Building a common vision for *sustainable* food and agriculture

PRINCIPLES AND APPROACHES

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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Foreword

In 2012, the Rio+20 Conference called for enhancing food security and nutrition and a more sustainable agriculture, initiated the formulation of Sustainable Development Goals (SDGs) that would be integrated in the UN's Post-2015 Development Agenda (United Nations, 2012a), and launched the Zero Hunger Challenge. Meanwhile, United Nations organizations and agencies have adopted a framework for advancing environmental and social sustainability, which calls for a common vision (United Nations, 2012b).

FAO's ultimate vision is that of "a world free from hunger and malnutrition, where food and agriculture contribute to improving the living standards of all, especially the poorest, in an economically, socially and environmentally sustainable manner". **To focus action toward its global goals of food security, elimination of poverty, and sustainable management and utilization of natural resources, FAO has set itself five Strategic Objectives.** Through its Strategic Objective 2, FAO assists its Member Countries in identifying and implementing policies, strategies and technologies that contribute to sustainable and enhanced provision of products and services from agriculture, forestry and fisheries.

For several decades, FAO has been at the forefront of work towards sustainable agriculture. It has taken the lead in defining concepts and promoting international treaties, policies, strategies and programmes for sustainable development in food and agriculture. FAO and its Member Countries have made significant progress in enhancing agricultural productivity and sustainability at sub-sector level. They have developed approaches and frameworks at sub-sector level, such as the Ecosystem Approach to Fisheries and Aquaculture, "Save and Grow", the framework programme for sustainable crop production intensification, the Global Agenda for Sustainable Livestock, Sustainable Forest Management, the Global Soil Partnership, Climate-Smart Agriculture, Coping with Water Scarcity, adopted to varying degrees by countries.

It is now time to take advantage of the wealth of knowledge and experience acquired through these programmes to develop a common vision and an integrated approach to sustainability across agriculture, forestry and fisheries. This unified perspective – valid across all agricultural sectors and taking into account social, economic and environmental considerations – will ensure the effectiveness of action on the ground. Such a perspective must be underpinned by knowledge based on the best available science, and adaptation at community and country levels to ensure local relevance and applicability. This vision, and the approach needed to implement it, are presented in this document, aimed at creating a basis for discussion and dialogue on the way forward.

Maria Helena Semedo

Deputy Director-General

Coordinator for Natural Resources

About this *document*

Over the coming 35 years, agriculture will face an unprecedented confluence of pressures, including a 30 percent increase in the global population, intensifying competition for increasingly scarce land, water and energy resources, and the existential threat of climate change. To provide for a population projected to reach 9.3 billion in 2050 and support changing dietary patterns, estimates are that food production will need to increase from the current 8.4 billion tonnes to almost 13.5 billion tonnes a year. Achieving that level of production from an already seriously depleted natural resource base will be impossible without profound changes in our food and agriculture systems. We need to expand and accelerate the transition to sustainable food and agriculture which ensures world food security, provides economic and social opportunities, and protects the ecosystem services on which agriculture depends.

This report is aimed primarily at policy makers and others who make or influence national and institutional decisions and actions. It is the outcome of intensive consultations and discussions aimed at developing a common approach to FAO's work on sustainability. That process was conducted in a climate of cross-sectoral collaboration that drew on the contributions of leading specialists in crops, livestock, forestry, fisheries, aquaculture, and natural resources. It builds on the Organization's long experience in developing sustainability concepts, approaches and tools, and offers a common vision of the agriculture sector and of the inter-sectoral synergies aiming at making agriculture more productive and sustainable.

The result is a common vision and coordinated approach towards sustainable food and agriculture that is comprehensive and knowledge-based, but – above all – responsive to the needs and expectations of Member Countries. The report sets out five key principles that balance the social, economic and environmental dimensions of sustainability: 1) improving efficiency in the use of resources; 2) conserving, protecting and enhancing natural ecosystems; 3) protecting and improving rural livelihoods and social well-being; 4) enhancing the resilience of people, communities and ecosystems; and 5) promoting good governance of both natural and human systems. These five principles provide a basis for developing national policies, strategies, programmes, regulations and incentives that will guide the transition to an agriculture that is highly productive, economically viable, environmentally sound, and which is based on the principles of equity and social justice.

This approach to sustainability is at the heart of FAO's new Strategic Framework. It is embedded in all five strategic objectives and is the specific focus of Strategic Objective 2, which aims at *sustainably increasing the provision of goods and services from agriculture, forestry and fisheries*. While the implementation of more sustainable policies and practices is the decision and responsibility of each Member Country, partnerships, coalitions and creative modes of collaboration will be increasingly important. FAO can leverage its own expertise and resources, along with other partners, to complement those of the Member Countries in order to speed up the delivery and uptake of sustainable technologies and practices, and enhance impact.

This document represents the first step in accelerating the transition to sustainable food and agriculture, ending hunger and poverty, and realizing the future we all want.

