food systems.

Sustainable agriculture is inherently dependent on soil health. It is a measure of the state of natural capital that reflects the capacity of the soil, relative to its potential, to respond to agricultural management by maintaining both the agricultural production and the output of other soil-based ecosystem services. Key ecosystem functions have the soil as their regulatory centre, hence its biodiversity plays an important role in the functional resilience required for the sustained provision of ecosystem goods and services. The development of soil-health indicators and monitoring systems, which integrate local and scientific knowledge, is a valuable strategy to support producers towards building up resilience of agricultural systems required for sustainable-land management. (Barrios, Shepherd and Sinclair, 2015; Gliessman *et al.*, 2015).





plants. The soil nitrogen concentration is closely related to the soil organic matter content and, therefore, influenced by agricultural practices. The green revolution has particularly promoted nitrogen fertilization for greater crop yields. However, nitrogen use efficiency (NUE) for cereal production (wheat, corn, rice, barley, sorghum, millet, oat and rye) globally is approximately 33 percent. The remaining 67 percent represents a USD 15.9 billion annual loss of nitrogen fertilizer, assuming fertilizer-soil equilibrium (Wither *et al.*, 2015; Elser and Bennett; 2011). Loss of nitrogen fertilizer largely results from leaching, runoff, soil denitrification and volatilisation (greenhouse gases, GHG).

Phosphorus is also a major limiting nutrient in agricultural soils. To produce phosphate fertilizer, an increasingly scarce resource is needed – phosphate rocks. There is evidence that the quality of rock phosphate available has deteriorated while its price has increased. To guarantee a stable supply of phosphate in the future, it is not sufficient to reduce its consumption and apply it more efficiently, but it is also necessary to recycle it (Wither *et al.*, 2015; Elser and Bennett, 2011).

Of growing concern to public health and sustainable agriculture is the rise of antimicrobial - (antibiotic and other medicines) resistant pathogens in the environment. Most medicines injected, or taken orally, are eliminated from the host unchanged, or as residues, which eventually end up in the environment and soil through farm runoff or when uncured manure is used as fertilizer to condition the fields.

Erosion is another important threat to soil and depends heavily on land-use practices. The type of land-use (forests, rangeland, cropland) and agricultural practices (through the use of both structural and biological soil and water conservation practices) play a critical role in controlling erosion and retaining fertile soil. In North America, it has been estimated soil erosion could be reduced by 17 percent, saving around 36 million tonnes of soil annually. Valued at USD 2 per tonne, the cost of conservation would be USD 34 million annually, compared with the cost of restoring the soils, estimated at up to USD 332 million (Hellerstein, 2010).

SSM also offers substantial opportunities for climate change mitigation. It has been calculated storing carbon in the soil could not only enhance soil health but also contribute to climate change mitigation by capturing, for example, between 32 billion and 63 billion tonnes of carbon globally between 2014 and 2100 in arable land, permanent meadows and pastures (Sommer and Bossio, 2014).

Integrated approaches, such as watershed management and sustainable land management (SLM), apply the principles of SSM and put them in a broader landscape context, thus addressing issues that cannot be handled only at a farm level. SLM is best achieved by using a combination of agronomic and biophysical approaches in collaboration with social engagement and sound governance frameworks. Lessons from 40 projects supported by the Terrafrica programme show that blanket approaches and top-down processes should be avoided, and local actors need to be empowered in decision-making over their resources and territories through management plans and decentralized-governance mechanisms. Local community landowners have broad and unique knowledge of their resources as they depend on them for their livelihood. Decisions on community-managed land must involve all landowners and users. The prospects of sustainability at local levels are favoured when projects have ensured that pro-SLM bylaws and other local regulations have been enacted and are enforceable (FAO and Terrafrica, 2016).

Landscape approaches are becoming increasingly favoured in many agricultural projects and programmes using geographical units such as watersheds to support the integrated management of natural resources and ecosystems across sectors. For example, the Forest and Landscape Restoration Mechanism (FLRM) promotes restoration by incorporating assessments, identification of restoration opportunity, implementation, monitoring and evaluation, financial analysis and capacity building.

FAO's State of the World's Forests (FAO, 2016b) demonstrates that increasing agricultural production does not necessarily have to come at the expense of forests. More than 20 developing countries have improved their food security in the past 25 years

while maintaining, or increasing, forest cover. It clearly shows agricultural productivity can be increased and food security challenges can be solved, without further depleting resources, through integrated approaches (Box 22).

**BOX 22: INTEGRATING AGRICULTURE AND FOREST SECTORS FOR SUSTAINABLE DEVELOPMENT IN VIET NAM**

The reduction of emissions from deforestation and forest degradation (REDD+) encourages developing countries to formulate national strategies or action plans, which include policies and measures (known as ‘REDD+ actions’) that align with, or build upon, existing national priorities and programmes and SDGs. These include: (1) field implementation actions such as land-use planning, sustainable forestry and agriculture practices, support to alternative livelihoods, forest restoration; (2) updated regulations, tenure rights, subsidies, incentives, transparency, law enforcement; (3) national strategies, investment plans, studies of drivers of climate change; and (4) carbon rights and benefits sharing.

These policies and measures often allow countries to take a more integrated approach across land-use sectors. For example, Viet Nam traditionally invested into the forestry sector directly through efforts such as afforestation projects. With emerging domestic and international contexts, Viet Nam has taken the National REDD+ Action Plan to directly invest into sustainable agricultural and aquaculture commodities in order to achieve a win-win situation where forests area protected, and key agricultural export commodities, such as coffee and rubber, can grow and boost the country’s economic growth.

The sustainable management of grassland and pasture is also important. The Land Degradation Assessment in Drylands (LADA) estimated that about 16 percent of rangelands are currently being degraded (Conant, 2010). The Livestock Environmental Assessment and Performance (LEAP) Partnership programme produced principles for the assessment of livestock impacts on natural resources (Box 23).

**BOX 23: ASSESSING LIVESTOCK IMPACTS ON BIODIVERSITY AND SOIL CARBON**

Within the LEAP partnership, a group of international experts tackled the emerging challenge of biodiversity assessment in the livestock sector and developed principles for the assessment of livestock impacts on biodiversity. LEAP documents provide concrete indicators and tools to capture the various dimensions of biodiversity and the range of livestock pressures and benefits occurring along the supply chains where off-farm impacts can make substantial contributions to overall influence.

Another LEAP group of experts focuses on measuring soil carbon stock changes related to livestock production. The livestock sector has a strong potential to mitigate its GHG emissions through carbon sequestration in grasslands across the globe. The group is developing guidelines for the assessment of soil carbon stock changes, in collaboration with FAO’s ITPS of the Global Soil Partnership, the Global Research Partnership and the “4 pour 1000” initiative to harmonize measurement methods.

**6. PROTECT WATER AND MANAGE SCARCITY**



**Contributes to SDGs:**

- 1 2 6 7 8 9 11 12 14 15

Healthy agriculture and food systems, in particular fisheries and aquaculture, depend on the availability of clean freshwater from production to consumption. A finite resource, water is the ‘blood’ of ecosystems, and, as such, its supply is both regulated and relied on. Without water, ecosystems cannot survive. In many regions, freshwater resources are under heavy pressure as a result of combined demand from agriculture and other sectors. A significant proportion of agricultural production is rainfed, influencing soil water storage, streamflow and groundwater recharge.

Irrigated agriculture is responsible for 70 percent of all freshwater withdrawals worldwide, of which 43 percent comes from groundwater. Water is used for irrigation, for animals, or for sustaining fisheries

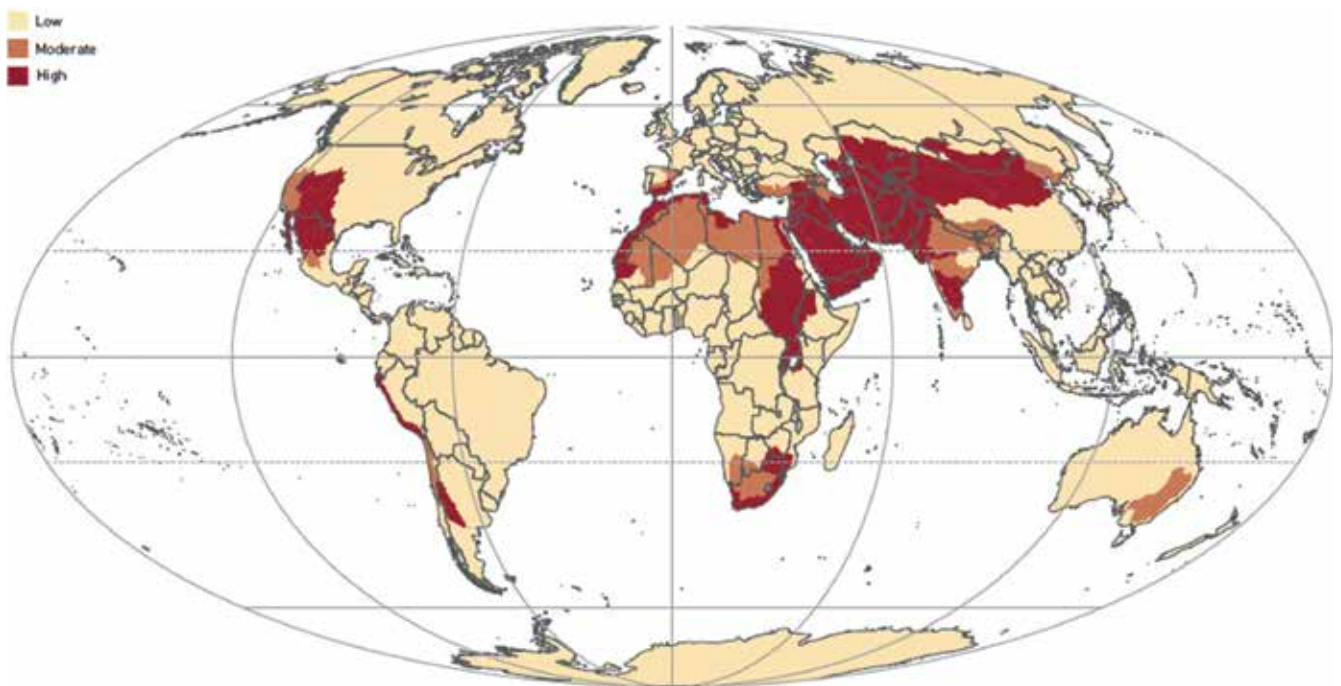


Figure 5: Global distribution of physical water scarcity by major water basins - Source: FAO, 2011b

and aquaculture. It is also utilized in food processing along the value chain. Food processing uses much less water than primary production. The protection of water sources (mountain headwater areas, springs and aquifers) and its efficient use in agriculture and along the food chain from farm to fork is therefore critical to ensuring productivity, livelihoods and healthy water-related ecosystems.

### Water scarcity

Water scarcity happens when the water demand by all users is greater than the available resources. The quest for enhanced productivity in agriculture, in particular in crop production, and the need to protect agricultural output from the vagaries of the climate often translate into investments in irrigation. The green revolution, which has boosted land productivity, was based on the combination of improved seeds, fertilizer and irrigation and was predicated on abundant availability of freshwater. This has led, in many places, to a situation where water, not land, has become the limiting factor to production. Water is also used to satisfy other

needs that lead to competition for water between agriculture and other sectors. For instance, in many cases, irrigation water pumped from rivers and lakes impacts inland fisheries and aquaculture, disrupts the functioning of coastal ecosystems, or reallocates water from one user to another.

In many river basins and watersheds, upstream activities reduce the volume and quality of the freshwater that reaches downstream users, in particular the loss and degradation of natural ecosystems. Water-related ecosystems, such as forests, wetlands and peatlands, are vital to the regulation and supply of freshwater by reducing erosion, filtering water, recharging groundwater and regulating dry season streamflow. It is estimated that 75 percent of freshwater used for domestic, agricultural and environmental uses comes from forested watersheds (MEA, 2005). Moreover, natural ecosystems, especially forests, are integral to the water cycle, contributing to precipitation through evapotranspiration, which provides much-needed water resources for agriculture. For example, it is estimated that over 70 percent of rainfall in the Rio Plata Basin of Latin America is dependent on

evapotranspiration from the Amazon forest; and recent droughts and unpredictable rainfall patterns have been linked to mass deforestation in the Amazon basin (Van der Ent *et al.*, 2010; Ellison *et al.*, 2017). When less water, or that of lower quality, reaches the oceans, it affects the functioning of wetlands, rivers, lakes, coastal and estuarine ecosystems that serve as habitat for several faunal and floral marine and riverine species – and provide breeding space for fish species. It is therefore important to prevent freshwater, coastal and marine pollution from agricultural activities, including nutrient pollution.

Groundwater depletion, as a result of increased pumping for agriculture and other activities, is a rapidly growing problem in many regions. With a 300 percent increase in groundwater pumping over the last 50 years, a growing number of aquifers are exploited beyond recharge (FAO, 2016e). Top-down regulatory systems to control its depletion have had very limited success, and new, stakeholder-based groundwater governance mechanisms are needed. They call for monitoring of the water table variation in order to better understand the pattern of recharge and extraction, a good understanding among water users on the implications of their practices, and the development of the capacity to address the issue collectively and agree on rules and responsibilities through contractual arrangements (Box 24).

Sustainable-water management implies the establishment of institutional mechanisms that ensure fair and effective allocation of water. Since strategic solutions to water scarcity are by their nature case specific, only generic principles can be proposed here. Improving water productivity (production obtained from a given volume of water) in food and agriculture plays an important role in addressing scarcity issues. A range of political, institutional, financial, social and technical interventions can be considered.



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#### BOX 24: FARMER MANAGEMENT OF GROUNDWATER IN ANDHRA PRADESH, INDIA

The experience of the Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) project in India on participatory groundwater monitoring is inspiring. The project, supported by the Government of the Netherlands and FAO between 2006 and 2010, aimed to improve groundwater management by empowering farmers in monitoring and managing groundwater resources. APFAMGS can be cited as an example of large-scale success in groundwater management by communities. However, even if farmers recognized the relevance of the monitoring, support is necessary to maintain the process. Groundwater management committees in each aquifer, or hydrological unit, came together to estimate the total groundwater resource available and work out the appropriate cropping systems to match. The committees then supplied the information to the farming community and acted as pressure groups encouraging appropriate water saving and harvesting projects, promoting low-investment organic agriculture and helping formulate sustainability rules. In terms of cumulative water abstractions, 42 percent of the units have consistently reduced the dry-season drought over the period of the project, while 51 percent have reduced the drought intermittently, and only 7 percent have witnessed an increase in groundwater drought. This impact is unprecedented, in terms of reductions actually being realized in groundwater withdrawals, and in terms of the geographical extent of this impact, covering dozens of aquifers and hundreds of communities, with an approximate outreach of one million farmers. (FAO, 2016e).

### BOX 25: COPING WITH WATER SCARCITY WITH INCREASED IRRIGATION IN THE AWASH BASIN, ETHIOPIA

The Awash basin is the most developed (irrigation) basin in Ethiopia, with ongoing growth plans. FAO responded to a Government of Ethiopia request to understand the future water management options for coping with scarcity. A water audit was implemented with a survey covering 2 166 schemes, which lasted about five months, and involved nearly 160 trained surveyors and 15 supervisors, for an overall cost of about USD 95 000. The auditing included also a multilevel institutional analysis and the use of different scenarios of irrigation area expansion and changes in cropping patterns and intensity. The work resulted in the setup of AWMISSET database, with geo-referenced information on uses. The results showed that monitoring enables informed irrigation development choices. Other regions in the country intend to replicate the survey. Another element provided were recommendations for institutional settings such as reduced overlap and decentralization of activities to basin authority (Dost *et al.* 2013).

The principles of integrated water resources management (IWRM<sup>8</sup>) guide the way water is being planned and managed for agriculture. Ensuring policy coordination between different users is key to its sustainable management, taking in consideration the multi-sectoral nature of water use. Policies, legislation and fiscal measures have a profound effect on how water is managed. However, external action such as that concerning energy prices or subsidies (e.g. pumping cost), trade agreements or market demand (e.g. attractiveness of profitable crops with a high-water demand), and environmental conservation often have a hidden impact on water supply and demand.

### Promoting sustainable consumption of water

Improving water efficiency in agriculture is often proposed as a solution in countries where it is scarce. However, evidence shows that even if it seems that irrigation systems are inefficient, the

reality may differ. For example, in Egypt, farmers along the Nile and around the delta lose on average about 55 percent of the water they apply. However, the water that is lost to the producer is recycled through the drainage system and groundwater pumping. As a result, only 10 to 15 percent of the Nile water in Egypt enters the sea, which brings the system's overall efficiency to about 85 percent (HLPE, 2015). Reducing field losses by converting to modern irrigation technologies may increase yields but may not necessarily save water. Experience from China and Morocco shows that water-saving technologies resulted in fact in more water consumed as farmers expanded their irrigation areas (Kendy *et al.*, 2003; Venot, *et al.*, 2017).

Improving water productivity at different levels, such as field, basin, country, remains an important target and can be achieved via innovation. Integrated systems with trees and crops, or the recycling systems using aquaponics should be considered as opportunities to reduce, recycle and reuse while simultaneously improving yields for crops, fish, and trees, thus increasing production per unit of water used.

### Pollution

Sustainable agriculture implies that levels of chemicals, heavy metals and salts (nutrients) in water remain within acceptable boundaries, i.e. within the environmental capacity of receiving water bodies and aquatic ecosystems.

Intensive agriculture makes use of inputs like mineral fertilizers, pesticides and other chemicals. When not properly handled, part of these chemicals end up in surface water and aquifers where they affect not only the quality of water but also living aquatic resources. Intensive livestock production can

<sup>8</sup> *Integrated water resources management* has been defined by the Global Water Partnership as "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems". IWRM rests upon the three principles of social equity; economic efficiency; and ecological sustainability.

also lead to excessive concentrations of ammonia leaching in the water bodies (rivers and aquifers).

Agriculture contributes to degradation of water quality and is the main cause of diffused water pollution. Nitrogen and phosphorus, as well as pesticides applied to crops, are key water pollutants stemming from agricultural production, and pollution by nitrogen is the single most widespread water-quality problem associated with the sector (FAO and IWMI, 2017). Both livestock and aquaculture output, when carried out on an industrial scale, are associated with significant wastewater discharge along their value chains with potential adverse impacts on human and animal health and the environment (Delgado *et al.*, 1999; Naylor *et al.*, 2000). While relatively low in volume, wastewater discharged from food processing tends to be highly polluting if untreated, and, as such, warrants analysis. Wastewater from fruit and vegetable processing may be rich in pesticides and suspended solids (HLPE, 2015). In arid regions, the leaching of salt in irrigated fields may lead to excessive concentrations of salts in rivers. Ensuring that agriculture contributes to good water quality is paramount. To avoid long-term unintended consequences of over-application of nutrients, a close monitoring of soil status is recommended. Regular soil fertility analysis should be performed.

In many cases, bringing additional nitrates into a system that is already naturally rich in nitrates increases the risk of long-term pollution in groundwater and eutrophication in lakes, rivers and coastal waters. The change in farming practices, for example conversion to organic farming, can improve water quality. The case of Munich, Germany is frequently cited as an example. In this case, nearly all of the farmers converting to organic agriculture in 1992 resulted in a decrease of 43 percent in nitrate concentration in water.

#### BOX 26: AGRICULTURE AND COASTAL ECOSYSTEMS IN SOUTH AFRICA

In South Africa, coastal ecosystems are often affected by the reduction in quantity of freshwater due to several water-consumptive activities, including irrigation. They also suffer from pollution resulting from the use of fertilizers and pesticides for agriculture as well as from other activities, such as mining or industries.

In response to these problems, the 1998 South African Water Act provides a framework to protect water resources against over exploitation and to ensure there is water for social and economic development and for the future. The reserve refers to both the quantity and quality of the water in the resource, and will vary depending on the class of the resource. Dams in the country are now designed in such a way that they are equipped with outlets which can mimic natural events, when needed, in order to respond to the ecological requirements of downstream reaches such as estuaries.

Several solutions exist to reduce adverse impacts from agricultural inputs. They include enhanced nutrient-use efficiency; the phasing out of subsidies for fertilizers; conservation agriculture measures that reduce erosion and crop rotations with nitrogen-fixing cover crops; and closing the nutrient cycle through recovery from effluents and sewage, followed by reuse in agriculture. Appropriate reuse of wastewater can also reduce the cost of fertilizers, particularly phosphorus and nitrogen (Drechsel and Evans, 2010).

As with soils, antimicrobial-resistant pathogens or antimicrobial residues can be found in waterways, groundwater and surface waters, thus augmenting the public health threat of not having the right medicines to cure human and animal diseases. Reducing the need to use these medicines through better prevention practices (e.g. vaccination schemes, hygiene, alternatives to antibiotics) and improving the way pesticides are used for crop production requires capacity building and the promotion of good practices among producers (Box 27).

**BOX 27: INTEGRATED PEST AND PRODUCTION MANAGEMENT THROUGH FARMER FIELDS SCHOOLS IN MALI**

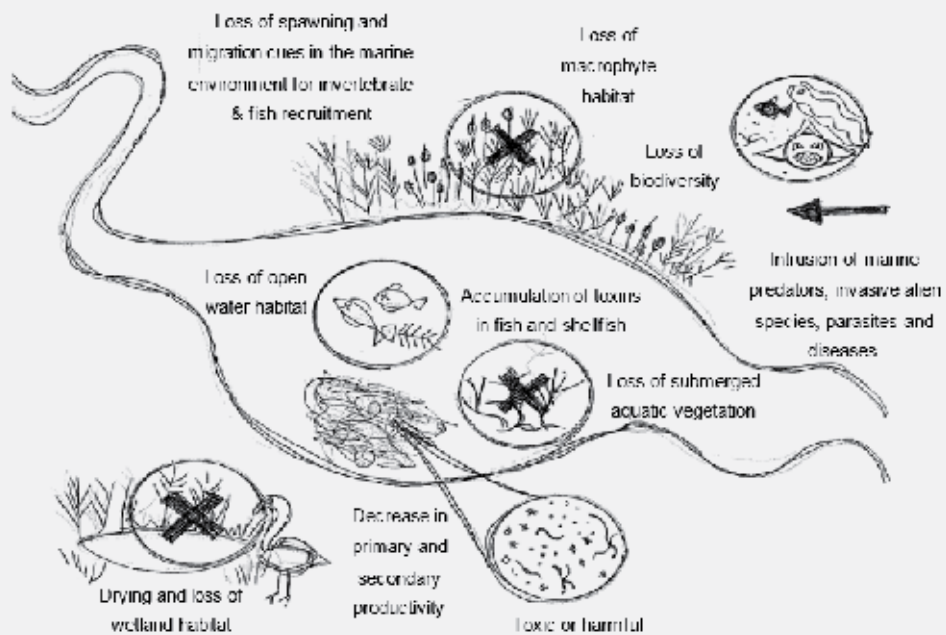
FFS in Mali are improving the social, economic and environmental impact of agricultural practices through extension that puts farmers at the centre. The FFS encourage farmers to control pests using Integrated Production and Pest Management (IPPM) to reduce the use of pesticides and to minimize environmental and health risks including water pollution.

Field schools that train farmers in alternative methods of pest control have succeeded in nearly eliminating the use of toxic pesticides within a community of cotton growers in the Bla region of Mali, where FAO established an FFS programme in 2003. A study published by the United Kingdom of Great Britain and Northern Ireland's Royal Society found that pesticide use on Bla's cotton farms dropped by 92 percent with no negative impact on yields (Settle *et al.*, 2014). In addition, by reducing application of pesticides by 47 000 litres of toxic pesticides, farmers saved nearly USD 500 000. Training in IPPM also helps raising awareness on children's greater vulnerability to pesticides and developing measures to protect them from exposure (Figure 6).



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Figure 6: Biotic response of permanently open estuaries to reduced freshwater  
 Source: Adams, Cowie and van Niekerk, 2016



## More targeted investments in water for agriculture

There is a need for more strategic and targeted investments in water for agriculture. Not all producers have the same constraints and needs in relation to water. Smallholder farmers typically seek investments in local, small-scale irrigation where feasible. They need reliable access to land, guaranteed access to water, support to the empowerment of local communities, in particular water user associations (WUAs), and improved access to inputs and markets. Fishers need secure water and land rights guaranteeing supply of water, protection of fish habitats and access to fishing grounds.

Inequalities in water access depend on how distribution of and control over water are exerted. Its distribution and control are determined by the way water is managed, priced and regulated (Mehta, 2014; UNDP, 2006), by property rights, social and political institutions, and cultural and gender norms. Therefore, access to water is often socially differentiated by gender, caste, race, occupation and other categories. For example, traditional or historical inequalities can limit women's and other vulnerable groups' access to land and thereby to water for agricultural uses, which hampers livelihood strategies and negatively impacts food security (FAO, 2012b).

When the focus is specifically on poverty reduction in rural areas, improved water control and management include a range of technical options to support cropping, livestock, forestry, aquaculture, domestic and other productive activities. In cropping, interventions range from on-farm water conservation practices that focus on improving soil water storage in rainfed agriculture to more elaborate types of water control (e.g. small dams), moving along the continuum from rainfed to irrigated agriculture. First, as a means of securing output through supplementary irrigation, then allowing for an increase in the cropping intensity and diversification of crop production through 'full control' - irrigation. Such systems are not mutually exclusive, and several of them can find their application in a single livelihood context.

It is also important to design investments in the sector so that they promote multiple uses of water. Multiple use of water systems (MUS) can provide

the more vulnerable users with low-cost services for domestic water, agriculture (irrigation, rainfed), homestead, garden, animals, habitats for fish and other aquatic resources and rural enterprise water supplies.

Water also plays a key role in climate change adaptation. Climate change is leading to increased frequency and intensity of extreme events but also increased variability of rainfall patterns. It is becoming more difficult to predict future patterns of supply and demands with any great confidence. Adaptive management puts the emphasis on flexible planning, backed with strong monitoring and information management system that allow for constant adaptation and periodic upgrading of systems (FAO, 2012a).

## 7. MAINSTREAM BIODIVERSITY AND PROTECT ECOSYSTEM FUNCTIONS



Contributes to SDGs:

1 2 6 11 12 13 14 15

Biodiversity, the many species of plants, animals, and microorganisms, the diversity of genes in these species, and the different ecosystems in which they live, is one of the most important heritages on which our future depends. Many species, especially microbes and invertebrates, provide essential regulating and supporting ecosystem services to food production and agriculture, such as nutrient cycling, soil health, water purification, biological control or pollination (FAO 2016i).

Declining biodiversity, in particular as it relates to agriculture, is therefore a major sustainability concern. It is widely recognized that the transformation towards sustainable food and agriculture systems plays a central role in ensuring the future of planetary biodiversity - at the genetic, species and ecosystem levels.



Biodiversity mainstreaming<sup>9</sup> across all agricultural sectors is therefore of vital importance, not only to reduce negative impacts of agriculture on biodiversity, but also to ensure that agricultural production continues to benefit from these important services.

### Agricultural biodiversity: a rich heritage

Biodiversity for food and agriculture has been shaped by family farmers, fisherfolk, pastoralists, forest dwellers, and indigenous peoples for millennia and remains a key element of the livelihood strategies of smallholders throughout the world. The majority of genetic resources diversity is maintained by smallholder producers.

Producers in smallholder and traditional systems have historically used biodiversity, including agricultural biodiversity<sup>10</sup>, as an insurance and coping mechanism to increase flexibility and to spread or reduce risk in the face of uncertainty and shocks. A wide portfolio of genetic diversity provides a broad range of products and services, adaptability and resilience in the face of climate change, emerging pests and diseases, pressures on feed, land and water supplies and shifting market demands. Different species, or varieties, provide different nutrient values, including vitamins, minerals and other micronutrients.

### Threats to biodiversity

The world’s rich agrobiodiversity heritage is threatened from increasing social and economic

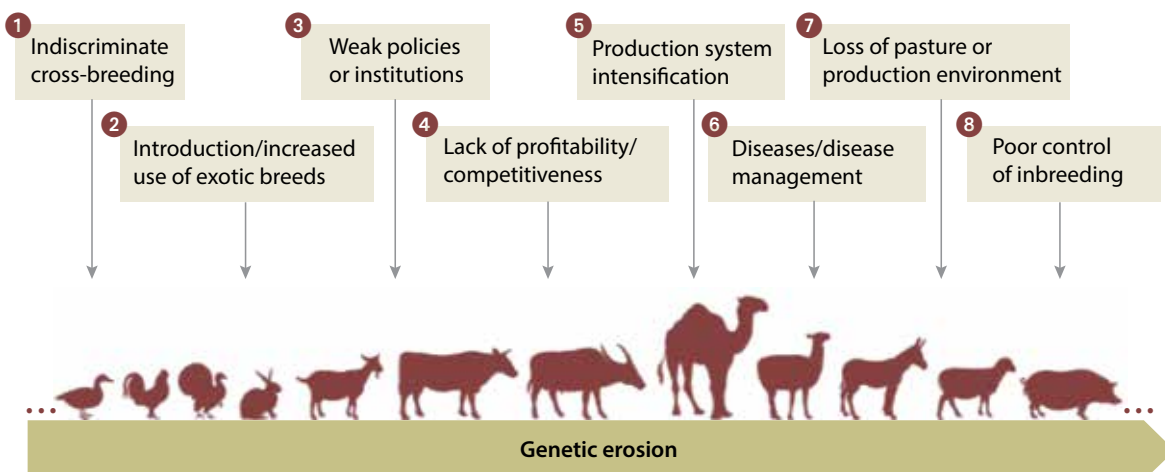
pressures. The main factors leading to genetic erosion are similar for animal and plant genetic resources, including aquatic species: genetic dilution, or replacement, of local species, varieties or breeds; production system changes; inappropriate legislation or policy and weak institutions; and lack of profitability or competitiveness. For crops and their wild relatives, these threats include land clearing, overexploitation, environmental degradation and overgrazing. The same applies for local populations of forest and aquatic genetic resources where drivers include extinction of local communities, degrading habitats or land-use changes, overexploitation, invasive alien species, climate change, and, in the case of aquatic genetic resources (AqGR), water pollution from pesticides and fertilizers (see figure 7).

Inland fisheries and their landings in many regions have been significantly reduced by biodiversity loss, habitat degradation and aquatic pollution. Agriculture related changes were also identified as

<sup>9</sup> Biodiversity mainstreaming involves “integrating actions related to conservation and sustainable use of biodiversity in strategies relating to the production sectors, including agriculture, forestry and fisheries. Mainstreaming might also refer to including biodiversity considerations in poverty reduction plans and national sustainable development plans” (CBD, 2014).

<sup>10</sup> Agricultural biodiversity is a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes.

Figure 7: Top eight reported threats to animal genetic resources - Source: FAO, 2015a



main drivers for emerging zoonotic diseases (Jones *et al.*, 2008; Keesing *et al.*, 2010).

Food production systems are rapidly losing their diversity. Over the last century, agricultural policies have increasingly focused on specialization, productivity and scale economies that have led to less diversified production systems, relying more on external inputs, such as pesticides and hybrid seeds, and less on ecosystem services and local biodiversity.

It is estimated that only 30 crops now provide 95 percent of human food-energy needs, and just five of them – rice, wheat, maize, millet and sorghum – provide about 60 percent. Eight crop varieties (barley, beans, groundnut, maize, potatoes, rice, sorghum and wheat) provide 53 percent of average daily calories consumed – with wheat, rice and maize covering the majority. Five animal species (cattle, sheep, goats, pigs and chicken) provide 31 percent of average daily protein consumed. By contrast, more than 600 aquatic species are being farmed in aquaculture, producing more than half of all food fish supplied for human consumption (FAO, 2016f).

Furthermore, the emphasis on intensification of individual agricultural sectors in recent decades has created a situation in which crop production, livestock, forestry, capture fisheries and aquaculture increasingly interact with each other. Deforestation for crop production, for example, destroys habitats for wild pollinators, while intensive use of fertilizers leads to water pollution, which harms aquatic living organisms.

Gaps were identified in the capacity to manage genetic resources for food and agriculture, particularly in developing countries (FAO 2015a, FAO, 2010). The global plans of action for the management of these genetic resources, adopted by the Commission on Genetic Resources for Food and Agriculture, aim at remediating the gaps identified in the global assessment reports. Progress has been made globally in national awareness raising about the value of genetic resources for food and agriculture, education and human capacity, building of national institutions for the management of these genetic resources and the development of legislation for their management (often linked to

National Biodiversity Strategies and Action Plans, or NBSAPs).

### Promoting more integrated production systems

Important synergies and complementarities between agricultural sectors (crops, livestock, capture fisheries and aquaculture) can be managed. These sectors can be supported by forests, which provide ecosystem services, especially soil formation, water purification, biodiversity conservation and climate regulation. Synergies between livestock and crop production are especially significant. Crops provide fodder and feed, and grasslands contribute to sequestration of some of the greenhouse gases emitted by livestock. In turn, livestock produces manure that contributes to the productivity of crops and, by reducing the need for mineral fertilizer, improves sustainability. Practices and approaches such as agroforestry, and integrated crop-livestock systems support ecosystem services, such as pollination.

### Managing landscapes for biodiversity and ecosystem services

Mainstreaming biodiversity across the agriculture sectors means protecting the ecosystem services that are often derived from the landscape scale. For example, controlling pests in one field requires consideration of several trophic aspects across the landscape; combating soil erosion on the slope of a watershed involves the improvement of the land's capacity to absorb water across the entire slope; and ensuring adequate pollination services requires the integration of diverse pollinator habitats throughout the landscape. Landscape or territorial approaches are necessary to ensure sustainability. This often requires reversing the degradation of natural habitats at landscape scale due to unsustainable agriculture practices, in particular in mountain, forests, freshwater and coastal environments. Managing landscapes and seascapes for biodiversity and ecosystem services requires coordinated actions and the mobilization of a wide range of actors.

Providing incentives for ecosystem services from agriculture is one approach for transforming the management of landscapes. Incentives are strategies used by the public and private sectors to encourage

food producers to protect or enhance ecosystem services that benefit people and planet. They are diverse and can include regulatory (permits, laws, quotas) and voluntary (certification, labelling) measures (Box 28).

### BOX 28: DEVELOPING SMART SUBSIDIES FOR FOREST CONSERVATION IN COLOMBIA

In Colombia, a review of existing agriculture and environmental financing instruments led by Earth Innovation Institute EII, World Wildlife Fund Colombia, Forest Trends y Fundación Natura has identified adjustments that could offer the correct signals to relevant sectors and effectively reduce deforestation: (1) 'AgroBosque': a new incentive that would go beyond the existing subsidy programme for commercial forest plantations to cover also conservation and restoration through silvopastoral and agroforestry systems; (2) 'EcoAgro': to broaden the scope of the Rural Capitalization Incentive programme, which aims to increase competitiveness of the agrolivestock sector, to farmers who are also willing to invest in rehabilitation of soils and pasture.

## Protecting pollinators

Pollination is a keystone process of all terrestrial ecosystems. Without this service, many interconnected species and processes functioning within an ecosystem would collapse. A significant part of crop pollination is delivered by bees. The vast majority of flowering plant species is specialized for pollination by animals, mostly insects. They represent 35 percent of the world's crop production, and 87 percent of the output for leading food crops worldwide (FAO, 2016j). There is an increasing dependence of agriculture on pollinators in response to the growing human demand for fruit, vegetables and nuts.

Landscapes influence wild pollinator distribution. A recent global analysis (Batáry *et al.*, 2011) revealed the importance of maintaining a certain amount of natural or semi-natural habitat around or within agroecosystems. The type and diversity of habitat determine the pools of pollinators available for farms. Most producers cannot control the

whole landscape but can act on how the fields and their borders are managed. The careful choice of flowering plant species and a clear knowledge of methods for the establishment and maintenance are critical for the successful functioning of planting (Isaacs, Blaauw, Kwapong *et al.*, 2016). (Box 29)

### BOX 29: STRATEGIES AND PRACTICES TO ENHANCE POLLINATORS IN GHANA

Large-scale monocultures and the loss of non-cultivated land deprives pollinators of their habitat and pesticide use threatens pollinator populations. Restoration of biodiversity within and around crop fields can improve pollinator habitat and, thus, enhance pollination services. This can be achieved, for example, through reduced mowing of non-crop areas, cultivating hedgerows or intercropping with flowering crops. Research suggests that if 20 to 30 percent of the surrounding landscape within a mile of the farm is maintained as permanent pollen and nectar-rich habitat, many types of crops can get their pollination needs met from the bees sustained by that habitat.

In Ghana, farmers for many years have been practicing farm-management methods that support pollinators. It is common practice, for example, for vegetable growers to line their field boundaries with one or two rows of cassava plants. Most cassava varieties will flower three months after planting, producing a profuse amount of nectar that attracts bees and other insects. Vegetable crops such as aubergine, tomato and paper – none of which are highly attractive to pollinators – most probably benefit from visits which were initially attracted by the cassava flowers. In addition to the flower resources, cassava stems are pithy and serve as nests for many carpenter and other wood-boring bees and wasps. Additional on-farm 'pollinator-friendly' practices in Ghana include leaving bushes within the farming area which serve as refugia to pollinators into the field before the crop flower, or flowering after the crop harvest.

## Conserving genetic resources

Genetic resources must be conserved on-farm, *in situ* and through soundly managed and diversified ex-situ conservation schemes and gene banks. Over the past decade, gene banks for plant genetic resources (PGR) have increased in both size and number (FAO 2016i). In animal genetic resources (AnGR) ex-situ conservation is technically more challenging than for PGR. Forest genetic resources (FGR) and aquatic genetic resources (AqGR) are to a large extent conserved in wild populations, and FGR are also managed in naturally regenerated ecosystems. In this way, evolutionary processes are maintained, and genetic diversity changes temporally and spatially within the populations.

Ensuring that appropriate genetic resources with relevant traits are available and accessible, especially for use in developing improved varieties or breeds, is crucial for the future. In most countries, a significant part of the genetic diversity used in food and agriculture originates from other nations. Countries are thus interdependent when it comes to accessing the genetic resources needed to safeguard their food security. At the same time, it is widely acknowledged that countries have the sovereign right to exploit their own resources, including the right to control and limit access to them (CBD, 1992). Promoting fair and equitable sharing of the benefits arising from the utilisation of genetic resources and appropriate access to such resources is important for sustainable agriculture. This is supported by the International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA) and the Nagoya Protocol on Access and Benefit Sharing of the Convention on Biological Diversity.

## Markets and consumption behaviour that support biodiversity

Consumers' demand is an important driver affecting biodiversity conservation. Biodiverse agroecosystems supply a wide range of foods rich in essential nutrients to maintain human health. The promotion of sustainable diets would ensure that consumers' demand is aligned with the capacity of ecosystems to provide food in a sustainable way.

Production systems that are based on biodiversity and ecosystem services increase biodiversity across space and time. The experience of the FAO Forest and

Farm Facility supporting farmer organizations for the marketing of agroforestry products in ten countries shows that markets that are developed as vertical value chains for single products do not resonate with diversified production systems such as agroecology and agroforestry. The diversification of products, which generally involves local and cultural traditions, lends itself to market configurations based on short value chains. FAO's work on markets for sustainable agriculture and agroecology (FAO and INRA, 2018) shows that diversification of market channels, including creating new markets, are promising options for supporting sustainable agriculture.

Market incentives include subsidies that can in some cases be harmful to biodiversity and ecosystem services. FAO is working with partners to ensure that fishing capacity is adjusted to sustainable levels through policy and regulations, including judicious use of targeted incentives, while eradicating subsidies that contribute to overcapacity and overfishing or support illegal, unreported and unregulated fishing.

## 8. REDUCE LOSSES, ENCOURAGE REUSE AND RECYCLE, AND PROMOTE SUSTAINABLE CONSUMPTION



### Contributes to SDGs:

2 6 7 12

Reducing food losses and waste is gathering increasing interest and action among policy-makers. Food losses refer to the decrease in edible food mass throughout the different segments of the supply chains: production, post-harvest handling, agroprocessing, distribution and consumption. Food waste refers to the discarding of food that was fit for human consumption – by choice or as a result of negligence. The causes of food losses and waste vary throughout the world and are very much dependent on the specific conditions and local situation in a given country.

Every year the world loses, or wastes, about a third of the food it produces. The Global Save Food Initiative<sup>11</sup> provides worrying estimates of food losses: 35 percent of fish and seafood, 30 percent of cereals,

<sup>11</sup> Global Save Food Initiative led by FAO and Messe Düsseldorf.

45 percent of fruits and vegetables, 45 percent roots and tubers and 20 percent meat. The global economic cost of food wastage, based on 2009 producer prices, is USD 750 billion, approximately the GDP of Turkey or Switzerland in 2011. The lost grain in sub-Saharan Africa alone could meet the minimum annual food requirement of 48 million people. Produced but uneaten food vainly occupies almost 1.4 billion hectares of land (close to 30 percent of the world's agricultural land area). This food waste translates to squandering 250 km<sup>3</sup> to 300 km<sup>3</sup> of water, in other words the equivalent of surface and groundwater resources consumed in producing the food (the annual water discharge of the Volga River), a cost of USD 4 billion to USD 17 billion and 1 to 1.5 percent of global energy (Aulakh and Regmi, 2013). Loss and waste also have an impact on fishery resources: high post-harvest losses contribute to more pressure on fishery resources, as only about two thirds of production reach the final consumer.

Wasted food also has an impact global climate change. Without accounting for GHG emissions from land use change, the carbon footprint of food produced and not eaten is estimated at 3.3 gigatonnes of carbon dioxide equivalent (FAO, 2013e). Just to give an idea of its size, one gigatonne is roughly equivalent to the emissions generated by all forms of transport in the European Union over a year. Compared with country emissions, food wastage would rank as the third top emitter after the United States of America and China.

### Acting on food waste and losses

All actors in the food chain, 'from farm to fork' or 'from sea to plate', can play a role in reducing losses, reusing, recycling and promoting more sustainable consumption patterns. This requires a good understanding of the dimension, causes, impacts of food waste and losses in addition to potential solutions. Major policy areas, such as agriculture, fisheries and food safety, all have a role to play and could be used to better combat food waste. For example, the move away in the European Union's Common Agricultural Policy (CAP) from intervention-based agriculture scheme reduced overproduction. Improving post-harvest activities in developing countries is an important way to increase farmers' incomes and improve the efficiency of the food systems. In developing countries, most food losses occur during harvest and storage.

Solutions to food-loss reduction should not be more costly than the food loss itself, nor cause any negative impact or risk on consumer's health, nor place a higher burden on the environment and GHG emissions. Therefore, a good situation assessment is key. It starts with an identification and quantification of the main causes of food losses; analysis of the impact and solutions to reduce this waste on their technical and economic feasibility, food quality and safety requirements, social acceptability and environmental sustainability (Box 30).

#### BOX 30: BANANA FOOD LOSSES ASSESSMENT TO INFORM THE DEVELOPMENT OF A STRATEGY, KENYA

In 2014, FAO carried out with the Government of Kenya an assessment of the banana value chain (dessert, plantain). Smallholder farming dominates the banana subsector with an estimated 390 000 farmers growing the fruit, the majority of whom are women, and about 500 000 are estimated to be directly involved in the business. Bananas plants occupy an average 0.21 of a hectare under a mixed cropping pattern. Mixed banana varieties are grown mainly under rainfed conditions.

The following elements of a strategy were proposed on the basis of the finding, for example with:

- (1) capacity development to strengthen the supply chains downstream (post-farm) because that is where the losses occur (the dissemination and extension of the various);
- (2) minimizing the handling of produce in storage and distribution systems, by integrating the supply chain approach and appropriate sequencing in the development of infrastructure that will ensure shorter supply chains, with fewer intermediaries;
- (3) investigating the potential (market and viability) of value-added processing in the banana chains by specialized processing enterprises, as well as quality improvement through better handling and ripening;
- (4) market development for diversified and value-added banana products, in addition to better-quality fruit, and promoting their consumption;
- (5) introducing a post-harvest pest and disease-management plan;
- (6) introducing, improving and expanding technology, structures and equipment, at trader and wholesale level, where it has more potential than at farm level;
- (7) working on the national banana policy;
- (8) establishing a monitoring mechanism, to estimate food losses at any particular time, sampling of banana traders at various stages along the supply chain and taking account of their practices in the trade. (FAO, 2014f).

## Moving towards a circular economy in the food and agriculture systems

One of the principles of agroecology is to enhance the recycling of biomass with a view to optimising organic matter decomposition and nutrient recycling over time. However, planning for efficiency improvement requires a careful assessment of cross-sectoral dimensions and potential trade-offs of efficiency solutions, even though a result that is promising for one dimension may lead to negative outcomes in another.

The philosophy of the circular economy can be adapted in the food and agriculture subsectors as an alternative to a traditional linear economy (produce, use, dispose) in which natural resources are kept in use for as long as possible, value is added from them while in use. Products and materials are recovered and regenerated from each of the production lines and across subsectors.

Residues from the different sectors of agriculture are often hidden resources. Their reuse and recycling can provide nutrients for the soils, food for fish or livestock. Integrated aquaculture-agriculture, integrated multi-trophic aquaculture, recirculation aquaculture systems, hydroponics and aquaponics are all systems that can contribute to more efficient use of water, land and nutrients.

CFS recommended in its 2014 conference that states and international organizations better integrate food chains and systems perspectives in any food security and nutrition strategy, or action, for the sector. Reduction of food losses and wastes (FLW) should be systematically considered and assessed as a potential means to improve agricultural and food-systems efficiency and sustainability towards improved food security and nutrition. Direct and indirect causes of FLW in a given system should be analysed to identify hotspots where it would be most efficient to act.

## Promoting energy-smart food systems

Clean and efficient use of energy is also important along the value chain. Energy-smart food systems seek to reduce the energy footprint of food production and consumption. Developing and

emerging economies are confronted with a two-fold energy challenge: expanding access to energy and promoting the transition to sustainable, low-carbon energy systems. A key element in this challenge is to identify the most promising domestic renewable energy resources and implement policies to promote their sustainable development. Bioenergy and Food Security (BEFS) Rapid Appraisal (RA) tools can support this (Box 31).

### BOX 31: RAPID APPRAISAL TOOLS INFORMING BIOENERGY POLICY IN PERU

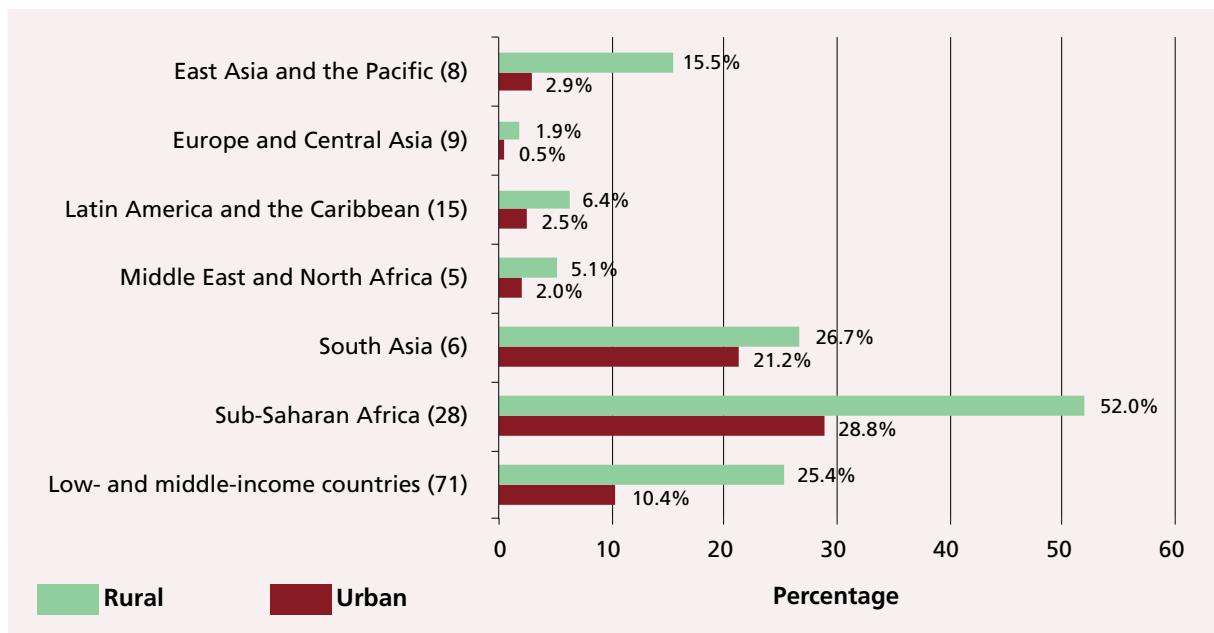
The BEFS RA tools assist policy-makers and technical officers to understand: (1) energy, agriculture and food security in the context of their country; (2) viable sustainable bioenergy options; (3) bioenergy options which require more in-depth analysis, for example through the BEFS Detailed Analysis.

The development of biofuels and bioenergy, generally, opens up an opportunity for strengthening the agriculture sector in developing countries. However, this requires a process of strategic planning and taking account of sustainable development. For example, Peru is fortunate in terms of the potential for biomass resources available. Nonetheless, biomass has several current uses. In the case of biomass uses for energy generation only large-scale output within the agro-industrial sector are considered economically viable in part due to production cost, the availability of raw material, storage and transport. The main source for the generation of electricity based on biomass to supply the interconnected system, is that obtained from biogas generated by the anaerobic decomposition of plant and animal waste. The latter can come from livestock ranches, poultry farms and also from the combustion or gasification of biomass residues produced in activities from the agro-industrial sector in addition to the forest-products industry (e.g. sawmills). Exploitable residue materials for these purposes include sugarcane bagasse, rice husk, wheat chaff and forestry waste. Also considered are residues produced by poultry, beef cattle and pigs. However, those residues may also be needed as compost for soil fertility management. A careful assessment of the pros and cons is, therefore, required.

## IMPROVE LIVELIHOODS AND FOSTER INCLUSIVE ECONOMIC GROWTH

Inclusive growth is about turning economic expansion into broad-based improvements in living standards for all. It is about creating opportunity and improving livelihoods across and within societies. Some of the challenges are the rising income inequality within countries and between nations, which are driving a variety of economic and social ills. Adding to this, the knowledge, power and coordination gaps between actors, gender inequalities, the lack of recognition of smallholders and land users rights and interests, the weak enforcement of existing policies and laws contribute to continued marginalization of smallholders, particularly women. Current production and trade policies are deepening the gap.

Figure 8: Share of rural and urban populations in low and middle-income countries living in extreme poverty (less than \$1.25 a day), by region - Source: FAO, 2015g



Notes: Rural and urban poverty rates, using international poverty lines, are not available for most countries. Here, they are estimated using available poverty data and following methods described in IFAD (2010) for all countries except China, India and Indonesia. That is, at the country level, the incidence of rural poverty, using international poverty lines, is estimated using (a) national poverty headcount rates based on international poverty lines and (b) rural and urban poverty headcount ratios using national poverty lines. For China, India and Indonesia, rural and urban poverty rates that use international poverty lines are available, and were therefore used for the regional estimates. In all cases, the most recent poverty information available for the period 2005–12 was used.

## 9. EMPOWER PEOPLE AND FIGHT INEQUALITIES



Contributes to SDGs:

- 1
- 2
- 5
- 8
- 10
- 13
- 14
- 16

Smallholder and family farmers are often marginalized by the lack of recognition of the rights and interests of producers, or weak enforcement of existing policies and laws. Too often, their limited access to knowledge, information and resources, and their poor organizational capacity and bargaining power leaves them ill-prepared, unable to benefit from opportunities for contributing to rural transformations. Due to the vicious cycle of poverty and discriminatory norms, rural women face even more severe constraints that prevent them from seizing socio-economic opportunities. Rural women and men’s empowerment, through inclusive participation in community decisions, education, strengthening of formal and informal organizations, in addition to conducive policies and legislation, is central to efforts towards more sustainable and inclusive agriculture and food systems.

## Crafting targeted engagement

Ensuring inclusive agricultural growth implies the recognition of the needs of different categories of rural people, and the crafting of specific approaches. To effectively engage the community in the development process, it is important to systematically target women, youth and particularly vulnerable groups (indigenous people, migrants and refugees), which are often disadvantaged in access to information, opportunities and resources.

For example, women's socio-economic empowerment plays a central role in poverty reduction and should be integral to any development intervention. Women face more barriers than men. Assisting women in developing their full labour market potential makes a significant contribution to economic growth. Increasing their skills and employment opportunities is fundamental to rural poverty-reduction strategies, as well as increasing their level of decision-making, access to social protection and services such as childcare. More broadly, addressing gender discrimination in countries' legal frameworks will be game changing (FAO, 2011a).

Another very important target group is youth. They are the leaders and producers of today and tomorrow, and making an investment in their

capacities, innovation and entrepreneurial potential today is significant for the sustainability of food systems, as well as for boosting poverty reduction and food security for the future. However, youth tend not to be attracted by productive activities, often because of poor incentives and inadequate support systems. The example of the National Youth Employment in Agriculture Programme (YEAP) in Nigeria shows it is possible to rejuvenate agriculture via the empowerment of youth – both graduates and producers (Box 32). Therefore, with the right enabling environment and support system, youth can have a pivotal role in modernizing the agricultural sector and food systems.

The fragmentation and small sizes of farms also constrain smallholder producers' access to services, markets, and governance mechanisms, and limit their ability to defend their rights and interests. The same applies to fisheries and aquaculture. By coming together in formal organizations, these smallholders can gain joint access to resources, set up small enterprises and work their way out of poverty (FAO, 2016n). In particular, through collective action, cooperatives, POs, networks and even informal community organizations, poor rural people can improve their bargaining power, access to markets and productivity, increase their participation in decision-making processes and influence the formulation of national policies.

### BOX 32: SUPPORTING YOUNG ENTREPRENEURS IN AGRICULTURE TO FOSTER ECONOMIC GROWTH IN NIGERIA

Agricultural growth contributes to reducing poverty directly, by raising producers' incomes, and indirectly, by generating more employment opportunities in rural areas. With this in mind, FAO is supporting the Federal Ministry of Agriculture and Rural Development of Nigeria to better engage young rural people through the Youth Employment in Agriculture Programme (YEAP).

Launched in September 2014, the scheme aims to create more decent employment opportunities and foster entrepreneurship in key value chains among poor young people in rural areas. Nigeria is committed to allocating some USD 230 million to cover the total cost of the programme, which will guide the support to create

750 000 jobs for young people in agriculture over a five-year period. The support system works through a scheme of private-public partnerships, including vocational centres for the provision of training, starter packs, business development support and funding.

The programme has already trained almost 7 000 young 'agropreneurs' in different agricultural productions, including rice, aquaculture, poultry, apiculture and palm oil. The training has contributed to increase the productivity of poor young people and their access to decent employment opportunities, with a positive impact on rural poverty reduction. (FAO, 2017e).



The important benefits that smallholder and family farmers can gain from organising can be conceptually mapped into four core areas that are discussed in the document: (1) access to information and services; (2) improved community-level natural resources governance; (3) increased access to markets; (4) empowerment and advocacy.

### Access to information and services (links to action 1)

In many contexts, smallholders, particularly of marginalized groups, are limited in accessing educational resources on their rights and government services, in addition to agricultural production information such as commodity prices. In some cases this lack of access can be due to discrimination, and other times it is simply because of the privatization of public services. Overcoming information barriers can be critical for smallholders to be able to effectively advocate for their rights and interests, and increase productivity. Social mobilization and collective action to reduce costs and strengthen social cohesion can be key tools for addressing and reducing conflict, marginalization and poverty. The Dimitra Clubs, promoted by FAO, for instance, is an approach that has proven to be particularly powerful in fostering gender equality, people's empowerment, women's leadership, community mobilization and collective action, reaching tangible results for sustainable development.

### Improved community-level natural resource governance (links to action 10)

Unbalanced power between individual smallholders and other more powerful actors can often lead to further marginalization to access and use natural resources, even when governance frameworks emphasise equality. Collective action for defending private land rights, ensuring equal access to resource commons and respecting customary rules are all examples in which smallholders organize themselves to defend their rights. Ultimately this kind of collective action can be used to avoid crisis situations, but more long-term solutions are usually needed to ensure sustainable and equitable conflict mediation and protection of human rights.

### Increased access to market (links to action 2)

POs, such as cooperatives, have a long history of supporting smallholders in achieving economies of scale to access and compete in new markets. In many instances, such as dairy production, access to agricultural processing infrastructure is not feasible for individual smallholders due to investment costs. Smallholders, by pooling resources and coordinating strategies, can access large-scale value chains and markets, and develop new ones to compete with larger producers. Provided that these organizations are inclusive, they can be a critical jumping board for smallholders to move out of poverty (FAO and Agricord, 2016).

#### BOX 33: COOPERATIVE ENTERPRISES ARE MAJOR PLAYERS IN THE GLOBAL ECONOMY

Cooperatives range from small grassroots initiatives to multibillion dollar businesses and operate in all sectors of the economy. A recent study indicates that 250 million people are actually employed or earn their living thanks to a cooperative enterprise.

Due to the values and principles they embody, as well as the economies of scale they generate, cooperatives can contribute to reducing trade costs and enhancing the ability of firms to connect to regional and global value chains. Cooperatives can enable access to goods and services, and promote fairer trade at competitive prices, inclusive employment and sustainable economic growth. With expansion in South-South trade flows, cooperative-to-cooperative trade is an alternative for countries that are still facing high trading costs. Furthermore, cooperatives are important for the implementation of the 2030 Agenda (Saner and Yiu, 2017).

### Empowerment and advocacy (links to action 4)

Empowerment of smallholders in an advocacy and policy context can encompass a wide range of activities and approaches. It is critical

that smallholders, through their POs, have the capacity to actively and effectively represent their interests in decision-making spaces, and have the right to participate as equal stakeholders in governance processes. The former speaks to the need of smallholder groups to have access to dedicated capacity development programmes to strengthen their capacities to effectively influence policy processes. The latter focuses on ensuring that governance mechanisms are inclusive and participatory so that smallholders have the political space for their voices to be heard and enable bottom-up approaches to development. In both cases, POs play a key role in engaging, empowering, representing and advocating for smallholders in policy processes. FAO's Forest and Farm Facility offers a prominent example of this area of work (Box 34).

#### BOX 34: FOREST AND FARM PRODUCER ORGANIZATIONS IN MEXICO

Mexico's national federation of forest owners takes an active role in the country's national forest council. The Confederacion Nacional de Organizaciones de Silvicultores (CONOSIL) represents 600 000 forests-owning family in the country. CONOSIL was formed in 2005 as a national federation of 32 state associations of family-forests owners. It lobbies for an advance in its members' livelihoods from improved forest production. To achieve that it worked with multiple stakeholders: state and national governments, with research, education, technical assistance and information, with financing bodies (negotiating low-cost credit for members). One of the most important partnership established is with the national forest council (Consejo Nacional Forestal) as the body responsible for multistakeholder consultation providing advice to the government on a number of forest-related issues.

This engagement brought fruits. Government budgets for forestry have been increased and communication between relevant stakeholders has improved as a result of effective lobbying. (FAO and Agricorn, 2016).

POs can also contribute to improving working conditions and addressing issues such as child labour and decent employment opportunities. Beyond job creation, improved working conditions and fair incomes in the agricultural sector are crucial to supporting the well-being and long-term productive potential of young workers, and are also major determinants of how attractive agricultural work is. Options to develop new and more decent employment opportunities should also focus on reducing the drudgery of agriculture and agroprocessing through use of appropriate technologies, the adoption of occupational safety and health measures and the adoption of internationally agreed labour standards, including the abolition of child labour<sup>12</sup>.

<sup>12</sup> Child labour is defined as work that is inappropriate for a child's age, affects children's education or is likely to harm their health, safety or morals.



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### BOX 35: ADDRESSING CHILD LABOUR IN FISHERIES IN CAMBODIA

Child-labour issues in agriculture need to be understood and integrated into national development policies and strategies in the sector. Agriculture is responsible for more than 70 percent of all child labour and corresponds to 108 million boys and girls between the age of 5 years and 17 years.

The example of Cambodia illustrates efforts to mainstream child labour into national programmes. Since 2010, FAO has been working with Cambodia to prevent and reduce child labour in the fisheries sector. The Cambodian Ministry of Agriculture, Forestry and Fisheries (MAFF) has proactively integrated child-labour concerns into existing policies and legal frameworks. These efforts have led to the drafting of a first Child Development Strategy, which includes a component on child-labour prevention.

A child-labour study was conducted in 2011 using the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication. On the basis of these guidelines, MAFF drafted the National Action Plan 2015-2020 on gender mainstreaming and elimination of the worst forms of child labour in the fisheries sector. The Action Plan has since been endorsed. This initiative was also the opportunity to field test the FAO Handbook for monitoring and evaluation of child labour in agriculture. The Handbook aims at providing agricultural programme staff worldwide with the necessary tools and knowledge to integrate child-labour concerns into their planning, monitoring and evaluation systems. Additionally, it encourages the identification and use of good practices and innovative approaches to prevent child labour.

Addressing these kinds of employment challenges requires more integrated approaches to agriculture and rural development. In particular, increased policy coherence is needed among agriculture, employment and youth-related policies. The Integrated Country Approach (ICA) for promoting decent rural employment is a policy support approach that identifies opportunities to harness the untapped employment potential of agriculture and other rural sectors. (Box 36).

### BOX 36: YOUTH MOBILITY, FOOD SECURITY AND RURAL POVERTY REDUCTION IN TUNISIA

In Tunisia, agricultural and rural development is interrelated to migration flows and the lack of gainful and productive employment opportunities. Moreover, the country has a youthful demographic profile and important challenges in ensuring employment and entrepreneurship-development opportunities for rural youth. Innovative solutions are needed to address root causes of distress economic migration, especially among the rural youth.

A key entry point is the strengthening of national capacity to prevent distress economic migration of the youth. The FAO project builds the capacity of relevant stakeholders, mainly governments, POs and migrant networks, to leverage migration for development. Innovative mechanisms and partnerships to generate decent work opportunities for rural youth in agriculture are supported. The private sector has a pivotal role in facilitating the access to land, finance and markets by young women and men, while also providing an enabling working environment. FAO partners with relevant ministries and stakeholders, and collaborates with other international organizations, such as the International Labour Organization.

Disasters and crises can rapidly wipe out the developments achieved and the livelihood base of populations. Countries in protracted crises are at risk of being left behind. Ongoing crises are often the result of the combination of multiple drivers, including conflict, natural disasters and climate change. Countries experiencing these circumstances need immediate assistance to alleviate hunger and suffering, and medium to long-term actions to build resilience, avoid impoverishment and address the underlying causes of food insecurity. The CFS Framework for Action for Food Security and Nutrition in Protracted Crises (CFS-FFA) should be considered by all actors involved in those situations. (CFS, 2017).

## 10. PROMOTE SECURE TENURE RIGHTS FOR MEN AND WOMEN



### Contributes to SDGs:

1 2 5 6 8 9 13 14

Promoting secure tenure rights and access to land and water is one of the most effective ways to reduce producers' vulnerability, support better and long-term investment on their land and other

### BOX 37: A NEW AGRICULTURAL LAND LAW IN MALI

FAO supports the framework for dialogue and action on Mali's new agricultural land law. Farmers in Mali have gained critical new rights to their traditional land and rural communities have gained much-needed economic stability as a result of a historic new law (Loi 2017-001 du 11 Avril 2017 portant sur le Foncier Agricole). This is the first time in the legislative history of Mali that a law was specifically enacted to deal with agricultural land. The largest platform of peasant organizations in Mali, CNOP (la Coordination Nationale des Organisations Paysannes) played an instrumental role in a project to apply the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT, FAO, 2012c). CNOP facilitated the national multi-actor platform known as "framework for dialogue and action on land governance in Mali". This platform was established in 2014 and created a space for a wide range of actors to discuss changes to the land law.

This new legal framework incorporates several VGGT principles and topics. In particular, it states that at least 15 percent of the land should go to women and youth in public facilities; and it recognizes the role of village land commissions as well as customary rights on land.

FAO supported the activities of the platform to allow the members of the multi-actor framework to collect first-hand information on land conflicts and directly discuss local tenure issues with the communities. This new legal framework incorporates several VGGT principles and topics. In particular, it states that at least 15 percent of the land should go to women and youth in public facilities; and it recognizes the role of village land commissions as well as customary rights on land.

natural resources, and promote more productive and sustainable practices. The livelihood of many rural people directly depends on secure access and control over natural resources. For example, insecure land rights, in particular, can undermine the sustainability of household farming both by deterring long-term investment (e.g. improving drainage or irrigation systems) and by hindering the social relationships which are needed to ensure the sustainable management of natural resources.

Secure and long-term access to land and other resources is an incentive for producers to invest in their land, sustainably manage the resources, and ensure that their soils are healthy and fertile. Governance for tenure of land, fisheries, forests and other natural resource is necessary to avoid overfishing, deforestation and forest degradation, depletion of aquifers and loss of soil quality. This is especially true at a time when demands from other sectors is increasing and resource are becoming scarcer overall.

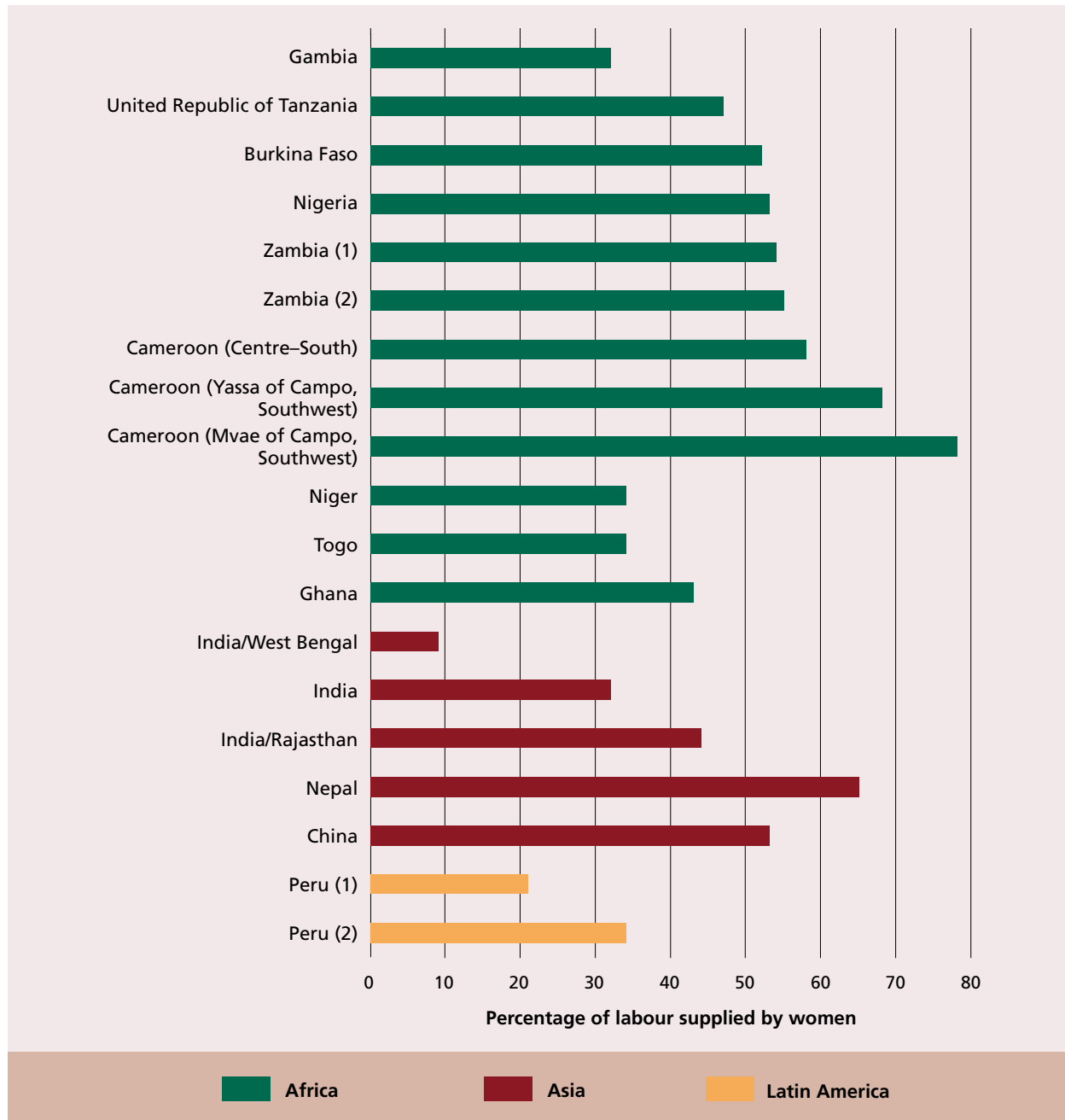
Well-designed and adequate tenure systems generate more equity in access, promote sustainable use of resources and help reduce conflicts. This is particularly important in view of the recent growth in large-scale land acquisitions that have raised concerns as they often focus on the more productive land and waters, with good access to infrastructures and often result in people's displacement. The interests of smallholder producers should be carefully considered in such acquisitions.

The Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (VGGT) form the first set of agreed principles and internationally accepted standards for responsible governance of tenure in order to provide a framework that actors can use when developing their own strategies, policies, legislation and programmes. FAO's programme in implementing the VGGT is based on five pillars: (1) awareness raising; (2) capacity development; (3) support to country level governance of tenure; (4) partnership; and (5) monitoring and evaluation. Empirical evidence shows that secure forest-tenure rights promote private investment in forest management in developing and developed countries (Zhang *et al.*, 1996 and 2007).

Women, youth and indigenous peoples are more likely to face limited access to natural resources. Women make up only 10 to 20 percent of all landholders, and the land that they have tends to be in smallholdings of poorer quality and with

more tenuous rights. Access of indigenous people to their traditional lands, fisheries, forests, territories and to other common property resources are often insecure, absent or under threat.

Figure 9: Proportion of labour in all agricultural activities that is supplied by women - Source: FAO, 2011a



Note: Only the survey for India is nationally representative.

Sources (from top to bottom): Gambia: von Braun and Webb, 1989; United Republic of Tanzania: Fontana and Natali, 2008; Burkina Faso: Saito, Mekonnen and Spurling, 1994; Nigeria: Rahji and Falusi, 2005; Zambia (1): Saito, Mekonnen and Spurling, 1994; Zambia (2): Kumar, 1994; Cameroon, Centre-South: Leplaideur, 1978, cited by Charmes, 2006; Cameroon (Yassa of Campo, Southwest): Charmes, 2006, based on Pasquet and Koppert, 1993 and 1996; Cameroon (Mvae of Campo, Southwest): Charmes, 2006, based on Pasquet and Koppert, 1993 and 1996; Niger: Baanante, Thompson and Acheampong, 1999; Togo: Baanante, Thompson and Acheampong, 1999; Ghana: Baanante, Thompson and Acheampong, 1999; India (West Bengal): Jain, 1996; India: Singh and Sengupta, 2009; India (Rajasthan): Jain, 1996; Nepal: Joshi, 2000; China: de Brauw *et al.*, 2008; Peru (1): Deere, 1982; Peru (2): Jacoby, 1992.

Adopting an approach to access to resources that does not discriminate against women, or vulnerable groups, but encourages families to produce food for consumption, helps ensure food security and improved nutrition. The importance of this issue is reflected in the 2030 Agenda, for example SDG 5 aims to achieve gender equality and empower all women and girls. In Honduras and Guatemala, the rights of indigenous groups were recognized in 2016 (Box 38).

Access to land and other natural resources like water is particularly challenging for young people. Specifically, inheritance laws and customs in developing countries often make the transfer of land to young women problematic, hence they need to be amended. Loans to assist youth in acquiring land are also needed, while leasing arrangements through which the youth gain access – but not ownership – to land may also prove effective. Case studies from the Philippines, Burkina Faso, Ethiopia, Mexico, Egypt and Uganda all highlight possible means of improving the youth's access to land (FAO, CTA and IFAD, 2014).

For small-scale fishers, tenure rights to land in the coastal or waterfront areas are critical.

Small-scale fisheries employ more than 90 percent of the world's capture fishers and fish workers, about half of whom are women. Many smallholder fishers, fish workers and their communities are directly dependent on access to fisheries resources and land.

The Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (FAO, 2015i) are the first internationally agreed instrument dedicated entirely to the sector. It recognizes that small-scale fishing communities need to have secure tenure rights. Through a human rights-based approach, these guidelines support equitable distribution of the benefits yielded from responsible management of fisheries and ecosystems, rewarding smallholder fishers and workers, both men and women.

Stronger tenure arrangement can also help sustain the livelihoods of pastoralists and the sustainability of pastoral production systems. Pastoralism is the main production system practiced in rangelands and drylands, providing livelihoods to an estimated 500 million people globally. Nowadays, pastoral communities face challenges to accessing land and mounting pressure on their livelihoods.

### BOX 38: INVESTING IN SECURE LAND RIGHTS FOR INDIGENOUS PEOPLE IN HONDURAS AND GUATEMALA

There are more than seven million indigenous people in Honduras and Guatemala. They are often among the poorest in the region and depend heavily on natural resources, including forests and cultivable land for their livelihoods. Yet, they frequently lack legal ownership, control over and access to land, which hinders their productive capacity and prevents them from investing in income-generating activities.

FAO is partnering with the World Bank to strengthen the governance and rights of indigenous communities over land and natural resources in Central America. In Honduras, this partnership has designed an investment plan to enable the delimitation and registration of new inter-communal titles in the Mosquitia region. As a result, the President of Honduras in 2016 recognized the ownership of more than one million hectares of communal land, including forests, to 12 regional councils of the Misquito indigenous people, and launched a Plan of Action to promote the conservation of natural

resources and sustainable management of indigenous territories. Thanks to this recognition, about 17 500 poor indigenous families are now able to better access and manage the natural resources present in their territories.

In Guatemala, thanks to a project designed by FAO and the World Bank, several indigenous and rural communities obtained legal recognition of their land. Building on this success, FAO has supported the government in preparing a new investment project to improve the governance of land tenure in the country and in developing a complementary initiative to strengthen territorial management of communal lands.

The project is also supporting the implementation of the Voluntary Guidelines on the Responsible Governance of Tenure (VGGT) to build the capacity of key stakeholders, including government officials and indigenous peoples, to strengthen the governance of land tenure and of other natural resources.

They practice extensive livestock production systems that are environmentally well-suited to these conditions. Traditionally, pastoral communities have accessed and managed these lands collectively, under customary systems. However, government programmes frequently prefer transformation of these areas towards more intensive production systems, including crop output, with public policies favouring individualisation of landownership.

Evidence from comparative studies in East Africa and the Andes (ELLA network, 2017) show that collective land tenure regimes support sustainable pastoral production systems. Public policies should emphasize supporting the maintenance of collective land tenure regimes and improving community mechanisms to manage sustainable land under collective access in pastoral areas. Policies could include: (1) strengthening local and customary institutions for land management and governance through the recognition of collective land access rights; (2) policies on land registration should focus on formalisation rather than individualisation of land tenure; (3) stimulating the formation of small- and medium-sized associations of herders would increase their access to a greater quantity and diversity of pastures; (4) promoting the continuity of sustainable pastoral management strategies through programmes that showcase and reward such practices; (e) sensitize pastoral community about herd-size management and breed improvement.

Access to, ownership and control of water is also becoming increasingly important, in particular in areas where it is scarce and competition increases. 'Water tenure' should therefore be considered in the same way as for land. In addition, many aspects of land tenure affect and are potentially affected by water and its tenure arrangements, as may land reforms. In South Africa, the competition between pastoralists and gardeners over riparian land demonstrates the important link between land and water. (FAO, 2016g).

Recording and monitoring tenure arrangements are key to the establishment of credible and secure tenure systems. The understanding of existing tenure arrangements – formal and informal, individual or collective – for land, water, coastal areas and pastoral land are a starting-point to recognize users and their relationship to the resources.

## 11. USE SOCIAL PROTECTION TOOLS TO ENHANCE PRODUCTIVITY AND INCOME



### Contributes to SDGs:

1 2 5 8 10 13 14

Agricultural producers, in particular small family farmers, in developing countries are the most vulnerable to risks and shocks (e.g. illness, drought and animal diseases). Fishers and aquaculture farmers, in particular in coastal areas, are equally exposed (e.g. tsunamis, change in water temperature and acidity, and hence in fish distribution, and erosion of coastal areas). As a result, they often adopt low risk strategies that limit their income-earning potential.

Social protection can play an important role in addressing this challenge. It encompasses the full set of policies and programmes that addresses economic, environmental and social vulnerabilities to food insecurity and poverty by protecting and promoting livelihoods and is, therefore, an important element of poverty-reduction strategies. Opportunities exist to tailor social protection programmes in a way that they contribute to sustainably enhancing productivity and income in agriculture-based activities, thus leading to building stable and more resilient livelihoods.

### Social protection boosts employment

When social protection measures lead to increased demand for food, other goods and services, agricultural interventions that support supply-side responses can promote local economic growth. This, in turn, can increase employment opportunities in agriculture and agribusiness, in addition to increasing food availability and keeping staple food prices low, with benefits for poor buyers. Such agricultural interventions can also lead to more secure livelihoods, thus progressively reducing the need for social protection (Devereux, 2009). By providing liquidity and financial security to poor producers, social protection measures allow them to invest in agriculture, increase participation in social networks and better manage risks, thereby allowing them to engage in more profitable agricultural

activities. Evidence of the results of combined social protection and agriculture interventions shows that these have larger impacts than these interventions considered separately (Box 39).

Coordinated agricultural and social protection policies (FAO, 2016l) and programmes can support small family producers in breaking out of the cycle of multigenerational poverty.

### BOX 39: COMBINING AGRICULTURAL PRODUCTION WITH SOCIAL PROTECTION IN ETHIOPIA, NICARAGUA AND BANGLADESH

The Government of Ethiopia complemented its Productive Safety Nets Programme (PSNP), a cash transfer and public works programme, with the Other Food Security Programme (OFSP) that provides access to credit, inputs and agricultural extension. Studies have shown that beneficiaries with access to both PSNP and OFSP had the largest improvements in food security, adoption of better agricultural technologies and participation in non-farm business enterprises compared with beneficiaries of either PSNP alone, even if this one offers higher benefits (Gilligan *et al.*, 2009).

Nicaragua's programme Atención a Crisis (2005-2006) combined a conditional cash transfer with either vocational training or a productive investment grant (non-agricultural). Evidence has shown the programme increased income diversification and provided greater protection from drought than basic conditional cash transfers (Macours *et al.*, 2012).

In Bangladesh, Challenging the Frontiers of Poverty Reduction (CFPR) programme provides beneficiaries with asset and cash grants, healthcare support and housing and sanitation materials (HLPE, 2012). Assets are loaned, or provided for free in, the form of livestock, agricultural or non-agricultural assets. The first and second phase impact evaluations of CFPR found an increase in agricultural-asset ownership, self-employment, savings, access to land, food security, income and a reduction in poverty (Rabbani *et al.*, 2006; Das and Shams, 2010)

The 'From Protection to Production' (PtoP) project, implemented by FAO in partnership with UNICEF, has provided insights on how social protection interventions contribute to sustainable poverty reduction and economic growth. Findings have spurred a new area of policy dialogue and support: global and regional level dialogue on strengthening coherence between agriculture and social protection help developing knowledge, facilitating cross-country experience, and sharing and developing tools to assist policy-makers (FAO and UNICEF, 2016).

### Strengthening policy coherence between social protection and agriculture subsectors

Stronger coherence between agriculture and social-protection policies and interventions can assist in improving the welfare of poor producers by facilitating productive inclusion, improving risk-management capacities and increasing agricultural productivity – all of which enable rural-based families to gradually lift themselves out of poverty and hunger (Tirivayi *et al.*, 2016). There is also evidence that countries investing in social protection have lower levels of child labour (ILO, 2013).

Social protection can also help encourage smallholder and vulnerable producers to adopt practices that contribute to disaster risk reduction, coping with emergencies and crises, climate change adaptation and mitigation and reduce environmental degradation. By improving risk-management capacities and relieving liquidity constraints, social protection allows family farmers to invest and engage in more productive activities in addition to improve their human capital, which is key to lifting their labour productivity and in turn their employability. They can be a vehicle to promote and facilitate the adoption of more sustainable agricultural practices. By providing them with a minimum income, these measures help reduce insurance and credit constraints, allowing poor rural people to invest in agricultural production, or to start an enterprise, and facilitating economic transition (FAO, 2015g). In Botswana, a multisectoral approach to social protection is promoted (Box 40).



#### BOX 40: DELIVERING SOCIAL PROTECTION THROUGH A MULTISECTORAL APPROACH IN BOTSWANA

The Government of Botswana implements a number of social protection programmes through several ministries, which together provide comprehensive social assistance to various poor and food insecure groups. The Ministry of Local Government runs a public works scheme called 'Ipelegeng' that offers temporary employment, which scales up during drought. The same ministry provides grants to 'remote area dwellers' to develop rural infrastructure and promote income generation and agricultural production. The Department of Social Services runs a programme for destitute people, 73 percent of whom are women, which includes cash and food transfers designed to ensure a nutritionally balanced diet. The department also runs the state old-age pension scheme for all citizens over 65 years, with 60 percent of social pensioners being women. The Ministry of Education runs a comprehensive school feeding programme that delivers meals every school day to all primary and secondary students in state schools. The Ministry of Health runs a 'vulnerable group feeding programme' that distributes food rations through clinics to malnourished children under the age of six years, pregnant and breastfeeding women. Botswana has designed comprehensive social-development framework on the basis of these various initiatives. (Europaid, 2012; HLPE, 2012).

In forestry, social protection can also contribute to efforts towards better resource conservation, preventing negative coping strategies that lead to forest clearance and land degradation. The additional income it provides, for instance, can lead to investments in non-forest employment, which diverts labour and pressure away from forests; compensate for forgone production revenue through income transfers that are conditional on forest conservation; improve working conditions and wages of sector workers; and enable beneficiaries to acquire knowledge and skills in reforestation or afforestation. For this to happen social protection and conservation programmes need to be designed and implemented in a coordinated way.

Social protection is specifically important in contexts of prolonged ongoing crises and conflicts (Box 41).

#### BOX 41: REDUCING THE IMPACT OF THE CRISIS WITH PREVENTIVE SOCIAL PROTECTION MEASURES IN YEMEN

Yemen is one of the poorest countries in the Near East. One-third of its population is undernourished and living in poverty. Nevertheless, Yemen has a social safety net system that includes cash assistance and the Social Fund for Development (SFD), which aims to extend the provision of basic social services. SFD also designed and implemented labour-intensive projects to provide temporary employment for poor families. An Emergency Social Safety Nets project was launched that delivered cash assistance to poor households, alongside a second public works programme that constructed useful community assets and increased temporary employment opportunities. The success of these responses was attributed to the activities of SFD before the crisis struck, which allowed for a rapid scaling up of ongoing programmes. (HLPE, 2012).



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## 12. IMPROVE NUTRITION AND PROMOTE BALANCED DIETS



Contributes to SDGs:

- 1
- 2
- 3
- 5
- 12

It is often taken for granted that agriculture and food systems provide for people’s nutritional needs, and that improving output and productivity automatically results in improved nutrition. However, this is not the case. Agriculture and food systems influence diets and nutrition in various ways, which can have both positive and negative impacts. Agriculture policies that focus exclusively on productivity often favour the production of limited commodities. This tends to reduce the availability of diversified food, in particular in rural areas, leading to a deterioration of people’s nutritional status. It is, therefore, essential that policies and investments which shape food systems are designed to address and prevent nutritional problems.



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Figure 10: Comparing prevalence of undernourishment and severe food insecurity

The prevalence of undernourishment and the prevalence of severe food insecurity show a consistent picture for most countries, but differences exist. Source: FAO, IFAD, UNICEF, WFP and WHO, 2018.

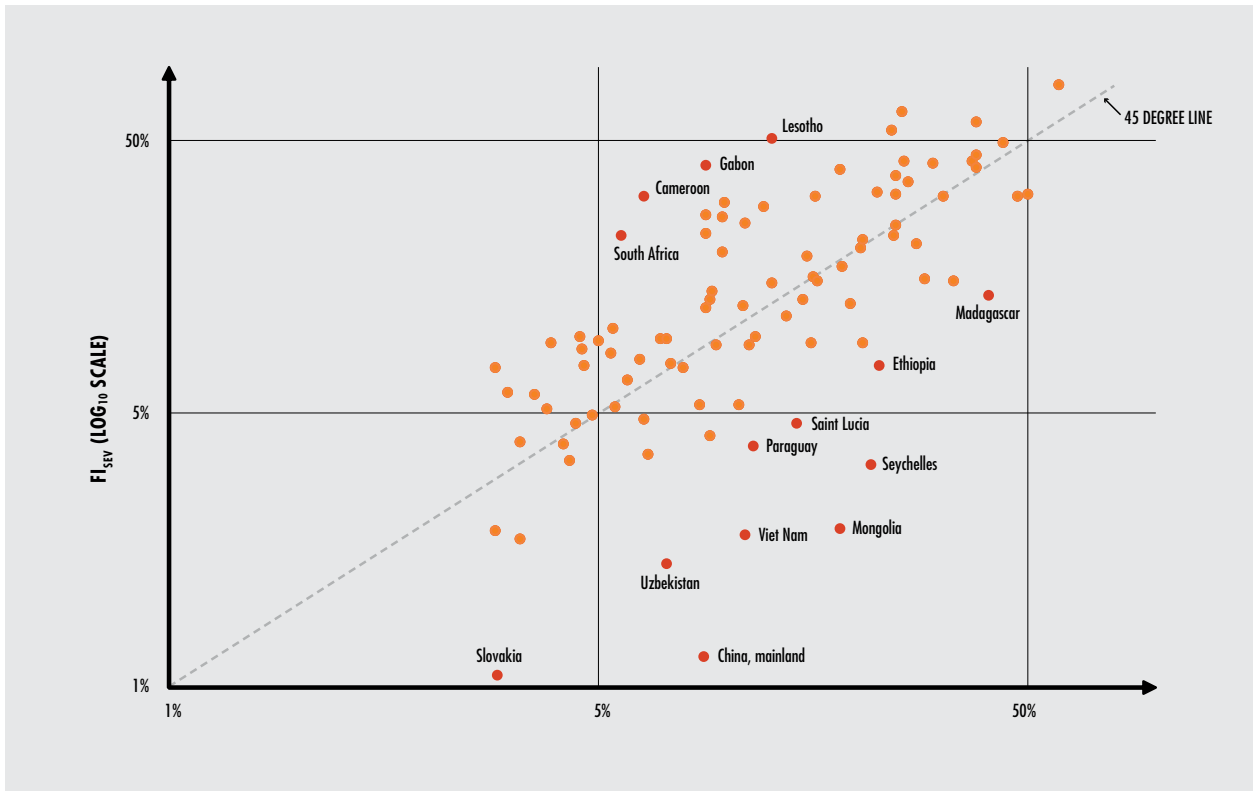
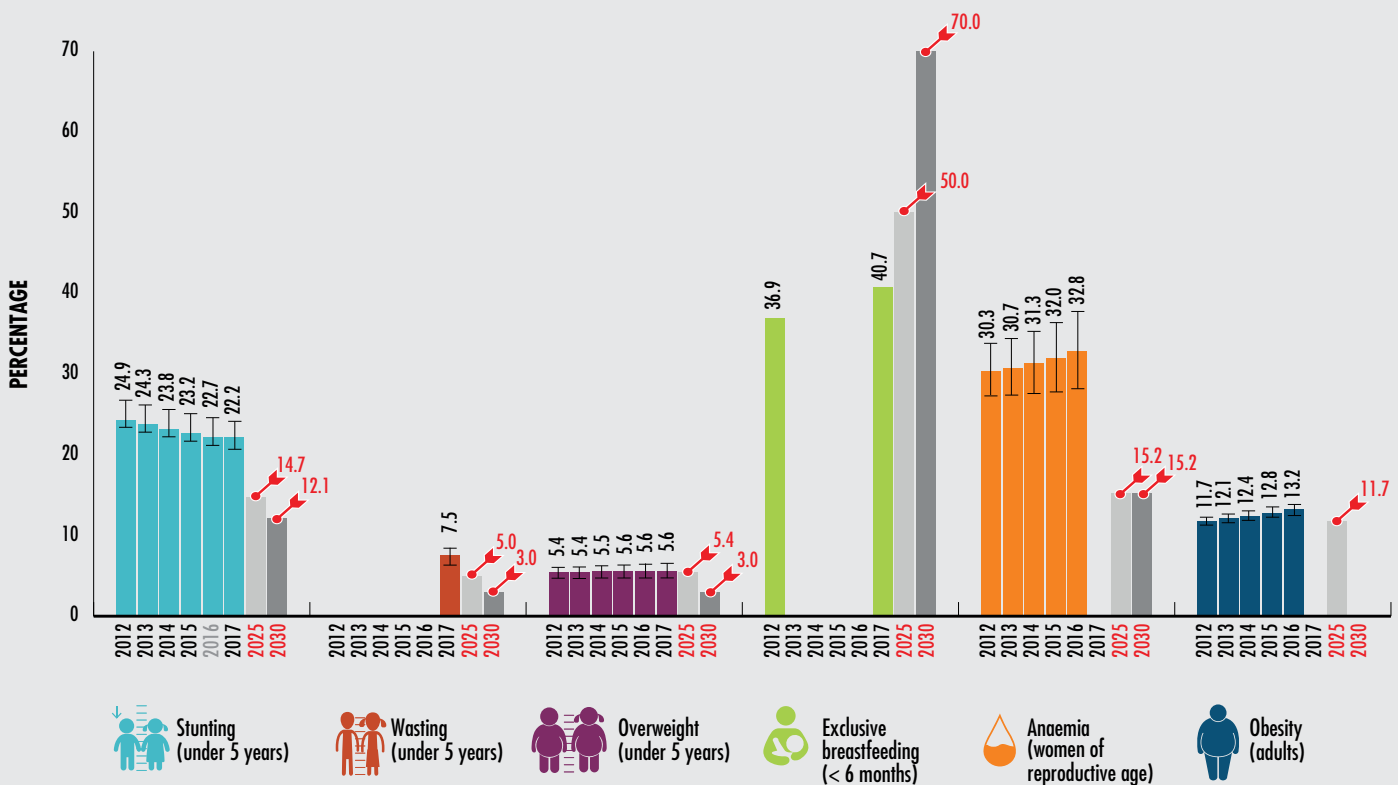


Figure 11: Trends in nutrition

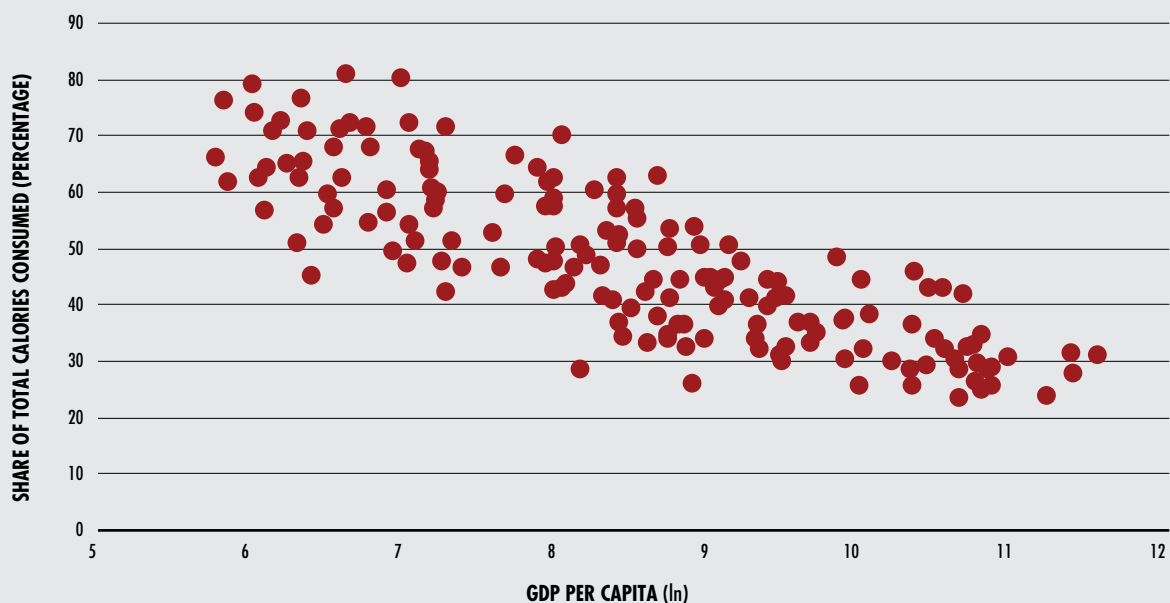
There is still a long road ahead to achieve the 2025 and 2030 targets for stunting, wasting, overweight, exclusive breastfeeding, anaemia in women of reproductive age and adult obesity

Source: FAO, IFAD, UNICEF, WFP and WHO, 2018

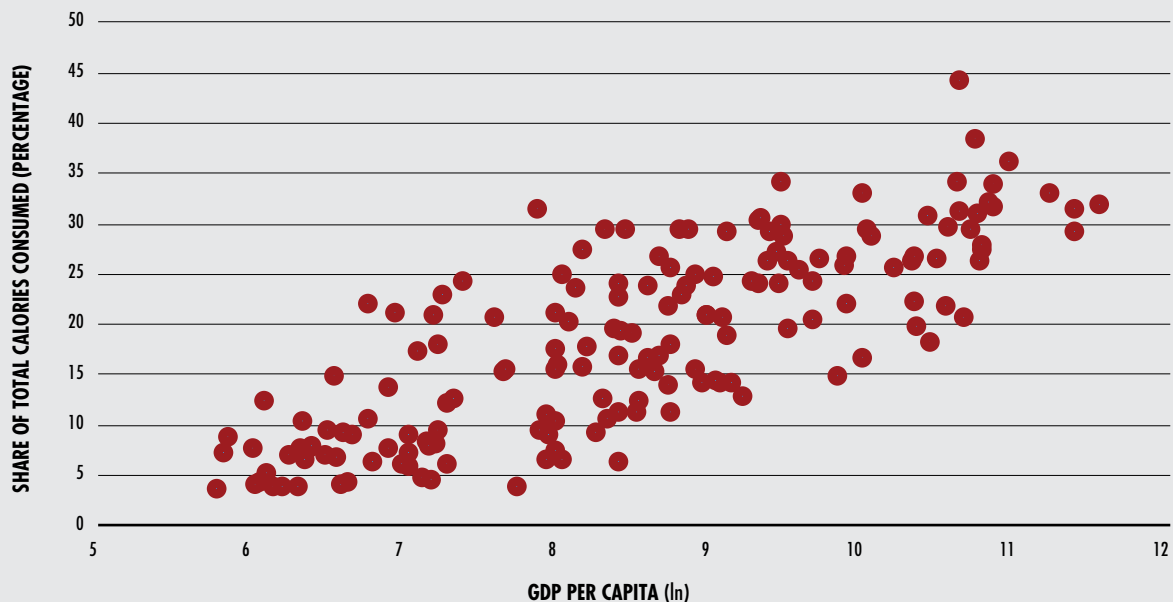


SOURCES: Data for stunting, wasting and overweight are based on UNICEF, WHO and International Bank for Reconstruction and Development/World Bank. 2018. UNICEF, WHO, World Bank Group Regional and Global Joint Malnutrition Estimates, May 2018 Edition [online]. <https://data.unicef.org/topic/nutrition>, [www.who.int/nutgrowthdb/estimates](http://www.who.int/nutgrowthdb/estimates), <https://data.worldbank.org>; data for exclusive breastfeeding are based on UNICEF. 2018. Infant and Young Child Feeding: Exclusive breastfeeding, Predominant breastfeeding. In: UNICEF Data: Monitoring the Situation of Children and Women [online]. <https://data.unicef.org/topic/nutrition/infant-and-young-child-feeding>; data for anaemia are based on WHO. 2017. Global Health Observatory (GHO) [online]. <http://apps.who.int/gho/data/node.imr.PREANEMIA?lang=en>; data for adult obesity are based on WHO. 2017. Global Health Observatory (GHO) [online]. <http://apps.who.int/gho/data/node.main.A900A?lang=en>

Figure 12: Correlation between consumption of staple foods and GDP per capita in selected countries in developing regions, 2010, and correlation between consumption of animal products and GDP per capita in selected countries in developing regions, 2010 Source: FAO, 2017a



NOTE: Staple foods include cereals, roots and tubers.



## All countries suffer from various forms of malnutrition

Malnutrition affects the development potential and the health of citizens and local communities. Accelerating efforts to address all forms of malnutrition will unlock human potential and stimulate positive change. The Decade of Action on Nutrition (2016-2025) provides a framework for collective action.

A nutrition-sensitive approach to agriculture and food systems seeks to ensure the production of a variety of affordable, nutritious, culturally appropriate and safe foods in adequate quantity and quality to meet the dietary requirements of populations in a sustainable manner. Addressing nutrition requires taking action at all stages of the food chain in order to deliver safe and nutritious foods all-year round to the consumer.



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### BOX 42: INTEGRATING AGRICULTURE AND HEALTH-BASED INTERVENTIONS IN BANGLADESH

The Integrated Agriculture and Health Based Interventions (IAHBI) Project implemented by Bangladesh's Ministry of Fisheries and Livestock and Ministry of Health and Family Welfare with technical support from FAO and UNICEF, and funding from the United States Agency for International Development (USAID), is an example of how agriculture interventions can be leveraged to improve diets and nutrition outcomes. The project was designed to address root causes of undernutrition and food insecurity in three districts of southern Bangladesh. It covered 50 000 households, targeting primarily women and young children. Farm households received support in horticulture production, small livestock rearing and aquaculture.

Key components of the programme included improved complementary feeding, food processing and preservation. Women were the main implementers, working through 1 680 women farmers' groups and 60 FFS led by women farmers. In three years, the project led to the increase in vegetable, fish and egg consumption among beneficiary households: the minimum dietary diversity score for women increased. A nutrition-impact assessment demonstrated declines in child underweight at the end of the project. There were marginal declines in stunting, and reductions in wasting and in anaemia among pregnant and breastfeeding women. After the end of the project in 2016, the government mainstreamed the approach within its extension activities.

### Adopting nutrition-sensitive agriculture result in better agriculture, health and income

Nutrition-sensitive agriculture and food systems contribute to improving health outcomes. This occurs not only by providing better diets, but also through income generation that can facilitate access to health services, via reducing contamination of water sources, exposure to water and animal-borne diseases, and thanks to the application of labour-saving technologies that protect producers' health.

FAO has developed ten principles to move towards more nutrition-sensitive agriculture and food systems (FAO, 2015m). Many of these principles echo the sustainability principles presented in these guidelines. Indeed, experience shows that agriculture policies and programmes are more likely to have a positive effect on nutrition and avoid negative impacts, if the following principles are applied (Box 43).

#### BOX 43: TEN PRINCIPLES TO MOVE TOWARDS MORE NUTRITION-SENSITIVE AGRICULTURE AND FOOD SYSTEMS

1. Incorporate explicit nutrition objectives and indicators into the design, and track and mitigate potential downsides;
2. Assess the context at the local level to design appropriate activities to address the types and causes of malnutrition;
3. Target the vulnerable and improve equity through participation, access to resources and decent employment;
4. Collaborate with other sectors and programmes;
5. Maintain or improve the natural resource base (water, soil, forests, biodiversity);
6. Empower women;
7. Facilitate production diversification, and increase output of nutrient-dense crops and small-scale livestock;
8. Improve processing, storage and preservation to retain nutritional value and food safety, to reduce seasonality and post-harvest losses, and to make healthy foods convenient to prepare;
9. Expand market access for vulnerable groups, particularly for marketing nutritious foods;
10. Incorporate nutrition promotion and education.

(FAO, 2015m)

Synergies between agriculture and nutrition can also be found in school-feeding programmes. By involving local producers, such schemes provide new market opportunities for fresh products, while improving the nutritional status of children attending school.

#### Education and awareness on nutrition, and diversified diets are needed at all levels

Nutrition education and awareness is fundamental in evolving towards more nutrition-sensitive agriculture and food systems. Specific programmes involving agriculture and health operators at decentralized level focusing on nutrition education and improvement of dietary habits of households, targeting in particular families with small children, offer significant potential. They can promote the consumption of diversified and locally grown nutritious food, thus fostering the economy. In order to be effective, nutrition-sensitive approaches should be supported by good knowledge on local food consumption patterns, practices and preferences, as well as knowledge on the nutritional value of different food products.

Systematically investigating the potential of underutilized food crops and animal species to enhance dietary diversity, including aquatic species, or breeds, can also play an important role in enhancing the nutritional status of rural and urban populations. Underutilized crops and species comprise a multitude of species that are currently largely neglected by major research, funding bodies and private-sector actors. Although these have long been overlooked, interest is growing in their potential to contribute to food and nutritional security and improved livelihood options for smallholders (Box 44).



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#### BOX 44: UNDERUTILIZED FOOD CROPS TO COMBAT HIDDEN HUNGER

Neglected and underutilized crops comprise the multitude of species that are currently largely disregarded by major research and funding bodies. These species have been overshadowed by those in greater demand. Of the 30 000 edible plant species, a mere 30 are used to feed the world.

They include cereals, grains, legumes, fruits, vegetables, flowers, roots, seeds and nuts. Those species have been kept by local, or indigenous, groups who created locally adapted landraces. Although these species have long been overlooked, interest in them is growing for their potential to contribute to food and nutritional security and improved livelihood options for smallholder farmers.

The African Orphan Crop Consortium (AOCC), an African-led international consortium founded by the New Partnership for Africa's Development (NEPAD) and Mars, Incorporated, is sequencing the genomes of 101 African underutilized crops and making this information publicly available. The AOCC is also training African plant scientists to make crops and their varieties more nutritious, and improve their yields and ability to withstand the effects of climate change.

In Guatemala, a recent survey by Bioversity International revealed that production systems and diets were dominated by maize and beans. In addition, several native vegetables and fruits were documented in the survey such as chaya (*Cnidoscolus aconitifolius*), a highly nutritious and drought-tolerant perennial providing a dark green leafy vegetable throughout the year. Currently the communities are not marketing this species but it could be an opportunity to earn income, while also improving availability of this nutritious food. (Bioversity International and Universidad del Valle de Guatemala, 2017).



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## ENHANCE THE RESILIENCE OF PEOPLE, COMMUNITIES AND ECOSYSTEMS

Resilience is a major factor in agricultural sustainability. Each year, millions of people who depend on the production, marketing and consumption of crops, livestock, fish, forests and other natural resources are confronted by disasters and crises. Phenomena such as extreme natural hazards and market volatility, in addition to civil strife and political instability, or infectious epidemics, impair the productivity and stability of agriculture. These increase uncertainties and risk for producers.

Decisions made under such conditions can have far-reaching consequences for households and communities. Policies, technologies and practices that build resilience, reduce risk exposure and disaster impacts among producers and across the food chain are key to developing more sustainable food and agriculture.

Disasters can be prevented and mitigated by systematically applying risk-reduction good practices before, during and after a crisis for agriculture, food and nutrition. When crises occur, their impact and the needs of families with agriculture-based livelihoods need to be assessed, and support provided accordingly to re-establish more sustainable livelihoods as quick as possible. This includes, for instance, seeds and other inputs to secure an imminent planting season or feed to keep animals alive.

### 13. PREVENT AND PROTECT AGAINST SHOCKS: ENHANCE RESILIENCE

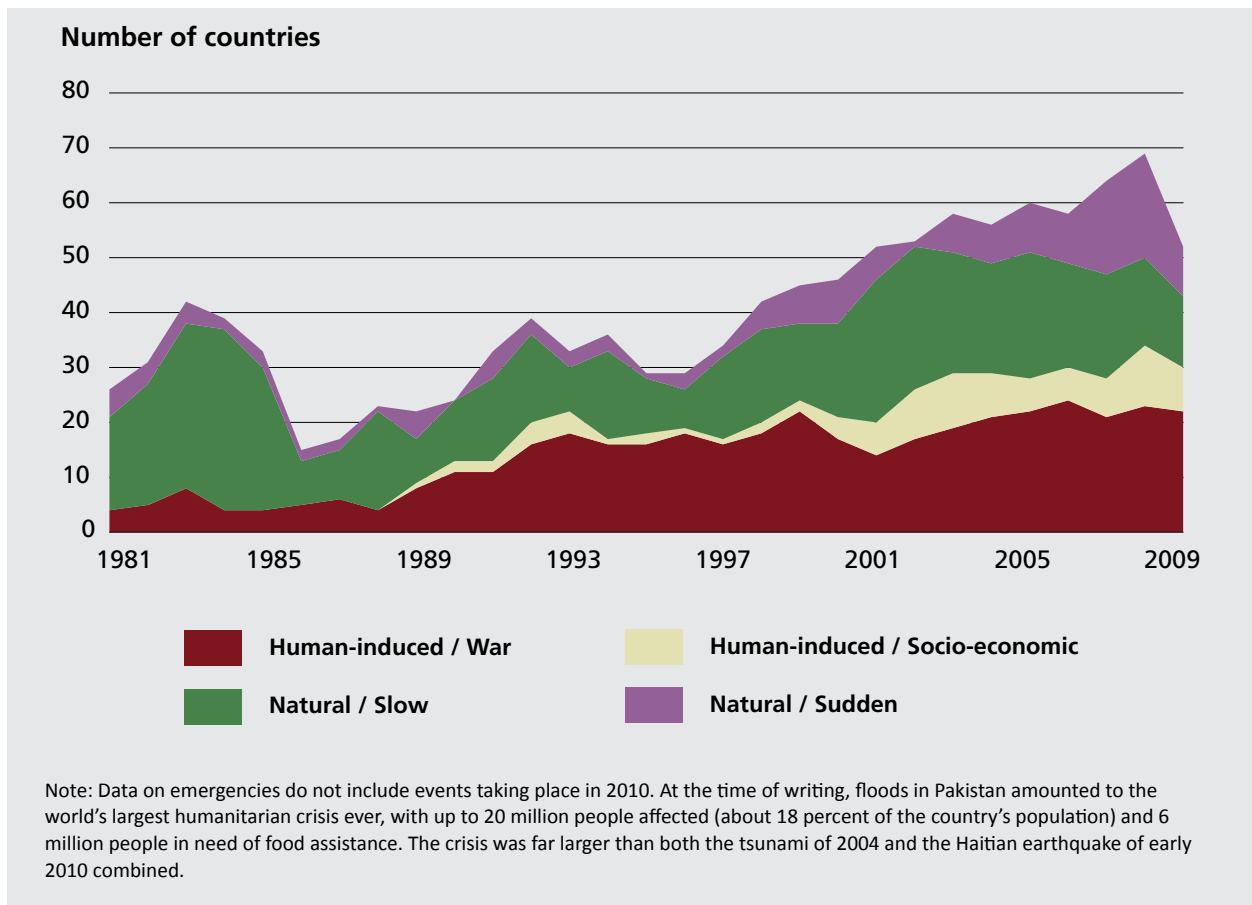


Contributes to SDGs:

1 2 9 11 13 14

Prevention is an important process and involves several stakeholders, from government services, to local authorities, producers and others. It is important to consider resilience as an ability to constantly adapt, not only to specific shock, but also to changes in trends and patterns (e.g. climate change).

Figure 13: Emergencies (by type) in countries requiring assistance, 1981 to 2009 - Source: FAO, 2011a



Recent FAO studies show that 23 percent of the total damage and loss caused by natural hazards and disasters in developing countries are in agriculture. In addition, the sector absorbs 80 percent of damage and losses caused by drought. Building resilience in agriculture and food systems implies a set of structural and behavioural changes and the careful review of strengths and weaknesses of prevailing livelihood systems in relation with shocks.

Prevention implies the development of and enhanced access to knowledge, technologies and services of those most at risk. It also requires enhancing institutional and technical capacities at all levels to deliver disaster-risk reduction, and the streaming of operational procedures necessary to effectively reduce risk and potential hazard impacts as part of ongoing development processes

The necessary adaptive capacity depends on a series of factors, including diversification of assets and

sources of income, but is also influenced by the type of production practices. Intensive agricultural systems, for instance, often based on a single commodity, are more vulnerable to shocks than more diversified systems. Similar to finance, building resilience in agriculture entails diversifying the portfolio of activities, and adopting good practices like managing soil cover and enhancing soil organic matter. A survey conducted in Central America after Hurricane Mitch has shown that farmers with diversified production systems, suffered less damage than those practicing monocropping (Nicholls and Altieri, 2012).

Tailoring interventions to the local context is important. The Self-evaluation and Holistic Assessment of disaster risk and climate Resilience of farmers and Pastoralists (SHARP) tool can be used at community level to set the baseline and then monitor changes in practice (Box 45).



#### BOX 45: SHARP, A TOOL TO ASSESS PRIORITIES FOR STRENGTHENING FARMERS' RESILIENCE TO CLIMATE VARIABILITY

The Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) is a survey tool designed to understand the vulnerability of farmers and pastoralists to climate change, and identify options to enhance their resilience. SHARP was first developed in the context of Global Environment Facility-financed climate change projects (Douxchamps *et al.*, 2017).

The tool explores agronomic, environmental, social and economic determinants of household resilience in rural areas (Dixon and Stringer, 2015; Choptiany *et al.*, 2016). Following a questionnaire-based assessment of households' climate resilience using a tablet, weaknesses in farmers' capacity to cope with and face climate variability are identified and analysed. As questionnaires are completed, respondents obtain offline 'resilience scores' for the different aspects considered in SHARP, which are then discussed with the respondents and project staff and validated by them. SHARP provides a baseline upon which changes can be assessed as project activities evolve, while the information can help prioritise actions aimed at the resilience of smallholders' agroecosystems in a sustainable manner.

SHARP is being used in Angola, Burkina Faso, Burundi, Côte d'Ivoire, Gambia, Kenya, Mali, Mozambique, the Niger, Senegal, South Sudan, Switzerland and Uganda. Moreover, a number of universities have used and adapted SHARP for research-based needs (Choptiany. *et al.*, 2016; Douxchamps *et al.*, 2017; Dixon and Stringer, 2015; Cabell and Oelofse, 2012; Jones and Tanner, 2017).

Integrating disaster risk reduction in agricultural interventions and poverty reduction strategies and strengthening the governance framework for early warning and action are elements that play a strong role in helping farming communities better cope with shocks, once they cannot be avoided.

Supporting gender-sensitive participatory approaches is key in resilience work to improve equality and ensure equal opportunities for all. This is achieved through community mobilization and by reinforcing the capacity of women and

men to prevent and reduce the impact of natural hazards and protracted crises. This gender-sensitive participatory approach requires a recognition that different socio-economic groups have diverse resilience needs and, therefore, often tailored interventions are required. In this sense, a rights-based approach is needed to ensure that the most marginalized groups receive equal resilience support despite often having the least 'voice' in determining policy and planning processes. The CFS (2012) states "policies and programmes designed to respond to climate change should be complementary to, not independent of, those needed for sustainable food security."

Climate-risk monitoring and forecasting are equally important components of resilience building (Ramasamy, 2012). The majority of risks associated with agricultural production are due to adverse climate. These risks affect the way producers behave as uncertainty pushes them to mitigate risk with a possible impact on productivity.

Recent advances in climate prediction and information have made it possible to substantially improve the accuracy, relevance and timeliness of information provided to producers, reducing the level of uncertainty and making it possible to optimise farm-management practices. There is a need, however, for down-scaling climate models, and to improve weather observations. Combining better climate information with the systematic use of ICT, offers concrete opportunities to help producers address climate variability more effectively. Efforts must be made to customise climate information to the needs of different stakeholders, provide the correct type of information, at the right frequency, packaged in a way that it is easily understandable by users.

In-depth and regular information and analysis of vulnerabilities and resilience help countries make better decisions and apply appropriate measures to protect and enhance the livelihoods of farmers and rural communities.

Many tools exist to assess vulnerability and help design programmes that increase resilience. The livelihood mapping approaches, in addition to the Resilience Index Measurement and Analysis (RIMA) methodology, offer opportunities

to understand and map the main features of resilience and rural livelihoods at local level, their strengths and weaknesses and their spatial distribution. This helps to better adapt resilience programmes to the different contexts and needs. Similarly, the Famine Early Warning Systems Network (FIEWSNET) develops livelihood maps per country and region in order to help adapting response in case of crises.

In addition to continuously investing in disaster-risk reduction and resilience building, it is equally crucial to be able to anticipate and respond timely to, and recover from shock, when they could not be avoided. To be resilient against threats and crises, people need to be informed in order to ward off, counteract, prepare and cope with both rapid and slow onsetting threats such as floods, tropical storms and droughts that threaten to damage peoples' assets, destroy production, or exhaust or contaminate water sources for crops, animals and trees.

## 14. PREPARE FOR AND RESPOND TO SHOCKS



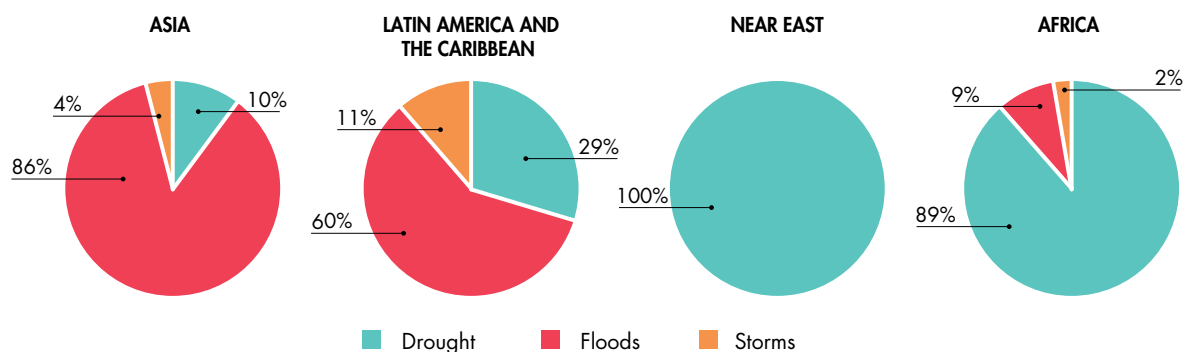
Contributes to SDGs:

1 2 9 13 14

The vast majority of people most affected by emergency situations are smallholder producers and when a crisis strikes, they often lose not only standing crops, but also their limited productive assets. In short, when affected by a disaster or a conflict, these populations are no longer able to sustain themselves and become highly vulnerable. Environmental and geopolitical shocks are often associated with large-scale migration flows (OECD, 2016a).

Early alerts on emerging disasters and triggering action before they strike are very important, as is contingency planning. Typically, preparedness measures include elements like seed and grazing fodder reserves; safe storage facility for seeds, harvest and tools; stockpiling agricultural tools; or the constitution of emergency funds. It also includes national and local preparedness planning: contingency plans for the different agriculture sectors; coordination arrangements, public information and training, in addition to specific planning for high-threat plant and animal diseases or pest outbreaks. A country's level of preparedness will largely determine how the burden of the disease can be minimized upon its incursion, or emergence (Box 46).

Figure 14: Crop and livestock production losses after medium- to large-scale, climate-related disasters, by type of hazard, 2003–13 Source: FAO, 2016h



#### BOX 46: PREPAREDNESS AND PREVENTION TO PROTECT FARMERS' LIVELIHOODS AND PUBLIC HEALTH FROM THE RIFT VALLEY FEVER

The Rift Valley Fever, a zoonotic disease transmitted by mosquitos, is characterised by widespread abortions and death in young ruminants. It can also affect people when in direct contact with the animals, such as livestock owners, veterinarians, butchers. With increased temperatures, rainfall and humidity, the Rift Valley Fever virus is likely to spread beyond the geographical regions where it is historically reported (mostly in sub-Saharan Africa and lower Nile River).

This life-threatening haemorrhagic disease can devastate communities and, therefore, preparedness is crucial. Good surveillance of the disease using our knowledge on the epidemiology and ecology of the virus will enable early forecasting based on precipitation models and assist in its detection. It is possible to minimize the disease burden not only on livestock but also to prevent the threat to human health thanks to preventive animal vaccination. Working with countries in developing their contingency plans has been FAO's strategy to ensure readiness.

Early-warning alerts help governments and organizations mobilize and act rapidly to prevent humanitarian disasters, such as famine or population displacements. At the local level, these systems advise producers on the likelihood of a threat and how to reduce their potential impacts. Some early-warning systems (e.g. tsunami or flood alerts) may also give advance notice to populations so they can evacuate the disaster area and prepare for the shock.

At international level, several early-warning systems exist, including FAO's Global Information and Early Warning System (GIEWS) and the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES). The Fisheries and aquaculture emergency response guidance (FAO, 2014f) and the Global Forest Fire Information Management System (GFIMS) also provide information on key elements to these two sectors.

The complementary support between global and local surveillance systems are exemplary, as illustrated by the FAO Desert Locust Information Service (DLIS). Locusts are among the most

devastating threats to food crops and pasture, and can endanger the economy and food security of an entire region. Desert locust monitoring is an essential component of the FAO Commission for Controlling the Desert Locust in the Western Region (CLCPRO) prevention strategy. Operating in collaboration with FAO's EMPRES, preventive early-control strategy implemented by CLCPRO has proved sustainable and economically viable (Box 47). It should be noted that the cost of controlling the 2003-2005 Desert Locust crisis is equivalent to 170 years of CLCPRO prevention (FAO, 2013c). EMPRES further contributes to diminishing environmental risks associated with locust control by promoting an approach that minimizes the use of pesticides through enhanced prevention and a careful management, storage, disposal and application of pesticides (FAO, 2005).

#### BOX 47: LOCUST PLAGUES IN THE SAHEL SHOW INVESTING IN PREVENTION PAYS OFF

The world's last Desert Locust plague lasted from 2003 to 2005, infesting 20 countries across west and northwest Africa and costing over USD 500 million in control operations and USD 2.5 billion in harvest losses. Mauritania, which was also suffering from several years of drought at the time, lost half of its cereal production in 2004 (FAO, 2005). The plague destroyed agricultural livelihoods and left millions without food.

Today, the chance of such a monumental plague happening again in the region has been significantly reduced thanks to the work of the FAO Commission for Controlling the Desert Locust in the Western Region (CLCPRO). Its role is to strengthen national capacities in locust survey, prevention, control, training, contingency planning, environmental and human safety, as well as coordination. CLCPRO works in collaboration with its ten member countries of the region (Algeria, Burkina Faso, Chad, Libya, Mali, Mauritania, Morocco, the Niger, Senegal and Tunisia).

Autonomous national control units for early warning and reaction to locust outbreaks are now firmly established in the ten national Ministries of Agriculture and sustained by their national budgets. Together they have successfully detected and rapidly controlled all Desert Locust outbreaks in the region since 2005 without external assistance.

Finally, when people’s capacities are overwhelmed by crises, they need to be able to count on effective local, national and international emergency responses.

In post-disaster situations the focus should be on the rehabilitation of the assets that form the basis of rural people’s livelihoods, and restore local food-production capacities in a way that they are more resistant to shocks and extremes than before. Emergency recovery and rehabilitation can include the provision of seeds and fertilizers; fishing equipment; animal restocking; fodder; and farm tools, obtained locally wherever possible, as well as approaches like the *Caisses de resilience* that promote savings and loans initiatives at community level. It can also include rehabilitation of agricultural infrastructure like irrigation schemes or feeder roads.

## 15. ADDRESS AND ADAPT TO CLIMATE CHANGE



Contributes to SDGs:

- 1
- 2
- 6
- 11
- 13
- 14

It is increasingly clear that the goals of achieving food security and sustainable agriculture and addressing the challenges of climate change, are closely intertwined and need to be addressed in a closely coordinated manner. The capacity of the agriculture sectors to respond to climate change will have far-reaching impacts on food security, nutrition and livelihoods for the majority of people in many

Figure 15: Impacts of climate change on population at risk of hunger in 2050, by region - Source: FAO, 2016h

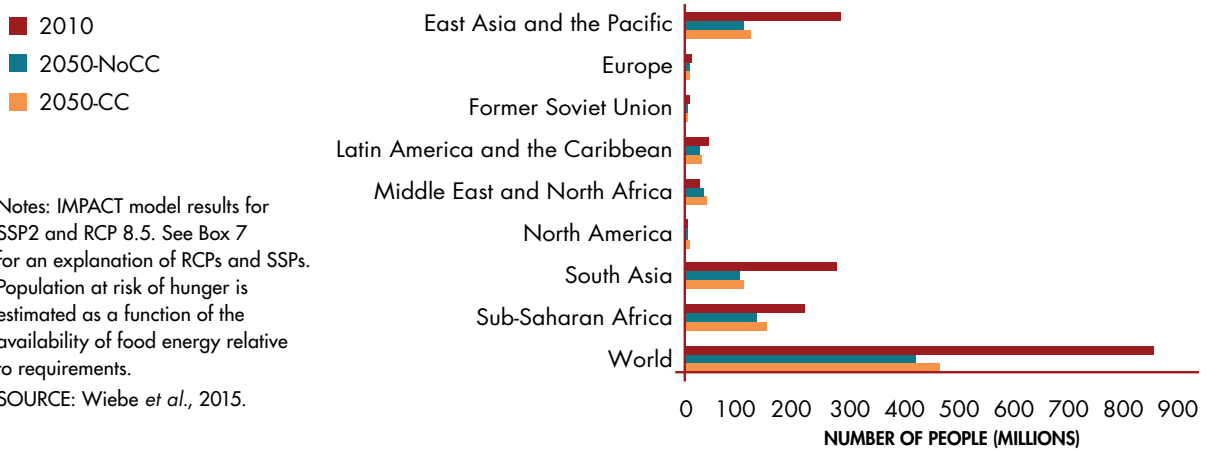
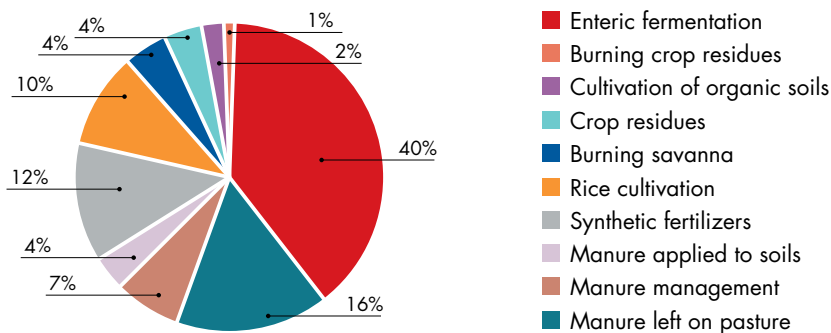


Figure 16: Share of agricultural emissions in co<sup>2</sup> equivalent in 2014, by source and at global level - Source: FAO, 2016h



developing countries and on national economies. On the other hand, agriculture is also a significant source of GHG emissions. The important targets foreseen in the Paris Climate Change Agreement make it essential that agriculture and other land-use sectors be part of the climate-mitigation solution.

Studies show that climate change is likely to affect agricultural productivity, output stability and farm incomes in some of the main production areas that already face serious food insecurity problems. In the long run, climate change will also lead to more drastic shifts, substantially modifying the boundaries of existing agroecological zones. This means that taking climate into consideration is not only about adjusting to gradual changes. It must include assessing whether marginal, or gradual, adaptation of existing production systems is appropriate, or whether switching to different systems and income sources is a more appropriate long-term strategy.

Climate change is already a reality for many producers across the world. The effects of increasingly volatile and extreme weather patterns are damaging infrastructure, wiping out harvests, jeopardising fish stocks, eroding natural resources and endangering species. Most recent studies indicate that climate change could also add 12 percent to 2030 food prices in Africa, where food consumption of the poorest households amounts to over 60 percent of their total spending. In addition it could create up to one billion environmental migrants by 2050 (FAO, 2016h; FAO, 2017h).

FAO promotes a 'climate-smart' approach to agriculture (climate-smart agriculture – CSA). This approach aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing, or removing, GHG emissions where possible. CSA looks for synergies between these objectives through identifying 'co-benefits'.

Actions towards CSA must therefore include a range of options that need to be considered as an integral part of sustainable agriculture programmes (FAO, 2017k). For example, in addition to mitigation benefits, an improvement of the fish-smoking technique has made it possible for operators in

Senegal to dry and smoke fish with the same equipment, thereby increasing the range of species that could be processed. This important advantage should reinforce processors' adaptation to climate change and increase their resilience, given that the composition of species is projected to change with climate change (Box 48).

#### BOX 48: REDUCING GREENHOUSE GAS EMISSIONS IN FISH-SMOKING ACTIVITIES IN SENEGAL

The Thiaroye fish-smoking technique (also known as FTT-Thiaroye) was developed by FAO together with the National Training Centre for Fisheries and Aquaculture Technicians in Senegal (CNFTPA) in 2008 and is now widely used in Côte d'Ivoire, Ghana, Togo and the United Republic of Tanzania. It addresses the deficiencies in smoking techniques by adding new components at the existing improved kilns. The result is new design of smoking kiln, which produces superior and consistent quality and safe products, better yield, hence reducing post-harvest losses by up to 50 percent compared with natural drying. It allows to reduce drying and smoking times, and produce a product that sells more readily and rapidly, reduces women's work burden and increases their income. Another advantage of the FTT-Thiaroye system is its improved energy efficiency and other potential environmental protection features. The new kiln reduces charcoal consumption and optimises the use of biomass (plant and organic by-products and cow dung) throughout the process, contribution to the reduction of GHG. (FAO, 2015h).

In moving toward more CSA, countries need to assess carefully the potential synergies and trade-offs between increased efficiency in the use of resources and greater resilience. The CSA approach can contribute to this goal by making sure that adaptation measures are not proposed in isolation and do not neglect potential co-benefits (FAO, 2016h). Given that adaptation actions need to consider potential co-benefits, CSA can provide options in the formulation and implementation of national adaptation plan (NAP) process. (Box 49).

### BOX 49: HELPING MALAWI, VIET NAM AND ZAMBIA MAKE THE TRANSITION TO A CLIMATE SMART AGRICULTURE

The Economic and Policy Innovations for Climate-Smart Agriculture (EPIC) programme is implemented by FAO and supported by the European Commission since 2011. It operates in three partner countries: Malawi, Zambia and Viet Nam.

The EPIC approach starts with a process of dialogue to identify national priority actions in agriculture to improve food security under climate change. A comprehensive evidence base is then created including analyses of historical climate data to identify trends in shocks relevant to agricultural production; the determinants of smallholder adoption and impacts of potential practices with a specific climate shock lens; the performance of different risk-management tools; the potential mitigation co-benefits of selected options; and institutional stocktaking to identify the strengths and challenges faced by relevant institutions in supporting food security under climate change. The process is complemented by actions to harmonize countries' agriculture and climate change policies, looking for synergies and addressing trade-offs.

A capacity development component includes supporting country representatives from agriculture to attend the United Nations Framework Convention on Climate Change (UNFCCC) negotiations, developing country specific training modules for extension services and supporting graduate students to work on CSA. Partner countries are also supported in the development of strategies and investment proposals that bring together the evidence, dialogue and tools to facilitate access to finance mechanisms.

Biodiversity and ecosystems are an important resource for increasing resilience and reducing the risks and damages associated with negative impacts of climate change. Diversified and integrated production systems offer greater options for adapting to a changing climate. With climate change, favourable conditions for crops and livestock will change geographically. Optimizing these conditions will thus require changes in species, varieties and breeds of crops, livestock, trees and aquatic species and their genetic improvement and management. The interaction between the environment, genetic resources and management

practices that occurs *in situ* within agroecosystems contributes to maintaining a dynamic portfolio of agricultural biodiversity.

Options for increased carbon sequestration, both above and below the ground, must be considered, together with the range of possible incentives for farmers. While there are still many knowledge gaps in terms of methodologies, practices, policies and finances, there is increasing evidence of successful approaches and technologies.

In the forest sector, actions aimed at reducing emissions from REDD+ countries, plus the sustainable management of forests and the conservation and enhancement of forest carbon stocks, are a significant part of the global efforts to mitigate climate change. A mechanism, established in 2005 under the UNFCCC, outlines five activities which can best be implemented – collectively or separately – through a package of coordinated REDD+ actions defined by each country and included in national strategies and action plans. These activities may also provide important climate change adaptation co-benefits and contribute to several sustainable development goals.

The NAP process established under the UNFCCC in 2010 supports least developed countries in their efforts towards climate change adaptation. It offers a means of identifying medium and long-term adaptation needs and developing and implementing strategies and programmes to address them. FAO recently published guidelines for addressing agriculture, forestry and fisheries in NAPs (referred to as the NAP-Ag Guidelines). NAP-Ag Guidelines aim to support developing countries in: reducing vulnerability of the agriculture sectors to the impacts of climate change by building adaptive capacities and resilience; addressing agriculture in the formulation and implementation of NAPs; and enhancing the integration of adaptation in agricultural development policies, programmes and plans. The Green Climate Fund (GCF) Readiness and Preparatory Support Programme provides country support for up to USD 3 million for the formulation of NAPs or other adaptation-planning processes. Through a joint global programme, FAO and United Nations Development Programme (UNDP) support country-driven processes to identify and address climate change adaptation

measures for the agriculture sectors in relevant national planning and budgeting.

### BOX 50: ALIGNING AGRICULTURE AND CLIMATE PRIORITIES IN KENYA

Kenya has been at the forefront of addressing climate change, launching a National Climate Change Response Strategy (NCCRS) in 2010 and a National Climate Change Action Plan (NCCAP) in 2013. The Action Plan outlines adaptation as a priority for the country because of the serious adverse socio-economic impacts climate change is expected to cause and the increasing vulnerabilities of different sectors. The NAP 2015-2030 builds on a comprehensive technical analysis developed as part of the NCCAP. The aim of Kenya's NAP is to consolidate the country's vision on adaptation, which is supported by macro-level actions targeting economic sectors and country-level vulnerabilities to enhance long-term resilience and adaptive capacity.

The national adaptation planning was informed by a highly participatory process. It included consultations at national and county levels that involved many different stakeholders, including national government ministries, departments and agencies, county governments, CSOs and the private sector. The agriculture sectors were represented in the Technical Working Groups charged to draft the NAP. The NAP recognizes CSA as the approach through which the agriculture sectors can achieve their adaptation goals. All these developments are addressed in Kenya's Intended Nationally Determined Contribution (INDC), which was submitted in 2015.

Investments in infrastructures and practices must also be assessed in terms of their robustness to increased climate variability. CSA can support a change of paradigm in agriculture and seek to reach carbon-neutral production in the food chain. Changes in practice can be obtained through awareness raising, innovation, capacity development and incentives based upon a systematic assessment of expected impacts of climate change on agriculture, related vulnerabilities and the viability of different options. Forest-related climate adaptation tools also include assisted migration of tree species, improved silviculture, forest and

landscape restoration, and forest genetic resource conservation, among others.

Climate change adaptation requires specific focus on the poor and vulnerable. For development to be climate-resilient, policy instruments to reduce poverty and enable adaptation must be integrated and target climate-vulnerable people. The rural poor are more vulnerable to climate change because they have fewer resources for protecting themselves against climatic hazards. In periods of stress, they may be forced to sell off their productive assets or migrate. Extending CSA to the rural poor can sustainably increase their productivity, enhance resilience and adaptation to climate change, reduce GHGs emissions, thus contributing to ending poverty and hunger.

There is compelling evidence (FAO, 2016h) that climate change is having gender-differentiated impacts, and in many cases is intensifying the constraints that already place women, especially those that are reliant on agriculture for their livelihoods, at a great disadvantage.

Because climate change and disasters are so closely linked, integrating disaster risk reduction (DRR) and climate change adaptation (CCA) allows for a more effective use of resources, knowledge, capacities, technologies and innovations that can address both the challenges of coping with shocks and challenges of slow onset impacts of climate change. DRR and climate-change adaptation are seen increasingly as complementary and inseparable elements to be merged under national comprehensive policy frameworks (Box 51).



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## BOX 51: LINKING CLIMATE CHANGE ADAPTION AND DISASTER-RISK MANAGEMENT IN AGRICULTURE IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

The Laos People's Democratic Republic suffers from natural hazards such as flood and drought that cause great damage to agriculture and the livelihoods of rural people. The frequency and severity of these disasters is increasing. Up to 250 000 people are affected each year by agricultural disasters of various types, losing a significant part of their production and causing local food shortages.

FAO has recently assisted the Government of the Lao People's Democratic Republic in the preparation of a plan of action for disaster risk reduction and management (DRRM) in agriculture. The plan is organized around five priority areas:

1. Strengthening good governance, institutional and technical capacities for DRRM and climate- change adaptation in agriculture;
2. Assessing and monitoring climate risks and vulnerabilities and issuing early warnings for food and nutrition security and transboundary threats;
3. Improving knowledge management, awareness raising and education on DRRM, climate change impacts and adaptation;
4. Reducing underlying risks and vulnerabilities by promoting technical options and community-based planning for DRRM/CCA in the agriculture sector;
5. Enhance capacities, facilities and procedures for effective disaster preparedness and response and integrate climate change adaptation in recovery initiatives.

(Government of Lao People's Democratic Republic, 2014)

## 16. STRENGTHEN ECOSYSTEM RESILIENCE



Contributes to SDGs:

1 2 6 13 14 15

The capacity of agricultural systems to recover from disturbances is commonly understood as a measure of their resilience and is largely defined by their ability to conserve, or recover, key ecological functions following disturbance.

There are often trade-offs to be addressed between ecosystem resilience and agriculture intensification. The latter is usually achieved through specialisation, involving large-scale production of single crop species or varieties (monoculture), or intensive animal farming. Evidence shows that the ecosystem services provided by monoculture systems are insufficient to compensate for the heavy costs of inputs and their pollution of the ecosystem (Pretty and Bharucha, 2014).

### Integrate production systems

The more elements are integrated in a production system, the more resilient it becomes and the more ecosystem services are provided. This is because the system has a larger range of responses to environmental change from the different components. Integrated systems can take several forms, from mixed cropping to crop-livestock systems, to agroforestry, tree-crop livestock system or agrosilvopastoral ones. They can also be associated with aquaculture. Sound agricultural intensification management practices of such systems are to integrate diversified ones for seed, breed and plant banks to ensure sustained production of agricultural goods in a context of increasing change.

Redundancy is an important element of ecosystem resilience. Having many organisms able to perform the same task actually ensures that key ecological functions are resilient. Redundancy may decrease a system's efficiency, but it gives the system multiple backups following a disturbance. It is important to recognize the biodiversity enhancement effect



on ecosystem function because those components that appear redundant at one point in time become important when some environmental stress occurs.

### Diversify and integrate multiple elements in the production systems

In many cases, diversified or integrated production systems have demonstrated their ability to cope with climatic variability and change, new technologies and changing social and political situations, so as to ensure food and livelihood security and risk alleviation. The concept of Globally Important Agricultural Heritage Systems (GIAHS), promoted by FAO, is a living, evolving system of human communities in an intricate relationship with their territory, cultural or agricultural landscape or biophysical and wider social environment. The overall goal of the FAO GIAHS Programme is to identify and safeguard such agricultural systems and their associated landscapes, biodiversity and knowledge systems. In GIAHS sites, dynamic conservation strategies and processes allow maintaining biodiversity and essential ecosystem services thanks to continuous innovation, transfer between generations and exchange with other communities and ecosystems.

Soil biodiversity plays an important contribution to ecological processes, such as carbon and nutrient cycling. For example, soil ecosystem 'engineers' which include earthworms, termites and mycorrhizal fungi influence soil structure stability which in turn impacts soil biological processes associated with the availability of nutrients to plants, the susceptibility of soil to erosion and soil-carbon storage.

Above ground organisms also play important ecological functions contributing to ecosystem resilience. For example, biological controller organisms such as predators, which contribute to the regulation of pests and diseases, or pollinators, are also important components of the biodiversity with special influence in the way agricultural systems respond to disturbance and, hence, their resilience.

Traditional knowledge is increasingly recognized as a source of valuable information for the design of resilient agricultural systems. This is based on the notion that it derives from an intuitive integration of agricultural system's responses to environmental changes over time. The blending of local and scientific knowledge to inform agricultural system management options is therefore an important

#### BOX 52: QUECHUA AND AYMARA COMMUNITIES MAINTAIN A GLOBALLY IMPORTANT AGRICULTURAL HERITAGE SYSTEM IN THE MOUNTAINS OF PERU

Andean agriculture is one of the best examples of the adaptation and knowledge of farmers to their environment. Actual presence of indigenous agricultural knowledge includes terraces, ridges fields, local irrigation systems and traditional tools, crops and livestock spread at different altitudes.

Experiences and selection over successive generations have led to the domestication of endemic species such as potatoes and quinoa. Their knowledge also includes three main agricultural systems, each one related to the altitude: maize (2 800 to 3 300 metres), potato (3 300 to 3 800 metres) and livestock area with high altitude crops such as quinoa and cañihua (3 800 to 4 500 metres). To each altitude, native-selected crops are cultivated.

The indigenous communities also show a strong social organization with their own norms and cultural rituals such as the tribute to the 'Pachamama' (mother earth), leading to sustainable practices but also to solidarity. Indeed, identity strengthening is probably one of the main goals to be achieved through agriculture.

These areas maintain most of the ancient traditional agricultural technologies. However, current issues such as the number of youth leaving leads to a severe loss of knowledge and biodiversity.

Source: FAO GIAHS Programme

strategy to foster a more sustainable utilisation of ecosystem services, including more systematic use of native species.

### BOX 53: TRADITIONAL HYDRO-AGRICULTURAL SYSTEMS IN ALGERIA

In the desert of Algeria, local communities have had to face dry and hot climatic conditions. Thanks to groundwater deep into the soil, farmers have succeeded in finding dunes and water management to use and conserve it. This is how they have created the ghout system allowing them to grow food plants and livestock from the fifteenth century.

The ghout traditional hydro-agricultural system consists in digging into the soil using wind knowledge to plant date-palm at the top of the groundwater resources. This system integrates at the same time vegetable, cereal, fruit trees and date-palm production through a complex multilayered organization. Divided in three levels, these mixed crops are sustainable looking at the soil and water resources. Ghout plays also a role as a habitat, maintaining biodiversity for plants, insects and animals.

There are more than 9 500 ghouts shaping the landscape of the desert. Not exceeding half a hectare, these green and living 'islands' turn the Souf region into a unique place. Sustainable and adapted to dry conditions, ghout offers an option for other dry areas subject to climate change. However, they are currently threatened by the use of groundwater for cities.

The integration of monitoring biological diversity into national and local plans should be encouraged as a guide to agricultural development policies and strategies, and as a requirement for biological diversity into these plans and processes.

### Adopt landscape and territorial approaches to foster integration

Many sustainability issues can only be addressed at the level of the landscape, territory or watershed. Biodiversity, land use and management, climate change, water management, forest management are all elements that require action beyond individual farmers. Likewise, many development activities related to employment, income and social inclusion

require actions and investments at territorial level. This requires supporting systems-oriented approaches to development that strive to address socioecological systems governance through holistic and integrated actions. Landscape approaches, which focus on ecosystem processes and boundaries (such as the functions and extent of a watershed), and territorial approaches, which look more at socio political processes and boundaries (such as how communities delimit and manage natural resources) are two examples of systems-oriented approaches promoted by FAO (FAO, 2017d). In a development context, the inherent challenges to landscape and territorial approaches are matching the needs and values of both ecosystems and social systems that overlap across different geographies, and effectively and equitably coordinating the different stakeholders or rights-holders and governance mechanisms in those geographies. With these objectives and challenges, three components of a territorial or landscape approach are highlighted.

The first component concerns recognizing spatial diversity as the foundation of development effort. These approaches strive to make the governance of natural resource adapted to local conditions and to the specific needs of different groups of actors. They critically analyse traditional dichotomies in agricultural development, such as the rural-urban and local-global 'divides', which are rapidly changing through global trends, such as rural-urban migration, political Decentralization, climate change and interconnectedness via new technologies. Furthermore, they question the 'one-size-fits all' approach adopted in most development policies by recognizing that systems memory (Wilson, 2008), for example historical socio-environmental decisions made in a particular territory, shapes the way in which communities function and engage with ecosystems. This does not mean that territorial development approaches aim to shape territories in isolation. In fact, building territorial linkages is a core part of this type of approach, for example through inclusive value chains connecting rural smallholders and urban markets, or facilitating cross-cultural exchange and skill-building among producers' organizations of different regions. However, recognizing and respecting the diversity inherent in different territories and landscapes requires that the way in which common development principles and goals are manifested

and enforced may differ depending on the local context and the interests of actors whose livelihoods are based in the territory. This point is particularly relevant when it comes to natural resource governance process, as described below.

The second component regards strengthening bottom-up approaches to multi-level governance. It responds to the recognition that the outcomes – both positive and negative – of development interventions have spatial implications and that a rights-based approach, which actively promotes the inclusive and participatory involvement of local communities and rights-holders in governance processes, is essential for sustainable development. Therefore, territorial development approaches aim to empower local communities, and strengthen local institutions, to be able to equitably engage in decision-making processes at different governance levels (local, regional, national) that impact their territory or landscape. In this way, territories (in a governance context) are recognized as spaces of negotiation, involving a range of stakeholders with different interests, in which compromise and consensus must be reached. Critical to this effort is FAO's long-standing work on building multistakeholder platforms, facilitating dialogue, and empowering marginalized groups to ensure their rights and interests are recognized and respected through this process of negotiation.

The third component concerns interrelations and interdependencies among social systems and ecosystems and the need for multisectoral approaches to development. Territorial development strives to analyse and promote integrated

approaches to natural resource management. This component draws off of political and environmental ecology disciplines in recognizing that ecosystems, as well as socio-economic ones, are interconnected webs and networks, and changes in one resource sector does not take place in isolation and can have unintended impacts. For example, changes in soil management of particular landscape will likely have impacts on local water quality. And in turn, changes in water use will likely impact different socio-economic groups in that territory differently. Thus, territorial and landscape approaches aim to acknowledge these interrelated dynamics within ecosystems and between ecosystems and social systems, avoiding the classic 'silo' approach to natural-resource governance which often regulates different natural-resource sectors in isolation from each other, through more integrated and multisectoral governance approaches.

Considering these three components, FAO is engaged in a range of landscape and territorial development initiatives including analysing the relationships between urban and rural landscape and the food streams as proposed in the regional city food systems, strengthening socio-environmental sustainability through territorial negotiation (FAO, 2016m), productive landscape (Box 54), participatory land delimitation (FAO, 2009), land-use planning (FAO, 2013b), applying territorial approaches to food security and nutrition policy (OECD, 2016b), and improving gender equality through territorial planning (FAO, 2012b) and governance (FAO, 2017f).



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#### BOX 54: PRODUCTIVE LANDSCAPES THROUGH LEASEHOLD FORESTRY IN NEPAL

Landlocked and in the heart of the Himalayas, Nepal is still one of the poorest and least-developed countries in the world today. Despite the degradation and dwindling resource base, forests offer the basic needs for rural livelihoods: they provide fodder for livestock, stabilise the soil, furnish suitable agricultural land under their cover and yield useful non-timber forest products (NTFPs). Community-based leasehold forestry is Nepal's pioneering approach to reverse deforestation and land degradation by involving and benefiting poor communities. The approach began in the country about 20 years ago and has two main objectives: regenerating forests on degraded lands; and alleviating rural poverty. In this system, the Government of Nepal leases state-owned degraded forestlands to small groups of poor households. It requires the households to protect their forestlands against further degradation and allows them to cultivate economically beneficial annual and perennial plants, while simultaneously allowing the forests to recover through natural regeneration and selective planting of mostly native trees.

Leasehold forestry has been highly successful in rehabilitating degraded landscapes while improving the socio-economic status and well-being of poor rural communities in Nepal. Key factors that contributed to its success include: generation of short-term income to improve livelihoods, combined with long-term economic and environmental benefits through the restoration of forestland; focus on the needs of the poorest communities; provision of secure, long-term tenure with clear rights and responsibilities; use of participatory approach in shaping project activities and determining the future of the landscape; investment of income generated from the sale of forest products to fund village development activities; ensuring strong interministerial and cross-sectoral collaboration; strengthening of women's role in decision-making; and the application of landscape approach linking productive aspects of forestry, livestock and agriculture, considering the needs and aspirations of present and future generations of local communities.

Source: Shono et al. 2014.

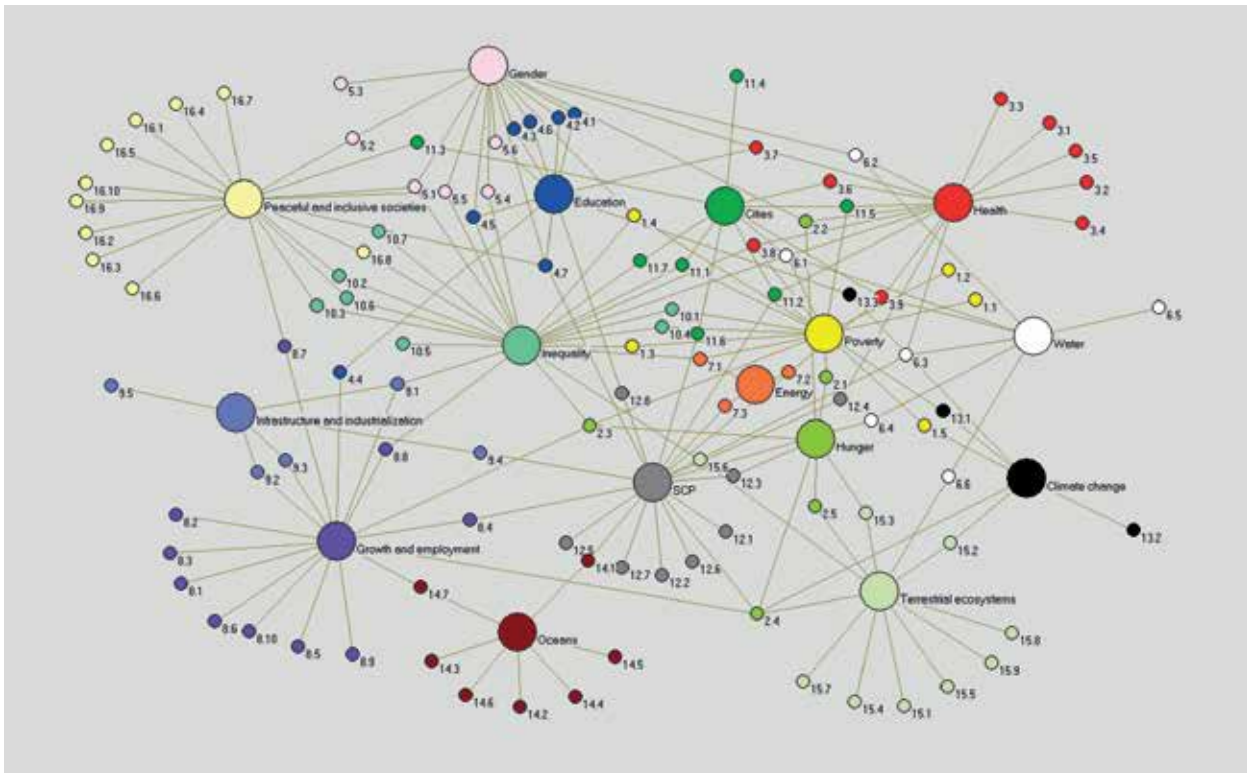
## ADAPT GOVERNANCE TO THE NEW CHALLENGES

The economic, ecological and business environments in which all the foregoing changes have to take place require a fundamentally new approach to governance. A key insight of the 2030 Agenda is that objectives, such as ending poverty and shifting to more environmentally sustainable patterns of production, consumption and growth, cannot be approached through traditional sectoral policies alone. They require holistic, integrated approaches that link action on multiple fronts (Figure 17 – Complexity). This is reaffirmed by other international agendas and agreements, such as the Addis Ababa Action Agenda on financing for development, the Malabo Declaration, the Sendai Framework for Disaster Risk Reduction 2015-2030 or the Paris Agreement on climate change.

Drawing attention to the ways that different objectives are interlinked is critical, both as a practical matter and as prerequisite for political success. Agriculture has much to contribute to the achievement of the social, economic and environmental objectives of the 2030 Agenda. However, agriculture will contribute far less on its own than in combination and together with actors from other sectors. The transition to more sustainable agriculture and food systems, in other words, requires action that focuses not only on promoting effective changes in practice, but also builds political alliances and coalitions with actors beyond food and agriculture. Changing markets, resource efficiency, human, environmental challenges, and, perhaps most importantly, capacity to access finance, technology, and markets increasingly lies with private actors. Each SDG target requires multi-sectoral and multistakeholder engagement.

Focusing on smallholders and family farmers is particularly effective for mobilizing rural economies with a strong multiplier impact on the wider sustainable development of countries. However, to sustain such approaches it will often prove necessary to engage other actors in food value chains, natural resource landscapes, and adjacent territories – especially cities – to build the necessary political support to sustain appropriate

Figure 17: Complexity: the multiple interactions of the sdgs - Source: David Leblanc (2015) "Towards integration at last? The SDGs as a Network of targets", DESA Working Paper No. 141



policies and regulatory frameworks over time. It is equally relevant to identify governance<sup>13</sup> issues, threats and risks that need to be addressed, their magnitude, as well as to determine the focus and depth of the necessary governance and political economy analyses to be carried out. The findings will assist in ensuring technical solutions and political realities are aligned in each specific case. The process of analysis itself may facilitate stakeholders' agreement on a realistic and legitimate solution adapted to the actual problem – which is not merely technical but simultaneously social and political in nature, requiring a durable consensus among stakeholders. Governance at different levels – sectoral or subsectoral, local, national and international – needs to re-form in light of emerging economic, environmental and social changes. Governance must adapt to rapidly changing contexts. Government and non-public actors must assume new roles and responsibilities, adapt, evolve or form new organizations and structures, and establish new modalities of co-provisioning and co-producing public goods and essential enabling services.

The world's farmers, herders, foresters, fishers and food consumers, must be engaged as key agents whose actions, or failures, will ultimately determine whether and how a common vision of sustainable food and agriculture can be realized – but they are unlikely to achieve success on their own. The SDGs provide an opportunity to strengthen the role of off-farm actors, including rural small and medium-sized agribusinesses and service providers, larger private sector entities, civil society groups and consumers and their collective commitment to achieving sustainability, to sharing responsibilities, and to accepting accountability to society. At the same time, the SDGs call for the adaptation of the role of public agencies and legislative bodies. Government roles and capacities must evolve from being the primary and direct providers of goods and services, to become a more strategic catalyst to where they facilitate and enable action by others to achieve sustainable development.

<sup>13</sup> Governance embraces formal and informal rules, organisations and processes through which public and private actors articulate their interests, frame and prioritise issues, and made, implement, monitor and enforce decisions.

## 17. ENHANCE POLICY DIALOGUE AND COORDINATION



### Contributes to SDGs:



The integrated and transformative nature of the 2030 Agenda requires policies that systematically consider intersectoral linkages and innovation in national and local institutional mechanisms to support cross-sectoral communications and collaboration. In particular, the food and agriculture sector itself needs to take an integrated approach to the three pillars of sustainable development. This includes taking stock of the pertinent sectoral policies, mapping and analysing synergies and trade-offs between the economic, social and environmental spheres, assessing the state of the sustainability of food systems and agriculture and identifying key issues, their causes and drivers.

#### **Analyse how sectoral policies interact with the targets and larger objectives of the SDGs prioritised in national or subnational planning.**

Assess the likely impacts of proposed policy actions, or their means of implementation. For example: agriculture is the largest user of water; energy is needed to produce and distribute both water and food; and the food production and supply chain accounts for a significant part of energy consumption. Policy decisions taken in each of these sectors can have significant impacts on the other ones and tensions may arise among stakeholders from real or perceived trade-offs between various objectives. The analysis should also look at the existing coordination mechanisms at the different scales and consider whether there is need to combine, reconfigure or otherwise adapt them. The increasing importance of better coordination between agriculture, water and energy policies and urban planning is illustrated below (Box 55).

### BOX 55: WALKING THE NEXUS TALK: WATER-ENERGY-FOOD

The water, energy and food (WEF) nexus means that the three sectors – water security, energy security and food security – are inextricably linked and that actions in one area, more often than not, have impacts in one or both of the others. The basis of the WEF nexus is an attempt to balance different uses of ecosystem resources (energy, water, land, soil and socio-economic factors). There are clear interactions between water, food and energy that may result in synergies or trade-offs between different sectors or interest groups. FAO has developed a WEF nexus assessment approach to help: (1) understand the interactions between water, energy and food systems in a given context; and (2) evaluate the performance of a technical, or policy, intervention in this given context. The ultimate goal of the WEF nexus assessment is to inform nexus-related responses in terms of strategies, policy measures, planning and institutional set-up or interventions.

As part of the WEF approach, the Nexus Assessment (including the Nexus Rapid Appraisal) consists of an easily applicable methodology, which relies on indicators that are based on different country typologies, allowing a quick assessment of possible interventions against overarching development goals such as food security, and the sustainability of the use and management of energy and water supplies (FAO, 2014g).

The analysis should highlight the most important interdependencies and the potential for conflicts and trade-offs among relevant objectives. It should enable policy-makers and stakeholders to identify and rank risks and develop mitigation strategies. A critical component of the assessment will be governance and political economy analysis to identify potential political or process bottlenecks for achieving sustainable food and agriculture, and to spur examination of policy options and future scenarios envisaged for solving them. The governance analysis will need to recognize structural issues and historical legacies; key players involved and their interests and ambitions; and information and power asymmetries that may impede the development of solutions perceived as fair or legitimate. It can also help clarify who has the power to help drive, or undermine, the

implementation. The analysis should indicate the current “room for manoeuvre” that is available within existing political constraints and also assess how configurations of interests, actors and incentives may evolve over time under the impact of known external factors and policy impacts. The findings from the analysis will guide the processes of identifying realistic entry points, setting targets, assessing risks and uncertainties, and tracking progress.

**Establish partnerships that work within established normative frameworks and invest in state capacity to coordinate.** This implies, on the one hand, the ability of governments (including at local level) to coordinate the synergistic implementation of key policies and programmes that deal with the multiple causes of poverty, unsustainable use and management of natural resources, food insecurity and malnutrition. On the other, it requires public employees at all levels to remain autonomous from undue influence while engaging relevant actors and ensuring their support to an integrated approach.

Strategic partnerships between state and non-state actors are crucial to mobilize resources and implement the SDGs. Partnerships, alliances, coalitions and other forms of collaboration can bring together players from government, POs, rural agribusiness enterprises, larger private sector, research and academic institutions, civil society and community organizations. Coordinated planning and implementation across sectors and actors requires institutional structures – formal or informal – that allow the necessary exchange of information, are aware of common objectives across multiple sectors, have a clear division of roles and responsibilities and capacity for mobilizing or leveraging of resources, along with mechanisms for trouble-shooting and for tracking and reporting results. Pre-existing conditions in a country can either facilitate or discourage this process. These include existing institutional relationships (e.g. conflicting or facilitative relationships among different stakeholder or sectoral representatives) and the degree and quality of ownership by different parties (FAO, 2017). Critical success factors include the level of agreement on the global vision, the problem to be solved and clarity of desired

outcomes. While the overall vision must be integral and “horizontal”, delivery needs to reflect the actual scope of state agencies, recognizing that public and indeed much of the private sector works in clearly defined “verticals”. Managing effectively vertical flows across levels is key to the success of decentralized systems.

Multistakeholder platforms can create a common space to voice and shape solutions towards shared objectives, helping to mobilize capacities, information, technologies, financial requirements and access to productive resources. Where possible, platforms should be built by adapting and reforming existing institutions – including parliaments and city councils. This builds on experience and resources, reduces duplication and conflict, and strengthens the legitimacy of governments. Global multistakeholder partnerships, such as CFS (Box 56), have the potential to leverage expertise and resources, and facilitate innovation and investments at country level.

#### BOX 56: THE COMMITTEE ON WORLD FOOD SECURITY, AN EXAMPLE OF MULTISTAKEHOLDER PARTNERSHIP

The aspiration of CFS is to be the foremost inclusive international and intergovernmental platform for a broad range of committed stakeholders to work in a coordinated manner in support of country-led processes towards the elimination of hunger, ensuring food security and nutrition for all. The CFS will strive for a world free from hunger where countries implement the Voluntary Guidelines to support the progressive realization of the right to adequate food in the context of national food security.

The unique features of CFS include expanded participation rules and a specific science-policy interface. Its inclusive policy-making processes ensure that the voices of all relevant stakeholders, particularly those most affected by food insecurity and malnutrition, are heard in the food and agriculture policy dialogue. The High Level Panel of Experts on Food Security and Nutrition (HLPE) provides independent evidence-based reports to inform and support policy discussions. (CFS, 2017).

**Utilize the government's convening power to attract key stakeholders, create decision opportunities and consultations for public investment, and facilitate and enable innovative and flexible approaches to service provision.**

It will also allow for non-public spaces for private bargaining among stakeholders, which can be necessary for achieving the required convergence among them. Stakeholders need to know what the process will mean for them, how final decisions will be made, for which area (boundaries) and by whom. Trust among partners is important for collaboration to succeed. Most advances in coordination are made because of the insight and energy of a facilitative leader, champion or convening entity able to motivate and guide the processes and assist in negotiation among diverse actors. Power relations among partners in coordination are equally relevant. Power differences among players determine their willingness to participate, and their capacity to influence the process of negotiation and decision-making. In this regard, the respect of gender equality and inclusiveness is crucial. The facilitative leader needs to carefully manage contradicting interests and differences in power among sectors and actors, in order to find incentives to achieve system-wide goals and specific targets.

Thematic platforms and professional networks can be effective in engaging a specific community of practice and contribute to broadening its horizons through knowledge exchange and experience sharing. Annex 3 lists international knowledge platforms facilitated by FAO. They include, for example, the Sustainable Food Value Chains Knowledge Platform, Tropical Agriculture Platform (TAP), Climate Smart Agriculture platform, Global Agenda for Sustainable Livestock (GASL), the Global Soil Partnership, World Water Scarcity Initiative, Knowledge sharing platform on Resilience (KORE), and regional fisheries platforms. Countries' leading scientists and specialists need to be brought together to gather knowledge and develop approaches that will help tackle countries' complex challenges.

Unlocking the potential of the private sector is important. To accelerate implementation of the SDGs, governments and partners need to engage with entrepreneurs and tapping into private sector potential. This includes producers' organizations, cooperatives, small and medium-sized enterprises

### BOX 57: THE GLOBAL AGENDA FOR SUSTAINABLE LIVESTOCK

Improvements in sector policies, governance and investments will be needed to ensure that the continuing demand expansion for livestock products does not increase pressure on natural resources and contributes to socially desirable outcomes.

To address these issues, FAO started a process in 2010 of building a GASL. It is a partnership of livestock stakeholders committed to the sustainable development of the sector. GASL builds consensus on the path towards sustainability and catalyses coherent and collective practice change through dialogue, consultation and joint analysis. It is based on voluntary and informal stakeholder commitment to act towards improved sector performance by targeting natural resource protection, while including poverty reduction and public health protection as they relate to the livestock sector. It gathers many research organizations bringing in new knowledge.

GASL focuses on the improvement of resource-use efficiency in the global livestock sector to support livelihoods, long-term food security and economic growth while safeguarding other environmental and public health outcomes, factoring in regional differences, and linking to other related initiatives as appropriate. The initiative supports improved resource use in the sector resulting from changed practices by stakeholders; and adoption, by the public and private sector, of guidance and recommendations to make livestock food value chains more sustainable. GASL benefits from the financial support of several donors.

(SMEs), in addition to international corporations. Far greater than just a source of financing, private sector partnerships promise technology development, knowledge transfer and innovation, job creation and alternative revenue streams. Partnership is particularly relevant in value chains, where producers, governments and private actors can work together towards more sustainable and inclusive value chains<sup>14</sup>.

<sup>14</sup> A food value chain is sustainable when it: is profitable throughout all of its stages (economic sustainability); has broad-based benefits for society (social sustainability); and has a positive or neutral impact on the natural environment (environmental sustainability).



SMEs account for a large share of world economic activity in both developed and developing countries. They are essential partners for a transformative agenda for agriculture. They can lead the implementation of the most “economic” development goals: building the basis of a productive agriculture sector (SDG 2), promoting inclusive and sustainable economic growth, employment, and decent work for all (SDG 8); promoting sustainable industrialisation and fostering innovation (SDG 9). They can significantly reduce income inequalities (SDG 10) if they are enabled to provide good-quality local employment. For this to happen, there is a need to unlock the potential of SMEs with appropriate institutional, financial and capacity development support.

Some of the main elements to make this happen are: address market and institutional failures, put in place a business environment and policies to make SMEs more productive; empower them to reduce the productivity disparities with large companies and get innovation into SMEs building on the rural youth and connectivity. Two critical interventions at the firm level are to improve access to finance (SDG 8.3) and facilitate beneficial participation in global value chains (SDG 9.3). The latter can provide SMEs with an opportunity to gain access to international markets and foreign technology, with positive effects for raising SME productivity in ways that are similar to those enjoyed by direct exporters. Ensuring fair distribution of benefits along the value chain is an important point to keep in mind in SME development.

**Increase the voice and agency of producers, especially small ones.** POs and new forms of innovative institutional arrangements can help small producers access an array of services, including improved market information, extension, and collective bargaining power. They are also an effective means to empower small producers, in particular women and youth, by helping them build their capacity to formulate and express their needs and concerns both within their organizations and vis-à-vis other influential economic actors and policy-makers. Indeed, better collaboration helps small producers to better participate in the economic, social and political life at all levels.

Ensuring broad participation in agenda-setting and decision-making processes is a worthy objective in its own right, contributing to the legitimacy and ultimately the effectiveness and sustainability of solutions developed. Participation can help mobilize and empower smallholder producer stakeholders, improve their knowledge and understanding of the issues at stake, and enable consensus building. However, considerable care needs to be taken in framing issues in ways that facilitate collaboration rather than complicate it. Participation must be structured to encourage problem-solving, taking into account and addressing power imbalances. It should make provision for private conversations and bargaining between stakeholders, including affected third parties which help make or break deals that emerge from discussions among the primary stakeholders.

## 18. STRENGTHEN INNOVATION SYSTEMS



### Contributes to SDGs:

1 2 5 9 12 14

Innovation is not only an explicit focus of SDG 9 (build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation) but also a key enabler of most – if not all – SDGs. Strong agricultural innovation systems are essential for the improvement of the economic, environmental and social performance of agriculture.

Innovation is a main driver of agricultural and rural transformations. It refers to technologies and practices applied such as improved crop varieties, agroecological practices, biotechnologies, and mobile devices, financial instruments. It also refers to processes and organizational forms such as public-private partnerships, producers’ organizations, performance contracts. Despite important progress over the last decade, many remain excluded from the benefits of social and technical change, and these are disproportionately poorer and more socially disadvantaged groups, with most living in rural areas.

**Increase investments in agricultural R&D, extension and advisory services, as well as capacity development to improve national agricultural innovation systems.**

Technical change, including improved agroecological practices, is required not only to improve breeding and yields, but also to reduce water consumption, enhance resistance to pests and diseases, ensure sustainable fishing techniques and strengthen resilience of crops and livestock to climate change. To compensate for reduced government capacities to support agricultural research, new institutional arrangements should be put in place for research, extension and innovation, diversifying sources of support to include farmer-led initiatives, South-South, North-South and triangular collaboration arrangements. Over the last few decades, private investment in research and innovation has increased, in addition to collaboration between public and private partners along the value chain. As agricultural systems become more complex, producers need more advanced innovation skills, and improved information about relevant new technologies and practices. Better provision of information to producers, including smallholders, about innovations (both in form of improved technological products and processes, as well as in form of social practices and organization) is also needed, in order to facilitate their acceptance and use.

It should be noted, however, that in this context the role of the public sector remains strategically important. As the private sector becomes increasingly involved in some elements of R&D, the governance of innovation processes, dealing with issues of property rights and public-private partnerships in research, and ensuring adequate flow of resources in key areas of interest to small-scale producers needs to be strengthened.



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**BOX 58: INSTITUTIONAL INNOVATIONS IN TRANSITIONING TO AGROECOLOGY**

Between 2013 and 2015, FAO and the French National Institute for Agricultural Research (INRA) looked at how institutional innovations enabled the transition towards agroecology in 15 developing countries. Institutional innovations are new rules and forms of interactions that bring together actors in food systems who have not traditionally worked together, allowing them to define agriculture within their respective context. The results showed that local actors adapt sustainable practices to local contexts and create new market outlets for their products in line with local values related to trustworthiness, health (nutrition and safety), food sovereignty, youth development, and farmer and community livelihoods. New forms of organization allowed actors to play multiple roles in the system, such as farmer-auditor, farmer-researcher, consumer-auditor, and consumer-intermediary. New forms of market exchange, such as box schemes, direct marketing, public procurement and community seed exchanges, were the result of integrating local and scientific knowledge. Most importantly, the study revealed that social and institutional innovations are as essential as technological innovations in transitioning to agroecology. Among the conclusions were that any new regulatory measures should provide actors with the appropriate level of autonomy to adapt technologies and rules to their local situations; and that institutional innovation is a long-term process that can only be achieved through cooperation among public, private and civil society actors.

Source: (<http://www.fao.org/3/a-i5907e.pdf>)

Promote innovation for, by and with smallholders themselves. Existing resources and capabilities within public and private sector should be combined to develop simple, practical solutions, and make services and products available that might otherwise be unaffordable to rural populations. In order to create new markets in areas where there is a lack of infrastructure or a lack of experience in logistics and distribution, this kind of innovation can take advantage of new technologies such as the use of mobile phones and social networks.

For this to happen, policies should make provisions for the acquisition of tools and the possibility to experiment with new technologies and capabilities. Policies should also put in place initiatives aimed at helping agricultural producers bridge the informal, heterogeneous nature of traditional innovation and existing R&D capabilities. Public investments in knowledge infrastructure, such as repositories and innovation platforms, can greatly accelerate foster the diffusion, replication and improvement of innovations and ideas from the grassroots to a wider audience.

**Clarify public and private roles in agricultural innovation systems.** This involves the identification of areas for partnerships and the improved governance of public-private partnerships; the focusing of public research efforts on longer-term sustainability and specific needs of rural areas, including remote ones; and appropriate funding mechanisms, as well as facilitating access to information and extension and advisory services to improve producers' knowledge and skills. Agricultural innovation systems governance can also be enhanced through the greater integration of agriculture within the general innovation system and through cross-sectoral collaboration.

Harnessing the positive contribution of innovation to SDGs also means recognizing that some forms of contemporary innovation can contribute to environmental degradation, are disruptive of livelihoods and exacerbate inequalities. The key questions, therefore, concern not how to encourage more innovation in more places, but which kinds of innovation need to be encouraged, where and for whom. Governments and partners should encourage innovation that particularly benefits smallholders by improving sustainability and resilience, raising incomes and reducing risks, including by creating new market opportunities and encouraging diversification, or by reducing natural resource depletion and degradation.

## 19. ADAPT AND IMPROVE INVESTMENT AND FINANCE



### Contributes to SDGs:

1 2 9 12 13 14 15 16 17

Building the requisite general support for policies that promote agriculture and its contribution to national sustainable development strategies requires making the case for how national investment in sustainable food and agriculture production systems will contribute materially to broader social needs and objectives.

Producers, including smallholders, are the foremost investors in agriculture. Producers' investment decisions are directly influenced by the investment climate within which they operate. Smallholders often face specific constraints including poverty, lack of or insecure access to land, poor access to markets and financial services. Ensuring a level playing field between smallholders and larger investors is important for both equity and economic efficiency reasons, and to ensure environmental sustainability. The provision of public goods is a fundamental part of the enabling environment for agricultural investment. Evidence from many countries shows that public investment in agricultural R&D, education and access to information for producers, and in rural infrastructure yields much higher returns than other expenditures such as input subsidies.

**Increase investment in rural infrastructure.** Unlocking the agricultural potential of an area through public investment in basic infrastructure such as roads, water control or markets provides an incentive for producers to invest more in their production (see Action 1). Beyond improving producers' incomes, it generates on- and off-farm employment and contributes to strengthening local economies (Mellor, 2000; IFAD, 2001).

Green infrastructure is gaining increasing attention as a viable and sustainable investment option. It refers to the natural, or semi-natural, systems that provide services with equivalent, or similar, benefits to conventional infrastructure. Typically, such

solutions involve a deliberate and conscious effort to utilise the provision of ecosystem services to provide primary land and water management benefits, often associated with a range of secondary co-benefits. For example, well-managed floodplains can reduce flood risk and simultaneously improve water quality, recharge groundwater, and support fish and wildlife.

Many such solutions can increase their value and function over time as soils and vegetation generate or regenerate. Furthermore, the capacity of green infrastructure to build resilience to climate shocks and variability has already proven to be effective in numerous cases, for example conserving mangroves that provide protection against coastal erosion (UNEP, 2014).

### **Explore and exploit new opportunities for inclusive agricultural and rural finance.**

Inclusive financing can foster agribusiness development by easing liquidity constraints faced by many producers. A whole range of innovative approaches to rural finance and forms of investment are now available, such as agricultural investment funds, investment promotion, guarantee funds and ICT, to increase the level of financing while lowering the risks to investors (see Action 1).

Policy-makers should work on improving access to financial products and services tailored to the needs of different categories of producers and value chain actors – including consumers. Financial products and services should take into account the socio-economic conditions that shape producers' financial needs (with specific attention to women) and address the constraints that prevent financial institutions from supporting their work. Innovative social and collaborative platforms, such as the "ruche qui dit oui" in France, connect consumers directly with producers supporting local agriculture.

Interventions to improve access to credit should also promote financial literacy and management skills (IFAD, 2016), in addition to PO or community-based savings and loan groups, which allow for better risk management, and improved access to finance from the formal banking sector.

## **Using incentive mechanisms to foster sustainability and inclusiveness**

Producers often face barriers to the adoption of innovative sustainable practices. While these procedures may offer significant long-term increases in productivity and other economic and environmental benefits, the initial investment costs, absence of tenure security, and unavailability of access to rural credit and appropriate technologies often prevent producers from adopting such practices (Dasgupta and Maler, 1995; McCarthy, Lipper and Branca, 2011).

Different incentives can be used at various stages to address short and long-term changes (Brewer and Goodell, 2012; FAO, 2007). They include regulatory and voluntary mechanisms, public programmes and private initiatives. They can combine positive incentives, such as training, direct payments, to compensation for land set aside, improved market access or others, with regulatory instruments, such as prohibition of use, fines and taxes. Combining various kind of incentives at farm level for more sustainable practices not only supports improved productivity but also allows for greater farmer investment and motivation in the rehabilitation of landscapes and the conservation of threatened habitats.

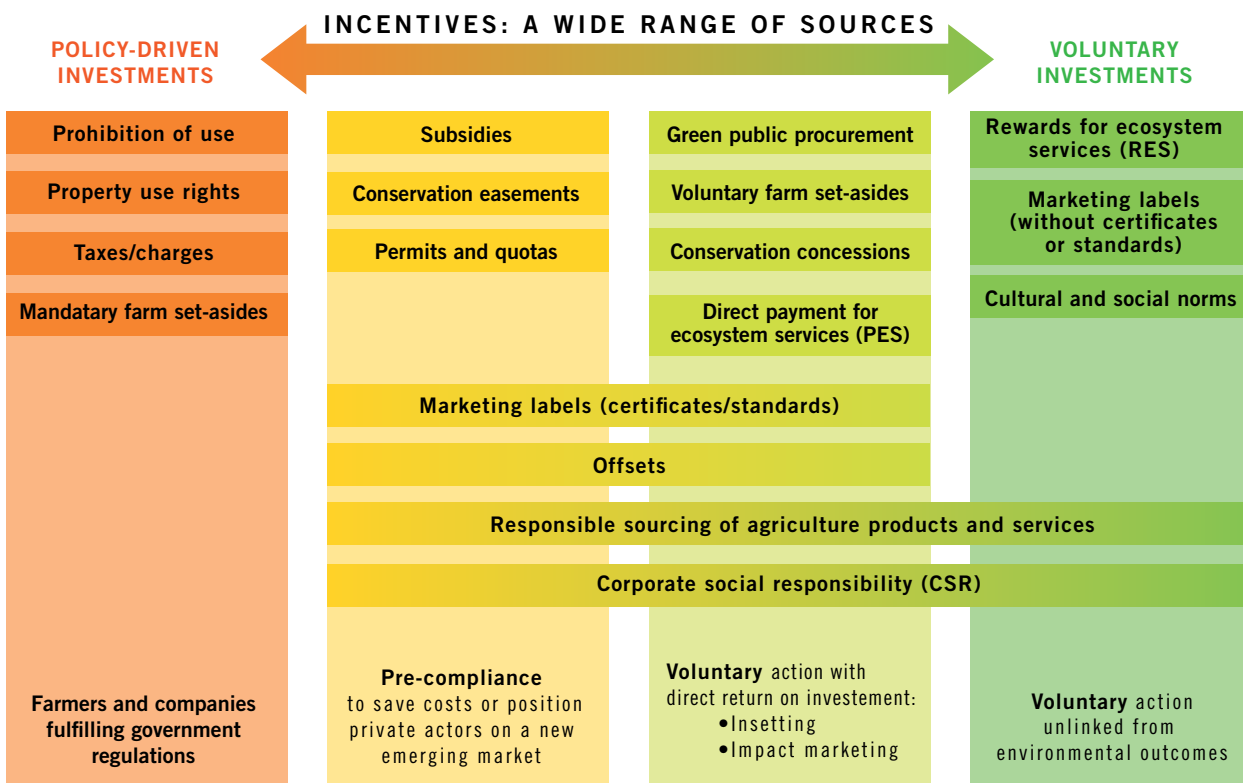
FAO has identified a range of possible Incentives for Ecosystem Services (IES) which can be used to support farmers adopt more sustainable practices. Figure 18 shows the range of possible incentive mechanisms that can be considered. In order to be effective, better coordination and long-term programmes of these existing incentives into inclusive, integrated packages are needed to maximize the adoption of sustainable practices. Policies must be aligned, and institutions need to know each other well enough to cooperate, delegate and engage more, also with the private sector. The example from the Mekong Delta illustrates how different instruments can be combined (Box 59).

### BOX 59: HOW DIFFERENT IMPLEMENTATION INSTRUMENTS WORK TOGETHER FOR SUSTAINABLE AGRICULTURE IN THE MEKONG DELTA

In the Mekong Delta, Viet Nam, diverse incentives co-financed from public programmes, private sector investment and civil society initiatives are used to support fishers comply with mangrove restoration and protection regulation, and improve the sustainability and livelihood benefits of shrimp fisheries.

Zoning of mangrove areas and mandatory forest set asides on private land with removal of aquaculture leases for non-compliance provide disincentives to deforest mangrove habitat. Civil society initiatives provide finance to reforest mangrove habitat, training in integrated mangrove-shrimp farming, organic shrimp farming techniques and management of household waste. The private sector provides financial bonuses per hectare of mangrove within aquaculture farms, and has developed a certification of shrimp raised in integrated mangrove-aquaculture areas with a ten percent premium for certified organic shrimp. This range of incentives provides a diverse source of financial, technical and market assistance for aquaculture farmers to restore mangrove habitats on their farms to reach regulatory compliance, improve sustainable production, reduce environmental impacts and raise productivity, and be rewarded for good environmental stewardship with access to higher-value markets for sustainably produced shrimp.

Figure 18: The diversity of sources that can provide incentives for ecosystem services - Source: FAO, IES Programme



## 20 STRENGTHEN THE ENABLING ENVIRONMENT AND REFORM THE INSTITUTIONAL FRAMEWORK



### Contributes to SDGs:



### Inspire institutional transformation

Institutions create the enabling mechanisms for social and economic activities related to agriculture leading to the achievement of SDGs. They provide a basis of trust and effective implementation of SDG-related programmes at national and local levels.

Over the last few decades, new institutional actors have emerged – fostered by different interests – as important players in the debate on innovation and technology for agriculture and its association to larger social goals. This is especially evident in the changing institutional landscape for rural service provision, which reflects a growing diversity of actors from the private sector, POs and civil society. This plurality of actors implies a changing role of the state from sole provider of services to that of regulator, coordinator and facilitator within increasingly pluralistic service systems (PSS) – in which a wide range of services are provided by different actors and funded by different sources (FAO, 2016n). The diversity of service providers, the knowledge and skills they bring are crucial for enabling producers to improve productivity, manage resources sustainably, operate profitably, and access and respond to broader markets. Institutional change, therefore, calls for recognition of the plurality of service providers and the potential they offer for access to services and markets.

**Incentivize the provision of rural services, beyond extension, and review their completeness, inclusiveness and efficiency and, where possible, improve through alternative arrangements.** A variety of factors makes the provision of rural services challenging: remoteness of some rural areas and lack of incentives for service providers. The private sector is often not interested

in providing services to the rural poor. The state is often not very effective in providing these services either. Other actors such as NGOs, communities or POs are possible alternative providers of rural services, but they often lack the necessary capacities and resources. Furthermore, prevailing institutional structures and social norms impinge on the effectiveness of service provision in many ways. Context matters, particularly when designing services to reach rural women and the poorest.

The past two decades have seen a range of governance reforms that can help improve agricultural and rural service provision, including democratization, decentralization and territorial development approaches, public sector management reforms and specific incentives. Institutional change should be supported and promoted by the mobilization of different social players, including smallholder producers themselves. The uncertainty and risk that characterise various country environments, in addition to the differences in geography, history, ethnicity, and access to markets, public services and infrastructure, account for the complexity of local responses and the great diversity of activities they generate. In light of this, there is a need for adaptable institutions able to carry out a range of policies and adjust and respond to specific national and local circumstances.

**Institutional reform proposals should be analysed and designed considering political economy dynamics.** Processes of institutional change cannot succeed unless they acknowledge underlying political dynamics at all levels. A good understanding of the way structures, institutions and stakeholders interact, the political risks and dynamics at play and the diverse factors, players and interests involved is fundamental for identifying realistic pathways leading to institutional change, and the main actors to engage. Recognizing and addressing asymmetries of power, access and information is critical for the legitimacy, effectiveness and durability of institutional arrangements. Understanding of all these dimensions is required to guide the vision and process of institutional change effectively.

**Institutional change is an incremental process that evolves over time.** The outcomes of these processes depend on the behaviour and capacities

of different actors and the particular ways in which they respond to scenarios and challenges. Developing institutions incrementally, identifying strengths and limitations, building upon previous successes and taking into account prior failures and stakeholders' insights, would foster a long-term approach with sustainable impact.

**The approach needs to be inclusive from the start.** Inclusiveness requires a recognition of key actors' interests and conflicts, and their preferences for certain institutional options. With these differences in mind, it is both necessary and possible to develop a broader range of institutional configurations, combining the collective efforts of public agencies with civil society and private actors. An inclusive approach mandates creating mechanisms through which local communities can articulate perspectives and demands. It also entails proactive measures for targeting the poor and most vulnerable. The fewer the number of restrictions on the participation of the poorest and weakest in the process, the more relevant and inclusive institutions will be. Social institutions, such as Brazil's Fome Zero (Ministry of Agrarian Development, 2011), can be used as brokers to deliver information and enforce compliance with rules, and, at a higher level, to ensure that the rural poor and producers have a strong voice in shaping and oversight of national policies and programmes. FAO Dimitra Clubs are an effective mechanism for creating synergies at local level (Box 60).



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### BOX 60: THE DIMITRA CLUBS AS A MECHANISM FOR CREATING SYNERGIES AT LOCAL LEVEL

The FAO Dimitra Clubs have been chosen in the Niger, as part of the framework of the United Nations joint programme on Rural Women Economic Empowerment (RWEE), as the entry point for coordinated implementation of activities at community level. The Clubs' approach is considered by the four United Nations agencies involved in RWEE (FAO, WFP, IFAD and UN Women) as one of the most effective mechanisms for creating synergies between all stakeholders, enabling the communities concerned to become involved in the design, execution and coordination of interventions in the field, in a fully inclusive manner.

This participatory communication approach, based on community mobilization and empowerment in addition to knowledge sharing, enables everyone – women and men – to be informed, participate in the decision-making process and take joint action for their own development. This process of collective awareness-raising and dialogue improves community governance and fosters behaviour change in all sectors. Launched in November 2012 by FAO, UN Women, IFAD and WFP, the United Nations joint programme on RWEE is implemented in Ethiopia, Guatemala, Kyrgyzstan, Liberia, Nepal, Rwanda and the Niger.

**Decentralization processes represent an opportunity and a challenge.** While the transfer of responsibilities to subnational bodies is justifiable in terms of efficiency and equity, the challenge remains what to transfer and how to implement it for the benefit of all. To make it an opportunity, the capacities of local institutions and POs are to be strengthened at all levels. Local institutions and organizations play multiple roles in delivering services, articulating demands and representing their communities and members in policy dialogue and development processes. However, their participation is often constrained by weak capacities and skills needed to carry out these functions effectively. Appraising the capacities of local actors, and identifying and addressing organizational development needs and skill gaps should be a starting-point for building more relevant and effective institutions that serve the needs of all (Box 61).

## BOX 61: STRENGTHENING LOCAL INSTITUTIONS FOR COORDINATED ACTION IN RULINDO DISTRICT, RWANDA

Many programmes are actively investing in the Rulindo District to address low agricultural productivity, land degradation and poverty issues. The Crop Intensification Programme (CIP) focuses on agricultural productivity. It provides seedlings and mineral fertilizer subsidies for some major commodities. Capacity building is also provided via the FFS public programmes, focusing on practices such as organic manuring, mulching and composting techniques; post harvesting and agricultural enterprise development. Landscape restoration is addressed through bench terraces and water retention ditches to reduce soil erosion and increase water within the catchment; capacity building for the application of agroforestry systems (provision of seedlings, tree nurseries and management, planting knowledge); and funding to plant bamboo and Napier grass to restore riverbanks and gullies.

To diversify livelihoods and strengthen local capacities, the focus is on improved access to credit; support to cooperatives; improved access to market opportunities through better involvement of the private sector; and support to basic requirements through improved access to sanitation facilities and rainwater-harvesting systems.

All of these activities correspond to real needs on the ground. However, they are implemented in isolation from each other, often by different organizations. The strengthening of the capacities of the local administrators, through the adoption of a 'landscape governance approach', aims to improve the institutional and technical conditions to develop, combine and scale up public and private interventions towards commonly shared objectives. The combination of existing conservation, productivity and livelihood investments can support farmers overcome barriers to adopt more sustainable agricultural practices, restore landscapes and diversify their livelihoods. The coordination at district level can help enhance the impacts of the combined investments.

### Invest in capacities and knowledge

**Systematic but tailored institutional capacity strengthening is required to ensure all actors have sufficient capacities to move at the same speed.** In this sense, capacity, education and skills of state officials is one aspect of institutional

change that should be explored. For example, looking into the proportion of farmers, fishers and pastoralists who are satisfied with their relationship with public service agents can provide a clue as to whether a local or national territory is ready for uptake of state innovation and incentive packages. Thus, institutional changes require an element of trust and satisfaction between public institutions and beneficiaries.

Reducing problems of information asymmetry is also a key to building more solid, effective and legitimate institutions. As part of this process, it is vital to improve the links between local, regional and national institutions. These links help to reduce disparities and inequalities, as well as create new opportunities for inclusive growth (see Action 4).

POs and producer-controlled cooperatives deserve particular attention, since they are an essential means for strengthening the capacity of smallholders to invest in agriculture. Depending on their mandate, capacity and the specific context in which they operate, POs can take different forms and functions. Three important functions are: (1) service delivery, by providing services themselves or channelling services from other providers to their members and communities; (2) collective economic operation, by aggregating production, joint marketing and consolidating assets and investments; and (3) advocacy, including political representation and voice, articulation of demand and collective bargaining on behalf of their members and communities (FAO). When POs have the capacity to perform these functions, they can improve their members' capacity to operate and incentives to invest, and mitigate risk.

### Monitor progress and build accountability

A significant factor to successfully achieving the SDGs will be the extent to which efficient and effective ways are developed to collect, analyse and use data in order to monitor progress toward achieving targets. Regular monitoring and reporting can make collaborative action more focused and conducive to more effective, evidence-based policy-making. A robust monitoring and learning framework can help stakeholders evaluate what is being done (actual versus intended outputs), how well it is being done (process improvement



analysis), and whether the results are those that are intended and why (root cause analysis). The monitoring process should aim to draw lessons that can be used to improve future work.

**Design a sound indicator framework.** Indicators can turn the target set into a management tool to allocate resources and support the implementation strategy and plan. Indicators will also serve as a report card to measure progress towards sustainable development and to help ensure the accountability of all stakeholders. Reporting against these common indicators provides the basis for learning from other national experiences and for assessing the overall collective efforts of United Nations Member States toward achieving the SDGs. Data collection should be sufficient to allow disaggregation by gender, age, income, geography and occupation to reflect the 2030 Agenda’s guiding principle to “leave no one behind.”

A distinction should be made between different kinds of indicators: outcome, structural and process indicators. The SDG includes outcome indicators but these are not sufficient to guide transition processes towards sustainable food systems. Participation of producers’ organizations and civil society would be an important process and structural indicator for improving accountability.

**Build a reliable, comprehensive and disaggregated information** base organized around the relevant SDG targets and indicators. Data can be

taken from existing official statistics or other sources available to governments. In many cases there will be data gaps, which can show which areas do not receive sufficient attention, where institutional capacity may be insufficient, or where deeper analyses are required to understand what needs to be measured and how.

Achieving better quality, high-frequency data in support of the SDGs will require a step change in the way NSOs work. While remaining the main actor in the process of generating data to monitor and manage progress at the national level, NSOs should join forces and work with other data contributors, including local and regional governments, line ministries, private players, academia, civil society and citizens. Their role should evolve from data producer to coordinator, managing the various data inputs from different actors, ensuring data quality, comparability and harmonisation. This will in turn ensure that data streams are relevant and useful for national policy-makers and other stakeholders looking to manage and monitor progress.

FAO has identified 40 SDG targets that are important for the food and agriculture sector, to which 53 indicators are associated (see Annex 3 for a detailed list of these targets and indicators). FAO also supports countries in the methodological and monitoring aspects of 21 SDG indicators directly related to food security, agriculture, forestry and fisheries for which it is custodian (Box 62).

## BOX 62: MEASURING PROGRESS TOWARDS ACHIEVING THE SDGs

Progress towards implementing the 2030 Agenda is being measured through a set of 231 indicators that cover all of the SDGs and associated targets. Food and agriculture span across all 17 goals and are reflected in 53 indicators. These include: proportion of population living below the national poverty line (1.2.1); prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES) (2.1.2); average income of smallholder producers, by gender and indigenous status (2.3.2); proportion of agricultural area under productive and sustainable agriculture (2.4.1); proportion of land that is degraded over total land area (15.3.1); level of water stress: freshwater withdrawal as a proportion of available freshwater resources (6.4.2); proportion of fish stocks within biologically sustainable levels (14.4.1); proportion of total adult population with secure tenure rights to land (1.4.2) and global food loss index (12.3.1).

SDG indicator 2.4.1, which measures progress towards more sustainable and productive agriculture, offers the most comprehensive measures of agriculture’s contribution to sustainable development. Subindicators across the three dimensions (social, economic, and environmental) form the basis for defining this indicator. They include themes related to land, water, wage and income, productivity and profitability, resilience and land rights. As such, this indicator captures the multidimensional nature of sustainable agriculture.

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# Annex 1

## STEP FOR OPERATIONALIZING SDG IMPLEMENTATION IN FOOD AND AGRICULTURE

The table below summarises the main elements to be considered as part of the steps for operationalizing SDG implementation in the food and agriculture sectors.

STEP	ELEMENTS TO CONSIDER UNDER EACH STEP
<div style="text-align: center;">  <p><b>A</b></p> <p><b>BUILDING POLITICAL MOMENTUM</b></p> </div>	<p><b>MOBILIZE KEY PLAYERS</b></p> <ul style="list-style-type: none"> <li>• Carry out initial stakeholder mapping</li> <li>• Define strategic sectors and actors to engage</li> <li>• Take stock of the cross-sectoral dynamics in the country</li> <li>• Set up task force/multidisciplinary team</li> </ul> <p><b>ENGAGE SUSTAINABLE FOOD AND AGRICULTURE WITH THE BROADER SDG PROCESS IN THE COUNTRY</b></p> <ul style="list-style-type: none"> <li>• Engage with ongoing mechanisms related to the different SDGs</li> <li>• Advocate for the role of sustainable food and agriculture in the SDGs</li> </ul> <p><b>RAISE AWARENESS OF THE SDGs AND THEIR IMPLICATIONS ON FOOD AND AGRICULTURE</b></p> <ul style="list-style-type: none"> <li>• Develop communication plan and media campaign to raise awareness</li> <li>• Reach out to key audience within and beyond the food and agriculture sectors</li> <li>• Organize national level workshops</li> </ul>
<div style="text-align: center;">  <p><b>B</b></p> <p><b>BUILDING A JOINT VISION AND ACTION PLAN ON SUSTAINABLE FOOD AND AGRICULTURE</b></p> </div>	<p><b>ENGAGE STAKEHOLDERS IN CROSS-SECTORAL AND MULTIDISCIPLINARY DIALOGUE ON SDGs</b></p> <ul style="list-style-type: none"> <li>• Identify champions, facilitators or catalysts</li> <li>• Set up a platform for inclusive dialogue processes</li> <li>• Mobilize non-state stakeholders into the process, with a particular attention to civil society and the private sector</li> <li>• Organize workshops, ensure that all stakeholders understand the objective of the process and that key actors' needs and constraints are understood</li> </ul> <p><b>DEVELOP A JOINT VISION ON SUSTAINABLE FOOD AND AGRICULTURE</b></p> <ul style="list-style-type: none"> <li>• Carry out a gap analysis on the SDGs targets for the country and assess key sustainability issues</li> <li>• Identify key SDG targets on which to focus</li> <li>• Analyse policy interlinkages, vertical and horizontal policy coherence and trade-offs</li> <li>• Develop a theory of change for sectoral contribution to SDGs</li> </ul> <p><b>ADDRESS CONTENTIOUS CHALLENGES AND CONTRADICTION INTERESTS</b></p> <ul style="list-style-type: none"> <li>• Set up mechanisms to address trade-offs between sectors, objectives and interests, and between the economic, social and environmental dimensions</li> <li>• Carry out governance and political economy analysis related to contentious issues and contradictory interests</li> <li>• Gather scientific evidence on contentious issues</li> <li>• Develop co-constructed understanding of contentious issues and agreement on the way to address them</li> </ul> <p><b>DEVELOP AN ACTION PLAN TOWARDS SUSTAINABLE FOOD AND AGRICULTURE</b></p> <ul style="list-style-type: none"> <li>• Identify priority areas for action</li> <li>• Develop scenarios to analyse the implications of different development pathways</li> <li>• Identify key policy/technical measures to achieve the targets</li> <li>• Identify mechanisms and incentives for sustainability of cross-sectoral approaches and to address practice change constraints</li> </ul>

STEP	ELEMENTS TO CONSIDER UNDER EACH STEP
<div data-bbox="209 831 331 949" style="text-align: center;">  </div> <p data-bbox="201 976 464 1048"><b>TRANSLATING VISION INTO ACTION TO ACCELERATE CHANGE TOWARDS SUSTAINABLE FOOD AND AGRICULTURE</b></p>	<p data-bbox="528 640 1059 665"><b>MOBILIZE PRIVATE SECTOR AND CIVIL SOCIETY AND ENHANCE PARTNERSHIPS</b></p> <ul data-bbox="528 665 975 736" style="list-style-type: none"> <li>• Amend regulatory frameworks to facilitate partnerships</li> <li>• Facilitate a platform for permanent dialogue with non-state actors</li> <li>• Raise awareness on non-state actors' role in achieving the SDGs</li> </ul> <p data-bbox="528 763 979 788"><b>INTEGRATE SDGs IN POLICIES, PROGRAMMES AND ACTION PLANS</b></p> <ul data-bbox="528 788 1369 887" style="list-style-type: none"> <li>• Perform a policy review to assess critical gaps</li> <li>• Incorporate key priorities of the common vision into sectoral policies and strategies and develop operational plans at sector level</li> <li>• Clarify institutional arrangement for coordination, mandates, scope and procedures</li> <li>• Harmonize territorial (decentralized) plans to incorporate key priorities for sustainable food and agriculture</li> </ul> <p data-bbox="528 909 1075 934"><b>AMEND BUDGET FRAMEWORKS AND MOBILIZE FUNDING FOR IMPLEMENTATION</b></p> <ul data-bbox="528 934 1302 1032" style="list-style-type: none"> <li>• Develop a strategy for resource mobilization</li> <li>• Amend budget frameworks to facilitate the involvement of key resources partners</li> <li>• Review public and private investments, funding and budget</li> <li>• Use support from development agencies and development partners to develop transformative programmes or projects</li> </ul> <p data-bbox="528 1055 746 1079"><b>BUILD CAPACITY AT ALL LEVELS</b></p> <ul data-bbox="528 1079 1321 1178" style="list-style-type: none"> <li>• Assess strategic capacities needed in integration of the SDGs into national plans and strategies</li> <li>• Define capacity gaps at all levels and develop strategies for expertise and capacities of all stakeholder groups</li> <li>• Make evidence and experience available at all levels to facilitate cross sectoral coordination and support decision-making</li> <li>• Develop incentives to work in cross-sectoral way</li> </ul> <p data-bbox="528 1200 1031 1225"><b>STRENGTHEN STATISTICAL CAPACITY ON DATA RELATED TO SDGs AND SFA</b></p> <ul data-bbox="528 1225 1094 1341" style="list-style-type: none"> <li>• Set-up a baseline using SDG and SFA indicators</li> <li>• Define a monitoring and evaluation system using the SDG monitoring framework</li> <li>• Strengthen capacities of the national statistics offices and ensure coordination</li> <li>• Monitor progress and achievements and report through agreed pathways</li> <li>• Review progress and adapt strategies and financial arrangements according to needs.</li> </ul>

# Annex 2

## HOW THE FIVE PILLARS CONTRIBUTE TO ACHIEVING THE SDGs

**MAJOR:** Direct and substantial impact on one or more of the targets of the SDG;

**CONTRIBUTE:** Indirect or minor impact on one or more of the targets of the SDG.

(x.y): SDG target that is impacted by action area.

PILLAR	Increase productivity, employment and value addition in food systems	Protect and enhance natural resources	Improve livelihoods and foster inclusive economic growth	Enhance the resilience of people, communities and ecosystems	Adapt governance to new challenges
SDG 1: No Poverty	<b>MAJOR:</b> Most poor people live in rural areas and rely on agriculture and food systems for their livelihood. Increasing value addition and productivity translates in higher income and labour opportunities for poor rural populations. (1.4)	<b>CONTRIBUTE:</b> Natural resources degradation affects the poor in a disproportionate way. (1.4, 1.5)	<b>MAJOR:</b> Actions that aim at improving livelihoods and foster inclusive economic growth reduce poverty and inequalities. (1.1, 1.2, 1.3, 1.4, 1.5)	<b>CONTRIBUTE:</b> The poor are also the most vulnerable to shocks. Focusing on the poor in prevention, preparedness and response to shocks, and in strengthening their adaptive capacities can contribute to achieving SDG1 (1.5)	<b>MAJOR:</b> Policy frameworks to address poverty in agriculture sectors and are based on pro-poor and gender sensitive strategies, and support to accelerated investment in poverty reduction areas are central to SDG 1. (1.1, 1.b)
	<b>Focus on:</b> Facilitate access to productive resources, finance and services; Connect smallholders and family farmers to markets; Encourage diversification of production and income; Build producers' knowledge and develop their capacities	<b>Focus on:</b> Enhance soil health and restore land; Protect water and manage scarcity	<b>Focus on:</b> Empower people and fight inequalities; Promote secure tenure rights for men and women; Use social protection tools to enhance productivity and income; Improve nutrition and promote balanced diets	<b>Focus on:</b> Preventing and protecting against shocks: enhancing resilience; Preparing for and responding to shocks; Address and adapt to climate change	<b>Focus on:</b> Enhance policy dialogue and coordination; Strengthen innovation systems; Adapt and improve investment and finance; Strengthen the enabling environment and reform the institutional framework
SDG 2: Zero hunger	<b>MAJOR:</b> SDG 2 is predicated on food security, nutrition and sustainable agriculture. Productive agriculture sectors are a pre-requisite for achieving SDG 2 (2.1, 2.2, 2.3, 2.4)	<b>MAJOR:</b> to achieve the sustainable agriculture target of SDG 2 implies moving towards better use of natural resources and restoration of degraded ecosystems (2.4, 2.5, 2.a)	<b>MAJOR:</b> Actions that aim at improving livelihoods and foster inclusive economic growth in most cases contribute to enhanced food security (2.1, 2.2, 2.3, 2.4)	<b>MAJOR:</b> actions aiming at enhancing the preparedness and response to shocks help reducing the burden and impacts of food crises, thus contributing to food security (2.4)	<b>MAJOR:</b> Cross-sectoral coordination, development of means of implementation and partnerships are central to achieving SDG 2 targets (2.1, 2.3, 2.4, 2.a)
	<b>Focus on:</b> Facilitate access to productive resources, finance and services; Connect smallholders and family farmers to markets; Encourage diversification of production and income; Build producers' knowledge and develop their capacities	<b>Focus on:</b> Enhance soil health and restore land; Protect water and manage scarcity; Mainstream biodiversity conservation and protect ecosystem functions; Reduce losses, encouraging reuse and recycle, and promote sustainable consumption	<b>Focus on:</b> Empower people and fight inequalities; Promote secure tenure rights for men and women; Use social protection tools to enhance productivity and income; Improve nutrition and promote balanced diets	<b>Focus on:</b> Preventing and protecting against shocks: enhancing resilience; Preparing for and responding to shocks; Address and adapt to climate change; Strengthen ecosystem resilience	<b>Focus on:</b> Enhance policy dialogue and coordination; Strengthen innovation systems; Adapt and improve investment and finance; Strengthen the enabling environment and reform the institutional framework
SDG 3: Good health and well being			<b>CONTRIBUTE:</b> Nutrition education and better diets contribute to enhanced health and the reduction of non-communicable diseases (3.4)		
			<b>Focus on:</b> Improve nutrition and promote balanced diets		
SDG 4: Quality education	<b>CONTRIBUTE:</b> Access to extension services and knowledge contribute to skills development and capacity development (4.3, 4.4)		<b>MAJOR:</b> Empowerment of rural people implies enhancing the skills and capacities of youth and adults and contribute to employment, decent jobs and entrepreneurship. (4.3, 4.4)		
	<b>Focus on:</b> Build producers' knowledge and develop their capacities		<b>Focus on:</b> Empower people and fight inequalities		
SDG 5: Gender equality	<b>CONTRIBUTE:</b> Women access to knowledge and productive resources contribute to gender equality (5.b)		<b>MAJOR:</b> Women's economic empowerment, access to knowledge and productive resources, including land, and participation in decision-making in agriculture sectors contribute to gender equality (5.1, 5.5, 5.a)		<b>CONTRIBUTE:</b> Policy framework to empower women, strengthen their participation in decision-making and promote gender equality in agriculture sectors play a key role in achieving SDG 5. (5.a, 5.b, 5.c)
	<b>Focus on:</b> Facilitate access to productive resources, finance and services		<b>Focus on:</b> Empower people and fight inequalities; Promote secure tenure rights for men and women		<b>Focus on:</b> Enhance policy dialogue and coordination; Strengthen innovation systems; Adapt and improve investment and finance; Strengthen the enabling environment and reform the institutional framework
SDG 6: Clean water and sanitation	<b>CONTRIBUTE:</b> Developing producer's knowledge contributes to reducing water resources degradation and enhancing water use efficiency (6.3, 6.4).	<b>MAJOR:</b> Promoting more sustainable and efficient use of water in agriculture and reducing losses and waste play a key role in ensuring clean water and sanitation for all (6.3, 6.4, 6.6)	<b>CONTRIBUTE:</b> Promoting secure right to resources contributes to increase water use efficiency (6.4).	<b>CONTRIBUTE:</b> Adapting to climate change and building ecosystem resilience imply increased water use efficiency and better managed water-based ecosystems (6.4, 6.6).	<b>CONTRIBUTE:</b> Cross-sectoral coordination is critical to sustainable management of water resources (6.5, 6.a)
	<b>Focus on:</b> Build producers' knowledge and develop their capacities	<b>Focus on:</b> Protect water and manage scarcity; Mainstream biodiversity conservation and protect ecosystem functions	<b>Focus on:</b> Promote secure tenure rights for men and women	<b>Focus on:</b> Address and adapt to climate change; Strengthen ecosystem resilience	<b>Focus on:</b> Enhance policy dialogue and coordination; Strengthen the enabling environment and reform the institutional framework

PILLAR	Increase productivity, employment and value addition in food systems	Protect and enhance natural resources	Improve livelihoods and foster inclusive economic growth	Enhance the resilience of people, communities and ecosystems	Adapt governance to new challenges
SDG 7: Affordable clean energy	CONTRIBUTE: Affordable energy for all is critical in boosting agriculture productivity. At the same time, efficient use of energy in agriculture contributes to reduced carbon emissions (7.2, 7.3)	CONTRIBUTE: Addressing the water-food-energy nexus through better aligned policies and reducing losses and waste contribute to more efficient energy use (7.2, 7.3)			CONTRIBUTE: Cross-sectoral coordination is critical to sustainable management of energy in agriculture sectors (7.2, 7.3)
	Focus on: Facilitate access to productive resources, finance and services	Focus on: Protect water and manage scarcity; Reduce losses, reuse, recycle and promote sustainable consumption			Focus on: Enhance policy dialogue and coordination
SDG 8: Decent work and economic growth	CONTRIBUTE: All activities contribute to inclusive economic growth (8.2, 8.8, 8.10, 8.a)	CONTRIBUTE: Decoupling growth from natural resources use will contribute to protect water resources (8.4)	MAJOR: agriculture sectors are employing the majority of the world's poor population. Promoting decent work in agriculture and rural environment, including for the youth, is key to achieving SDG 8. (8.3, 8.5, 8.6, 8.7, 8.8, 8.10, 8.b)		
	Focus on: Facilitate access to productive resources, finance and services; Connect smallholders to markets; Encourage diversification of production and income; Build producers' knowledge and develop their capacities	Focus on: Protect water and manage scarcity	Focus on: Empower people and fight inequalities; Promote secure tenure rights for men and women; Use social protection tools to enhance productivity and income; Improve nutrition and promote balanced diets		
SDG 9: Industry, innovation and infrastructure	MAJOR: Producers and other rural people need access to infrastructure, markets, innovations and finance to ensure that their sector contributes effectively to local, national and global economy (9.3, 9.b, 9.c)	CONTRIBUTE: Managing water scarcity contributes to developing sustainable and resilient infrastructure, including regional and transborder infrastructure (9.1)	CONTRIBUTE: Improved tenure contributes to economic development and equitable access to infrastructure (9.1)	CONTRIBUTE: Investment in resilient infrastructure is a key element of climate change adaptation and protection against shocks (9.a)	CONTRIBUTE: Innovations and investments contribute to developing resilient infrastructure (9.3, 9.a, 9.b)
	Focus on: Facilitating access to productive resources, finance and services; Connecting smallholders and family farmers to markets; Build producers' knowledge and develop their capacities	Focus on: Protect water and manage scarcity	Focus on: Promote secure tenure rights for men and women	Focus on: Preventing and protecting against shocks: enhancing resilience; Preparing for and responding to shocks; Addressing and adapting to climate change	Focus on: Strengthen innovation systems; Adapt and improve investment and finance
SDG 10: Reduced inequalities			MAJOR: Reduction of inequalities among rural people and with urban populations implies empowerment, more inclusive policies and effective use of social protection mechanisms (10.1, 10.2, 10.3, 10.4)		CONTRIBUTE: Strengthening the enabling environment is key to reducing inequalities and ensuring equal opportunities for all (10.2, 10.3, 10.4)
			Focus on: Empowering people and fighting inequalities; Promoting secure tenure rights for men and women; Using social protection tools to enhance productivity and income		Focus on: Strengthen the enabling environment and reform the institutional framework
SDG 11: Sustainable cities and communities	CONTRIBUTE: Better integration between urban and rural areas and sustainable markets for food products benefit urban and peri-urban areas (11.4, 11.a)	CONTRIBUTE: The protection of soil, water and biodiversity contributes to more sustainable cities (11.4)		CONTRIBUTE: Preparing and protecting against disasters has positive impacts on the most vulnerable communities (11.5)	MAJOR: Better integration of urban and rural planning contributes to more sustainable cities (11.5, 11.a)
	Focus on: Connecting smallholders and family farmers to markets; Encouraging diversification of production and income	Focus on: Enhancing soil health and restoring land; Protecting water and managing scarcity; Mainstreaming biodiversity conservation and protecting ecosystem functions; Reducing losses, encouraging reuse and recycle, and promoting sustainable consumption		Focus on: Preventing and protecting against shocks: enhancing resilience; Preparing for and responding to shocks; Addressing and adapting to climate change	Focus on: Enhance policy dialogue and coordination; Strengthen the enabling environment and reform the institutional framework
SDG 12: Sustainable consumption and production	CONTRIBUTE: the development of sustainable value chains contribute directly to more sustainable consumption and production (12.1, 12.3)	MAJOR: Protection and efficient use of natural resources, sound management of chemicals and reduction in the losses and wastes associated to the production and consumption of agricultural commodities are central to SDG 12. (12.2, 12.3, 12.4, 12.5, 12.6, 12.c)	CONTRIBUTE: Improved diets is related to reducing waste and promoting recycling and reuse (12.5)		CONTRIBUTE: Better linkages between production, environment and trade policies make value chains more efficient and more sustainable (12.1, 12.6)
	Focus on: Connecting smallholders and family farmers to markets	Focus on: Enhancing soil health and restoring land; Protecting water and managing scarcity; Mainstreaming biodiversity conservation and protecting ecosystem functions; Reducing losses, encouraging reuse and recycle, and promoting sustainable consumption	Focus on: Improve nutrition and promote balanced diets		Focus on: Enhance policy dialogue and coordination; Strengthen innovation systems; Adapt and improve investment and finance; Strengthen the enabling environment and reform the institutional framework

PILLAR	Increase productivity, employment and value addition in food systems	Protect and enhance natural resources	Improve livelihoods and foster inclusive economic growth	Enhance the resilience of people, communities and ecosystems	Adapt governance to new challenges
SDG 13: Climate action	CONTRIBUTE: Developing capacities contributes to climate education (13.3)	CONTRIBUTE: Conserving biodiversity and protecting ecosystem services contributes to increasing resilience (13.1)	MAJOR: Empowerment and social protection enhance the resilience of most vulnerable people and contribute to climate action (13.1, 13.3)	MAJOR: All actions under Area 4 contribute to SDG 13 by increasing resilience and preparedness of rural communities (13.1, 13.2, 13.3, 13.b)	MAJOR: Mainstreaming climate action in agriculture sector programmes is a condition for successful achievement of SDG 13. (13.2, 13.b)
	Focus on: Build producers' knowledge and develop their capacities	Focus on: Mainstream biodiversity and protect ecosystem services	Focus on: Empowering people and fighting inequalities; Promoting secure tenure rights for men and women; Using social protection tools to enhance productivity and income	Focus on: Preventing and protecting against shocks: enhancing resilience; Preparing for and responding to shocks; Addressing and adapting to climate change; Strengthening ecosystem resilience	Focus on: Enhance policy dialogue and coordination; Strengthen innovation systems; Adapt and improve investment and finance; Strengthen the enabling environment and reform the institutional framework
SDG 14: Life under water	MAJOR: Better access to market for smallholder artisanal fishers contributes to more sustainable use of marine resources (14.b)	MAJOR: The sustainable management of natural resources and agricultural chemicals contribute to protection of marine and coastal ecosystems and reduced pollution from land-based activities (14.1, 14.2, 14.5, 14.c)	CONTRIBUTE: Empowering smallholder fishers contribute to more inclusive and sustainable use of marine resources (14.b)	CONTRIBUTE: Empowering smallholder fishers contribute to enhancing their resilience (14.2, 14.5, 14.b)	MAJOR: Coordination between land-based and freshwater or marine economies help maintaining healthy water ecosystems and promoting more sustainable use of marine resources (14.4, 14.6, 14.c)
	Focus on: Facilitating access to productive resources, finance and services; Connecting smallholders and family farmers to markets	Focus on: Protecting water and managing scarcity; Mainstreaming biodiversity conservation and protecting ecosystem functions	Focus on: Empowering people and fighting inequalities; Promoting secure tenure rights for men and women; Using social protection tools to enhance productivity and income	Focus on: Preventing and protecting against shocks: enhancing resilience; Preparing for and responding to shocks; Addressing and adapting to climate change; Strengthening ecosystem resilience	Focus on: Enhance policy dialogue and coordination; Strengthen innovation systems; Adapt and improve investment and finance; Strengthen the enabling environment and reform the institutional framework
SDG 15: Life on land	CONTRIBUTE: More productive agriculture plays an important role in reducing encroachment on natural ecosystems by limiting the areas needed for agricultural production (15.2)	MAJOR: The conservation and protection of soil and biodiversity, the restoration of degraded lands and the protection of forests are central to achieving SDG 15. (15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.8, 15.9, 15.a, 15.b)		CONTRIBUTE: Healthy ecosystems are also resilient ecosystems. (15.1, 15.3, 15.4, 15.5, 15.9, 15.a, 15.b)	MAJOR: Cross-sectoral approaches to the conservation and restoration of natural resources, including forests, and enhanced finance from all sources are key to the success of SDG 15 (15.9, 15.a, 15.b)
	Focus on: Facilitating access to productive resources, finance and services; Connecting smallholders and family farmers to markets;	Focus on: Enhancing soil health and restoring land; Mainstreaming biodiversity conservation and protecting ecosystem functions		Focus on: Strengthening ecosystem resilience	Focus on: Enhance policy dialogue and coordination; Adapt and improve investment and finance; Strengthen the enabling environment and reform the institutional framework
SDG 16: Peace, justice and strong institutions			CONTRIBUTE: Empowering people at local level for sustainable agriculture will contribute to more efficient and inclusive local institutions (16.5, 16.6, 16.7)		MAJOR: Adapting governance at all levels implies stronger policies and institutions, enhanced transparency and ensuring participation at all levels in decision making (16.3, 16.5, 16.6, 16.7)
			Focus on: Empowering people and fighting inequalities		Focus on: Enhance policy dialogue and coordination; Strengthen innovation systems; Adapt and improve investment and finance; Strengthen the enabling environment and reform the institutional framework
SDG 17: Partnerships for the goals					MAJOR: Enhanced and more effective governance will contribute to the partnership, resources mobilization and policy coherence of SDG 17 (17.1, 17.14, 17.17)
					Focus on: Enhance policy dialogue and coordination; Strengthen innovation systems; Adapt and improve investment and finance; Strengthen the enabling environment and reform the institutional framework

# Annex 3

## TOOLS AND APPROACHES TO SUPPORT FOOD AND AGRICULTURE TRANSFORMATION

This annex proposes a set of reference documents and websites of relevance to the 20 areas of actions. It is not exhaustive but highlights key resources that help start engaging in a specific actions.

# Policy support tools

**F**AO draws on its combination of technical and monitoring expertise to support countries shape policy on food and agriculture. These select products, tools and guidelines are educated by data and experience, and drafted following a collaborative process often involving multiple stakeholders.



The Committee on World Food Security (CFS) is the foremost inclusive international and intergovernmental platform for all stakeholders to work together to ensure food security and nutrition for all. Reporting to the UN General Assembly through the Economic and Social Council (ECOSOC) and to FAO Conference, the CFS supports countries to implement negotiated cross-cutting policy products.

### **The voluntary guidelines on the responsible governance of tenure of land, fisheries and forests in the context of national food security (VGGT)**

The VGGT provide a reference and guidance to improve the governance of tenure of land, fisheries and forests towards achieving food security for all and the progressive realization of the right to food (CFS, 2012).



### **The principles for responsible investment in agriculture and food systems (RAI)**

The Principles address all types of investment in agriculture and food systems – public as well as private, and provide a framework for the development of national policies, programmes, regulatory frameworks, and corporate or individual agreements or contracts (CFS, 2012).



## INVESTING IN SMALLHOLDERS

- Investing in Smallholder Agriculture for Food Security and Nutrition (2013)
- How to Increase Food Security and Smallholder Sensitive Investments in Agriculture (CFS, 2011)
- Connecting Smallholders to Markets (CFS, 2016).

## SUSTAINABLE AGRICULTURE, FORESTRY AND FISHERIES

- Increasing Agricultural Productivity and Production in a Socially, Economically and Environmentally Sustainable Manner (CFS, 2012);
- Biofuels and Food Security (CFS, 2013);
- Sustainable Fisheries and Aquaculture for Food Security and Nutrition (CFS, 2014);
- Sustainable Agricultural Development for Food Security and Nutrition: What Roles for Livestock? (CFS, 2016);
- Sustainable forestry for food security and nutrition (CFS, 2017).
- The Second Global Plan of Action for plant genetic resources for food and agriculture (PGRFA); the guidelines for developing a national strategy for PGRFA; and the Voluntary guide for national seed policy formulation
- The Sustainable Forest management Toolbox
- The Code of conduct for responsible fisheries (1995)
- The International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing
- The Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication
- International Guidelines on Bycatch Management and Reduction of Discards
- International Guidelines for the Management of Deep-sea Fisheries in the High Seas
- Voluntary Guidelines for flag State performance

## CLIMATE CHANGE AND NATURAL RESOURCES

- Food Security and Climate Change (CFS, 2012);
- Water for Food Security and Nutrition (CFS, 2015)
- Climate-Smart Agriculture Sourcebook (2017)
- The Voluntary Guidelines for Sustainable Soil Management (2016)

## OTHER CROSS-CUTTING ISSUES

- Engagement in Advancing Nutrition (CFS, 2016)
- Social Protection for Food Security and Nutrition (CFS, 2012)
- Gender, Food Security and Nutrition (CFS, 2011)
- Framework for action for food security and nutrition in protracted crises (CFS, 2015)
- Food Losses and Waste in the Context of Sustainable Food Systems (CFS, 2014)

# Tools supporting specific actions

## 1. FACILITATE ACCESS TO PRODUCTIVE RESOURCES, FINANCE AND SERVICES

**Save and grow** A guide to the sustainable intensification of smallholder crop production [www.fao.org/ag/save-and-grow](http://www.fao.org/ag/save-and-grow)

**Sustainable agricultural mechanization platform**  
[www.fao.org/sustainable-agricultural-mechanization](http://www.fao.org/sustainable-agricultural-mechanization)

**Voluntary guide for national seed policy formulation** [www.fao.org/3/a-i4916e.pdf](http://www.fao.org/3/a-i4916e.pdf)

## 2. CONNECT SMALLHOLDERS AND FAMILY FARMERS TO MARKETS

**Developing sustainable food value chains**  
Guiding principles [www.fao.org/3/a-i3953e.pdf](http://www.fao.org/3/a-i3953e.pdf)

**FAO sustainable food value chain knowledge platform**  
[www.fao.org/sustainable-foodvalue-chains/what-is-it](http://www.fao.org/sustainable-foodvalue-chains/what-is-it)

**Entrepreneurship Development Training Manual**  
[www.fao.org/sustainablefood-value-chains/training-and-learning-center/details-materials/en/c/277441/](http://www.fao.org/sustainablefood-value-chains/training-and-learning-center/details-materials/en/c/277441/)

**Innovative risk management strategies in rural and agriculture finance** [www.fao.org/3/a-i6940e.pdf](http://www.fao.org/3/a-i6940e.pdf)

**Technical guidelines on aquaculture certification**  
[www.fao.org/3/a-i2296t.pdf](http://www.fao.org/3/a-i2296t.pdf)

**Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries (Revision 1); and from Inland Capture Fisheries**  
[www.fao.org/docrep/012/i1119t/i1119t00.htm](http://www.fao.org/docrep/012/i1119t/i1119t00.htm) [www.fao.org/docrep/014/ba0001t/ba0001t00.pdf](http://www.fao.org/docrep/014/ba0001t/ba0001t00.pdf)

## 3. ENCOURAGE DIVERSIFICATION OF PRODUCTION AND INCOME

**Neglected and underutilized species community** (managed by Bioversity International) [www.nuscommunity.org/about-us/neglected-underutilized-species](http://www.nuscommunity.org/about-us/neglected-underutilized-species)

**LEAP- Livestock Environmental Assessment and Performance partnership programme**  
[www.fao.org/partnerships/leap](http://www.fao.org/partnerships/leap)

**FAO Diversification Booklet Series**  
[www.fao.org/sustainable-foodvalue-chains/training-and-learning-center/details/en/c/274790](http://www.fao.org/sustainable-foodvalue-chains/training-and-learning-center/details/en/c/274790)

**Sustaining livestock diversity** E-module [www.fao.org/ag/againfo/programmes/en/genetics/Guidelines.html](http://www.fao.org/ag/againfo/programmes/en/genetics/Guidelines.html)

## 4. BUILD PRODUCERS' KNOWLEDGE AND DEVELOP THEIR CAPACITIES

**Global Farmer Field Schools Platform**  
[www.fao.org/farmer-field-schools](http://www.fao.org/farmer-field-schools)

**FAO Research and Extension Portal**  
[www.fao.org/research-and-extension](http://www.fao.org/research-and-extension)

**A decision guide for rural advisory methods**  
[www.fao.org/3/a-i8141e.pdf](http://www.fao.org/3/a-i8141e.pdf)

**FAO Capacity Development Portal**  
[www.fao.org/capacity-development](http://www.fao.org/capacity-development)

**FAO capacity development learning courses**  
[www.fao.org/capacitydevelopment/resources/fao-learning-material/learning-courses](http://www.fao.org/capacitydevelopment/resources/fao-learning-material/learning-courses)



## 5. ENHANCE SOIL HEALTH AND RESTORE LAND

### **Global Soil Partnership**

[www.fao.org/global-soil-partnership](http://www.fao.org/global-soil-partnership)

### **Voluntary Guidelines for Sustainable Soil Management**

[www.fao.org/3/a-bl813e.pdf](http://www.fao.org/3/a-bl813e.pdf)

### **WOCAT (World Overview of Conservation Approaches and Technologies)**

[www.wocat.net](http://www.wocat.net)

### **COLLECT EARTH** Augmented visual interpretation for land monitoring

[www.openforis.org/tools/collectearth.html](http://www.openforis.org/tools/collectearth.html)

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

[www.fao.org/3/a-i5036e.pdf](http://www.fao.org/3/a-i5036e.pdf)

## 6. PROTECT WATER AND MANAGE SCARCITY

### **Coping with water scarcity, an action framework for agriculture and food security**

[www.fao.org/docrep/016/i3015e/i3015e.pdf](http://www.fao.org/docrep/016/i3015e/i3015e.pdf)

### **Water accounting and auditing** A sourcebook

[www.fao.org/3/a-i5923e.pdf](http://www.fao.org/3/a-i5923e.pdf)

### **Water and the rural poor - Interventions for improving livelihoods (sub-Saharan Africa and Asia)**

[www.fao.org/3/a-i0132e.pdf](http://www.fao.org/3/a-i0132e.pdf) [www.fao.org/3/a-i3705e.pdf](http://www.fao.org/3/a-i3705e.pdf)

### **On-farm practices for the safe use of wastewater in urban and peri-urban horticulture**

[www.fao.org/docrep/016/i3041e/i3041e.pdf](http://www.fao.org/docrep/016/i3041e/i3041e.pdf)

### **IPPM Integrated pest management** (training, outreach)

[www.fao.org/agriculture/ippm/activities/pesticide-risk-reduction](http://www.fao.org/agriculture/ippm/activities/pesticide-risk-reduction)

### **Technical Guidelines for the implementation of the International Code of Conduct on Pesticide management**

[www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/code/list-guide-new](http://www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/code/list-guide-new)

## 7. MAINSTREAM BIODIVERSITY AND PROTECT ECOSYSTEM FUNCTIONS

### **Guidelines for Developing a National Strategy for Plant Genetic Resources for Food and Agriculture**

[www.fao.org/3/a-i4917e.pdf](http://www.fao.org/3/a-i4917e.pdf)

### **Voluntary Guidelines for the Conservation and Sustainable Use of Crop Wild Relatives and Wild Food Plants**

[www.fao.org/documents/card/en/c/8f366de9-08a8-42ad-aae1-4f8f6822420e/](http://www.fao.org/documents/card/en/c/8f366de9-08a8-42ad-aae1-4f8f6822420e/)

### **Guidelines on animal genetic resources**

[www.fao.org/ag/againfo/programmes/en/genetics/Guidelines.html](http://www.fao.org/ag/againfo/programmes/en/genetics/Guidelines.html)

### **Principles for the assessment of livestock impacts on biodiversity** (LEAP partnership)

[www.fao.org/3/a-i6492e.pdf](http://www.fao.org/3/a-i6492e.pdf)

### **Sustaining livestock diversity** E-learning tools

[www.fao.org/ag/againfo/programmes/en/genetics/Guidelines.html](http://www.fao.org/ag/againfo/programmes/en/genetics/Guidelines.html)

### **Fishery Resources Monitoring System (FIRMS)**

[firms.fao.org](http://firms.fao.org)

### **Mainstreaming ecosystem services and biodiversity into agricultural production and management in East Africa & in the Pacific Islands**

[www.fao.org/3/a-i5603e.pdf](http://www.fao.org/3/a-i5603e.pdf) [www.fao.org/3/a-i6505e.pdf](http://www.fao.org/3/a-i6505e.pdf)

## 8. REDUCE LOSSES, ENCOURAGE REUSE AND RECYCLE, AND PROMOTE SUSTAINABLE CONSUMPTION

### **Community of practice on food loss reduction**

[www.fao.org/food-loss-reduction](http://www.fao.org/food-loss-reduction)

### **FAO bioenergy website**

[www.fao.org/energy/bioenergy](http://www.fao.org/energy/bioenergy)

### **FAO technical platform on the measurement and the reduction of food loss and waste**

[www.fao.org/platform-food-loss-waste](http://www.fao.org/platform-food-loss-waste)

**Global Save Food Initiative**

[www.fao.org/save-food/background](http://www.fao.org/save-food/background)

**Bioenergy and Food Security (BEFS) Approach**

[www.fao.org/docrep/019/i3672e/i3672e.pdf](http://www.fao.org/docrep/019/i3672e/i3672e.pdf)

**Assessing the sustainability and replicability of integrated food energy systems** A guidance document

[www.fao.org/docrep/019/i3669e/i3669e.pdf](http://www.fao.org/docrep/019/i3669e/i3669e.pdf)

**Small-scale aquaponics food production**

Integrating fish and plant farming [www.fao.org/3/a-i4021e.pdf](http://www.fao.org/3/a-i4021e.pdf)

**9. EMPOWER PEOPLE AND FIGHT INEQUALITIES**

**Right to Food.** Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security

<http://www.fao.org/3/a-y7937e.pdf>

**Right to Food Methodological Toolbox**

<http://www.fao.org/right-to-food/resources/rtf-methodological-toolbox>

**FAO online Toolbox on decent rural employment**

[www.fao.org/rural-employment/toolbox](http://www.fao.org/rural-employment/toolbox)

**FAO's work on youth employment**

[www.fao.org/rural-employment/workareas/youth-employment](http://www.fao.org/rural-employment/workareas/youth-employment)

**Guidance on addressing child labour in fisheries and aquaculture**

[www.fao.org/docrep/018/i3318e/i3318e.pdf](http://www.fao.org/docrep/018/i3318e/i3318e.pdf)

**CEDAW Guidelines** A tool for gender-sensitive agriculture and rural development policy and programme formulation

[www.fao.org/docrep/017/i3153e/i3153e.pdf](http://www.fao.org/docrep/017/i3153e/i3153e.pdf)

**Gender, rural women and development (Dimitra)**

[www.fao.org/dimitra/home](http://www.fao.org/dimitra/home)

**Realizing women's rights to land in the law** A guide

to report on SDG 5.a.2. [www.fao.org/3/i8785en/i8785en.pdf](http://www.fao.org/3/i8785en/i8785en.pdf)

**10. PROMOTE SECURE TENURE RIGHTS FOR MEN AND WOMEN**

**FAO Tenure Portal** [www.fao.org/tenure](http://www.fao.org/tenure)

**Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests**

[www.fao.org/docrep/016/i2801e/i2801e.pdf](http://www.fao.org/docrep/016/i2801e/i2801e.pdf)

**Responsible governance of tenure** E-learning

[www.fao.org/elearning/#/elc/en/courses/VGGT](http://www.fao.org/elearning/#/elc/en/courses/VGGT)

**Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication**

[www.fao.org/3/i4356en/14356EN.pdf](http://www.fao.org/3/i4356en/14356EN.pdf)

**11. USE SOCIAL PROTECTION TOOLS TO ENHANCE PRODUCTIVITY AND INCOME****FAO Social Protection Portal**

[www.fao.org/social-protection](http://www.fao.org/social-protection)

**Strengthening coherence between agriculture and social protection to combat poverty and hunger in Africa**

A framework for analysis and action

[www.fao.org/3/a-i5386e.pdf](http://www.fao.org/3/a-i5386e.pdf)

**Strengthening coherence between agriculture and social protection to combat poverty and hunger in Africa**

Diagnostic Tool [www.fao.org/3/a-i5385e.pdf](http://www.fao.org/3/a-i5385e.pdf)

**Social analysis for agriculture and rural investment projects**

[www.fao.org/elearning/#/elc/en/course/SA](http://www.fao.org/elearning/#/elc/en/course/SA)

**12. IMPROVE NUTRITION AND PROMOTE BALANCED DIETS**

**FAO Nutrition Portal** [www.fao.org/nutrition](http://www.fao.org/nutrition)

**Toolkit on nutrition-sensitive agriculture and food systems**

[www.fao.org/nutrition/policies-programmes/toolkit](http://www.fao.org/nutrition/policies-programmes/toolkit)

**Home-Grown School Feeding** Resource Framework  
[www.fao.org/3/i8724en/i8724EN.pdf](http://www.fao.org/3/i8724en/i8724EN.pdf)

**Key Recommendations for Improving Nutrition through Agriculture and Food Systems**  
[www.fao.org/3/a-i4922e.pdf](http://www.fao.org/3/a-i4922e.pdf)

**Strengthening sector policies for better food security and nutrition results (Series):** - Fisheries and aquaculture - Livestock - Forestry - Social Protection  
<http://www.fao.org/publications/policy-guidance-series/en/>

### 13. PREVENT AND PROTECT AGAINST SHOCKS: ENHANCE RESILIENCE

**KORE - Knowledge sharing platform on resilience**  
[www.fao.org/in-action/kore](http://www.fao.org/in-action/kore)

**Framework for Action for food security and nutrition in protracted crises (CFS-FFA)**  
[www.fao.org/3/a-bc852e.pdf](http://www.fao.org/3/a-bc852e.pdf)

**Resilient Livelihoods** Disaster Risk Reduction for Food and Nutrition Security Framework Programme  
[www.fao.org/3/a-i3270e.pdf](http://www.fao.org/3/a-i3270e.pdf)

**Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) & SHARP Background document**  
[www.fao.org/in-action/sharp/en/](http://www.fao.org/in-action/sharp/en/) [www.fao.org/3/a-i4495e.pdf](http://www.fao.org/3/a-i4495e.pdf)

**Resilience good practices**  
[www.fao.org/in-action/kore/good-practices](http://www.fao.org/in-action/kore/good-practices)

### 14. PREPARE FOR AND RESPOND TO SHOCKS

**Global Information and Early Warning System (GIEWS) on food and agriculture** [www.fao.org/giews](http://www.fao.org/giews)  
**Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES)**  
[www.fao.org/ag/againfo/programmes/en/empres/home.asp](http://www.fao.org/ag/againfo/programmes/en/empres/home.asp)

**Food chain crisis early warning system**  
[www.fao.org/food-chain-crisis](http://www.fao.org/food-chain-crisis)

**FAO Desert Locust Information Service (DLIS)**  
[www.fao.org/ag/locusts/en/activ/DLIS/dailyphotos/index.html](http://www.fao.org/ag/locusts/en/activ/DLIS/dailyphotos/index.html)

### 15. ADDRESS AND ADAPT TO CLIMATE CHANGE

**FAO Climate Smart Agriculture Portal and sourcebook** [www.fao.org/climate-smart-agriculture](http://www.fao.org/climate-smart-agriculture)

**Economic and Policy Innovations for Climate-Smart Agriculture (EPIC) programme**  
[www.fao.org/climatechange/epic/projects](http://www.fao.org/climatechange/epic/projects)

**Nationally Appropriate Mitigation Actions (NAMAs) learning tool** [www.fao.org/3/a-i4642e.pdf](http://www.fao.org/3/a-i4642e.pdf)

**REDD+ Reducing Emissions from Deforestation and Forest Degradation** [www.fao.org/redd](http://www.fao.org/redd)

**Ex-ante Carbon Balance Tool**  
[www.fao.org/tc/exact/carbonbalance-tool-ex-act](http://www.fao.org/tc/exact/carbonbalance-tool-ex-act)

### 16. STRENGTHEN ECOSYSTEM RESILIENCE

**Agroecology knowledge hub** [www.fao.org/agroecology](http://www.fao.org/agroecology)

**LADA- land degradation assessment and potential for sustainable land management manuals**  
[www.fao.org/nr/kagera/tools-and-methods/lada-local-levelassessment-manuals](http://www.fao.org/nr/kagera/tools-and-methods/lada-local-levelassessment-manuals)

**Landscapes for life** Approaches to landscape management for sustainable food and agriculture  
[www.fao.org/3/i8324en/i8324en.pdf](http://www.fao.org/3/i8324en/i8324en.pdf)

**Globally Important Agricultural Heritage Systems (GIAHS)** [www.fao.org/giahs](http://www.fao.org/giahs)

**17. ENHANCE POLICY DIALOGUE AND COORDINATION****FAO Policy and Governance Portal**[www.fao.org/policy-support/governance](http://www.fao.org/policy-support/governance)**FAO Partnership Portal** [www.fao.org/partnerships](http://www.fao.org/partnerships)**Monitoring and Analysing Food and Agricultural Policies (MAFAP) programme**[www.fao.org/in-action/mafap/home](http://www.fao.org/in-action/mafap/home)**Global Agenda for Sustainable Livestock**[www.livestockdialogue.org](http://www.livestockdialogue.org)**Global Partnerships for Responsible Fisheries**[www.fao.org/fishery/fishcode](http://www.fao.org/fishery/fishcode)**CFS-Committee on World Food Security** [www.fao.org/cfs](http://www.fao.org/cfs)**18. STRENGTHEN INNOVATION SYSTEMS****Good practices in building innovative rural institutions**[www.fao.org/docrep/015/i2258e/i2258e00.pdf](http://www.fao.org/docrep/015/i2258e/i2258e00.pdf)**Innovative markets for sustainable agriculture**[www.fao.org/3/a-i5907e.pdf](http://www.fao.org/3/a-i5907e.pdf)**Towards inclusive Pluralistic Service Systems** Insightsfor innovative thinking [www.fao.org/3/a-i6104e.pdf](http://www.fao.org/3/a-i6104e.pdf)**19. ADAPT AND IMPROVE INVESTMENT AND FINANCE****Investment Learning Platform**[www.fao.org/investment-learning-platform/home](http://www.fao.org/investment-learning-platform/home)**Agricultural Investment Funds for Development**[www.fao.org/3/18226EN/i8226en.pdf](http://www.fao.org/3/18226EN/i8226en.pdf)**Ending poverty and hunger by investing in agriculture and rural areas**[www.fao.org/3/a-i7556e.pdf](http://www.fao.org/3/a-i7556e.pdf)**Rural invest** A tool for project design [www.fao.org/support-to-investment/knowledge-resources/learning-tools/ruralinvest](http://www.fao.org/support-to-investment/knowledge-resources/learning-tools/ruralinvest)**Portal on Incentives for ecosystem services**[www.fao.org/ecosystem-services-biodiversity/incentives](http://www.fao.org/ecosystem-services-biodiversity/incentives)**20. STRENGTHEN THE ENABLING ENVIRONMENT AND REFORM THE INSTITUTIONAL FRAMEWORK****FAO SDGs website** Tracking progress[www.fao.org/sustainable-development-goals/tracking-progress](http://www.fao.org/sustainable-development-goals/tracking-progress)**Monitoring SDG indicators** E-learning tools[www.fao.org/sustainable-development-goals/indicators](http://www.fao.org/sustainable-development-goals/indicators)**Monitoring evaluation and impact assessment**E-learning tool [www.fao.org/elearning/#/elc/en/courses/MEIA](http://www.fao.org/elearning/#/elc/en/courses/MEIA)**Global strategy to improve agriculture and rural statistics** [www.gsars.org](http://www.gsars.org)**FAOLEX** FAO database on national laws and regulations[www.fao.org/faolex](http://www.fao.org/faolex)

# Annex 4

## KEY POLICIES AND PRACTICES FOR ENGAGING AGRICULTURE, FORESTRY AND FISHERIES IN THE 2030 AGENDA

ACTION AREA	Increase productivity, employment and value addition in food systems	Protect and enhance natural resources	Improve livelihoods and foster inclusive economic growth	Enhance the resilience of people, communities and ecosystems	Adapt governance to new challenges
CROPS	<ol style="list-style-type: none"> <li>1. Genetically diverse portfolio of varieties</li> <li>2. Conservation agriculture</li> <li>3. Judicious use of organic and inorganic fertilizers, improved soil moisture management</li> <li>4. Improved water productivity, precision irrigation</li> <li>5. Integrated pest management (IPM)</li> </ol>	<ol style="list-style-type: none"> <li>1. Use better practices for biodiversity, such as in situ and ex situ conservation of plant genetic resources, IPM...</li> <li>2. Use better practices for soil: land rehabilitation, appropriate cropping systems...</li> <li>3. Use better practices for water management: deficit irrigation, preventing water pollution...</li> <li>4. Set payments for using and for providing environmental services such as pollinators, carbon sequestration...</li> <li>5. Set policies, laws, incentives, and enforcement to promote the above</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase/protect farmers' access to resources (e.g. through equitable land and water tenure systems)</li> <li>2. Increase farmers' access to markets through capacity-building, credit, infrastructure</li> <li>3. Increase rural job opportunities (e.g. in small and medium enterprises sustainability and related activities)</li> <li>4. Improve rural nutrition: production of more and affordable nutritious and diverse foods, including fruits &amp; vegetables</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase/protect farmers' access to resources (e.g. through equitable land and water tenure systems)</li> <li>2. Increase farmers' access to markets through capacity-building, credit, infrastructure</li> <li>3. Increase rural job opportunities (e.g. in small and medium enterprises sustainability and related activities)</li> <li>4. Improve rural nutrition: production of more and affordable nutritious and diverse foods, including fruits &amp; vegetables</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase effective participation</li> <li>2. Encourage formation of associations</li> <li>3. Increase frequency and content of consultations among stakeholders</li> <li>4. Develop decentralized capacity</li> </ol>
LIVESTOCK	<ol style="list-style-type: none"> <li>1. Genetically diverse base of breeds</li> <li>2. Improved resource use efficiency</li> <li>3. Balanced and precision animal feeding and nutrition</li> <li>4. Integrated animal health control</li> </ol>	<ol style="list-style-type: none"> <li>1. Conserve animal genetics in situ and ex situ</li> <li>2. Use grassland for biodiversity, carbon storage and water services</li> <li>3. Protect water from pollution through waste management</li> <li>4. Use better practices for reduced emission intensity</li> <li>5. Set payments for using and for providing environmental services (e.g. grazing fees)</li> <li>6. Set policies, laws, incentives and enforcement to promote the above</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase/protect farmers' access to resources, such as pasture, water, credit</li> <li>2. Increase farmers' access to markets through capacity-building, credit, infrastructure</li> <li>3. Increase rural job opportunities (e.g. in small and medium enterprises sustainability and related activities)</li> <li>4. Improve rural nutrition: production of more and affordable nutritious and diverse foods, including fruits &amp; vegetables</li> </ol>	<ol style="list-style-type: none"> <li>1. Generalise risk assessment/management and communication</li> <li>2. Prepare for/adapt to climate change</li> <li>3. Respond to market volatility, (e.g. encouraging flexibility in production systems and savings)</li> <li>4. Contingency planning for droughts, floods, and pest outbreaks; development; social safety nets</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase effective participation</li> <li>2. Encourage formation of associations</li> <li>3. Increase frequency and content of consultations among stakeholders</li> <li>4. Develop decentralized capacity</li> </ol>
FORESTRY	<ol style="list-style-type: none"> <li>1. Sustainable management of natural and planted forests</li> <li>2. Forest area increase and slowing deforestation</li> <li>3. Improved efficiency of use of wood-based energy</li> <li>4. Development of innovative renewable forest products</li> <li>5. Tree improvement to support productivity and resilience</li> </ol>	<ol style="list-style-type: none"> <li>1. Conserve biodiversity and forest genetic resources</li> <li>2. Restore and rehabilitate degraded landscapes</li> <li>3. Enhance the role of forests in soil protection and conservation</li> <li>4. Enhance the role of forests in the protection and conservation of water resources</li> <li>5. Use reduced impact harvesting techniques</li> <li>6. Certification of forest management</li> </ol>	<ol style="list-style-type: none"> <li>1. Improve forest tenure rights and access to forest resources</li> <li>2. Promote engagement of local stakeholders, including communities and women's groups</li> <li>3. Promote the development of small and medium-size enterprises</li> <li>4. Provide forest-based employment including health and safety provisions</li> <li>5. Establish payment schemes for environmental services (PES)</li> <li>6. Integrate forestry in poverty reduction strategies</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase resilience of ecosystems to biotic and abiotic hazards including climate change phenomena, pests and diseases, forests</li> <li>2. Prevent the transmission of pathogens to other countries through international trade</li> <li>3. Integrate risk prevention and management into sustainable land-use planning</li> </ol>	<ol style="list-style-type: none"> <li>1. Develop personnel and institutional capacity</li> <li>2. Support good governance of rural areas</li> <li>3. Decentralise decision-making and empower local communities to promote participatory forestry</li> <li>4. Develop financial incentive packages to support private investment and enable equitable distribution of benefits</li> <li>5. Apply mediation and other conflict resolution mechanisms in resource governance</li> <li>6. Enhance communication to better articulate the benefits of forests</li> </ol>

ACTION AREA	Increase productivity, employment and value addition in food systems	Protect and enhance natural resources	Improve livelihoods and foster inclusive economic growth	Enhance the resilience of people, communities and ecosystems	Adapt governance to new challenges
AQUA-CULTURE	<ol style="list-style-type: none"> <li>1. Aquafeed management</li> <li>2. Integrated multitrophic aquaculture</li> <li>3. Robust biosecurity/aquatic animal health</li> <li>4. Use of best management practices (BMPs), good aquaculture practices (GAPs), codes</li> <li>5. Domestication of aquaculture species</li> <li>6. Aquaculture certification for animal health and welfare, and food safety</li> <li>7. Implementing the Ecosystem Approach to Aquaculture (EAA)</li> </ol>	<ol style="list-style-type: none"> <li>1. Conserve aquatic genetic resources</li> <li>2. Promote aquaculture certification for environmental protection</li> <li>3. Ensure biosecurity: pathogens, escapees, use of veterinary drugs, invasive species, biodiversity</li> <li>4. Use integrated aquaculture-agriculture systems</li> <li>5. Implementing the Ecosystem Approach to Aquaculture (EAA)</li> </ol>	<ol style="list-style-type: none"> <li>1. Aquaculture business-model, especially for smallholder producers</li> <li>2. Aquaculture certification including gender considerations</li> <li>3. Cooperative marketing</li> <li>4. Mainstream aquaculture into rural development processes</li> <li>5. Technological, trade, institutional, infrastructure, capacity development, investment and other support services</li> <li>6. Aquaculture and nutrition programs</li> <li>7. Implementing the Ecosystem Approach to Aquaculture (EAA)</li> </ol>	<ol style="list-style-type: none"> <li>1. Assess risks in aquaculture (pathogens, food safety, ecological, environmental, including climate change), genetic, social and financial)</li> <li>2. Set early warning, preparedness, surveillance systems and contingency plans for aquatic emergencies</li> <li>3. Implementing the Ecosystem Approach to Aquaculture (EAA)</li> </ol>	<ol style="list-style-type: none"> <li>1. Compliance with international treaties, standards, agreements on sustainable aquaculture, animal health, food safety</li> <li>2. Voluntary adoption of BMPs, GAPs</li> <li>3. Contribution and impact assessments</li> <li>4. Implementing the Ecosystem Approach to Aquaculture (EAA)</li> </ol>
FISHERIES	<ol style="list-style-type: none"> <li>1. Fuel efficiency increase and use of static gears</li> <li>2. Reduction of fishing costs and capacity</li> <li>3. Reduction of waste and discards</li> <li>4. Integration of inland fisheries in water and land planning &amp; management</li> <li>5. Value chain development, including through improved handling, better technology, food safety, access to new markets</li> </ol>	<ol style="list-style-type: none"> <li>1. Assess non-target resources</li> <li>2. Develop and use low-impact fishing gears</li> <li>3. Build fish passes in dams</li> <li>4. Rebuild depleted stocks and protect critical habitats</li> <li>5. Restock inland fisheries</li> <li>6. Implement the Ecosystem Approach to Fisheries (EAF): protect vulnerable marine ecosystems (VMEs), use MPAs in fisheries management as appropriate, explore certification schemes, including ecolabelling</li> <li>7. Implement the Code of Conduct for Responsible Fisheries (CCRF) and international action plans, and other related instruments</li> <li>8. Deter illegal (IUU) fishing</li> <li>9. Promote co-management</li> </ol>	<ol style="list-style-type: none"> <li>1. Improve access and tenure rights</li> <li>2. Improve local markets</li> <li>3. Promote small/medium enterprises</li> <li>4. Enhance gender equity</li> <li>5. Integrate fisheries in poverty reduction strategies</li> <li>6. Ensure access to services</li> </ol>	<ol style="list-style-type: none"> <li>1. Generalise risk assessment/management and communication</li> <li>2. Assess/value ecosystems &amp; services</li> <li>3. Maintain stocks at high level</li> <li>4. Adopt precautionary approach</li> <li>5. Enhance social safety nets</li> <li>6. Prepare for climate change and disaster risk</li> </ol>	<ol style="list-style-type: none"> <li>1. Develop local governance capacity</li> <li>2. Empower local communities</li> <li>3. Adopt Good Governance Principle</li> <li>4. Decentralise decision-making and related public fund allocation</li> </ol>

\* Source: FAO, 2014b.



# TRANSFORMING FOOD AND AGRICULTURE TO ACHIEVE THE SDGs

The path to prosperity is clearly marked by the 2030 Agenda for Sustainable Development. It requires transformative action, embracing the principles of sustainability and tackling the root causes of poverty and hunger to leave no one behind. As the prime connection between people and the planet, sustainable food and agriculture have great potential to address many of our challenges, serving up affordable, nutritious food, strengthening livelihoods, revitalising rural and urban landscapes, delivering inclusive national growth and driving positive change across the 2030 Agenda.

**20 interconnected  
actions to guide  
decision-makers**

How can decision-makers turn that potential into reality? How can they select and prioritise resources to accelerate progress? This publication presents practical solutions through 20 interconnected actions, each describing approaches, policies and tools that contribute to multiple SDGs. They integrate the three dimensions of sustainable development, and require participation and partnerships among different actors. Identifying synergies, understanding trade-offs and outlining incentives, these 20 actions tackle the real issues that countries face in building a Zero Hunger world and brighter future for all.

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