An unprecedented *confluence* of pressures

Every day, agriculture produces an average of 23.7 million tonnes of food, including 19.5 million tonnes of cereals, roots, tubers, fruit and vegetables, 1.1 million tonnes of meat, and 2.1 billion litres of milk. Capture fisheries and aquaculture harvest daily more than 400 000 tonnes of fish, while forests provide 9.5 million cubic metres of timber and fuelwood. In one day, crop production uses 7.4 trillion litres of water for irrigation, and 300 000 tonnes of fertilizer. The total value of that one day of agricultural production is estimated at USD7 billion (FAO, 2012a; FAO, 2013a; FAOSTAT, 2013; World Bank, 2007).

In addition to meeting humanity's basic needs for food, feed, fibre and fuel, agriculture employs more than one in three of the world's workers, and provides livelihoods for rural households totalling 2.5 billion people (FAO, 2013a). It contributes to social cohesion in rural areas, and preserves cultural traditions and heritage (Van Huylenbroeck *et al.,* 2007). It also makes important, but largely unrecognized, contributions to landscape and wildlife management, the protection of wildlife habitats, water management and quality, flood control and climate change mitigation.

The world's population is projected to grow from around 7.2 billion today to 9.3 billion in 2050 (United Nations, 2013a). That population increase and the expected dietary changes associated with income growth indicate that, by 2050, agriculture will need to produce 60 percent more food globally, and 100 percent more in developing countries, if it is to meet demand at current levels of consumption. In the past, technological innovation and improvements in institutions have led to significant gains in agricultural production and productivity.

Using high-yielding varieties, irrigation and high levels of chemical inputs, the Green Revolution boosted cereal yields in South Asia by more than 50 percent between 1975 and 2000 (World Bank, 2007). Global agricultural production increased as much as threefold in 50 years, with only 12 percent growth in the farmed area. Agricultural intensification not only allowed farmers to feed the world but, by saving millions of hectares of forests from conversion to farm land, it also saved an unquantifiable quantity of ecosystem services and avoided the release of an estimated 590 billion tonnes of carbon dioxide into the atmosphere (Burney *et al.*, 2010).

However, the situation is far from being ideal, and past agricultural performance is no longer a guarantee of future returns. While supplies have been growing, the current trajectory of growth in agricultural production and productivity is unsustainable. Food production on land and in aquatic systems already dominates much of the global terrestrial surface, and has major negative impacts on the Earth's ecosystems. At the same time, rural areas are still home to the majority of the world's poor and vulnerable populations, who rely heavily on "natural capital" for their livelihoods,

and lack secure access to these resources. Weak or absent governance for tenure of natural resources results in their degradation, perpetuates inequalities, and exacerbates conflicts.

Agricultural production systems, and the policies and institutions that underpin global food security, are increasingly inadequate. The world's food systems are heading towards an unprecedented confluence of pressures over the next 40 years (Foresight UK, 2011) which, if the current trajectory is maintained, will seriously compromise our long term global capacity to produce both food and the economic benefits needed for food security. Without a significant change of course, the following trends in food and agriculture will be exacerbated.

Poverty, inequalities, hunger and malnutrition

Current food production and distribution systems are failing to feed the world. While agriculture produces enough food for 12 to 14 billion people, some 850 million – or one in eight of the world population – live with chronic hunger (FAO, 2013b). The vast majority of the hungry live in developing regions, where the prevalence of undernutrition is estimated at 14.3 percent (FAO, IFAD and WFP, 2013). The main cause of hunger and malnutrition is not lack of food, but inability to buy. In 2010, more than one-third of rural people in developing countries were "extremely poor" (FAO, 2013b). Disproportionately, 60 percent of the undernourished are women, who make up 43 percent of the agricultural labour force and suffer deep discrimination in access to land and other resources and services (Asian Development Bank, 2013).

Inadequate diets and unsustainable consumption patterns

Inadequate diets lacking in protein, vitamins and minerals have left one-third of the developing world's population with micronutrient deficiencies which, if severe, can lead to blindness, mental retardation and early death, while 1.5 billion adults are overweight or obese and at greater risk of non-communicable diseases, owing to over-consumption of low-cost, high-energy and nutrient-poor foods (FAO, 2012b). At the same time, enormous financial and environmental resources are being spent to produce food that is lost or wasted, currently at the rate of some 1.3 billion tonnes a year. Food losses and waste are indicative of poorly functioning food systems, represent wasted resources and emissions (FAO, 2012c).

Land scarcity, degradation and soil depletion

FAO projections indicate that 80 percent of the additional food required to meet demand in 2050 will need to come from land already under cultivation. There is little scope for expansion of the agricultural area, except in some parts of Africa and South America. Much of the additional land available is not suitable for agriculture, and the ecological, social and economic costs of bringing it into production would be

very high. In addition, 33 percent of land is moderately to highly degraded owing to the erosion, salinization, compaction and chemical pollution of soils (FAO, 2011a). Drought and desertification are responsible for the loss of about 12 million hectares of land each year (UNCDD, 2013). Over the past decade, some 13 million hectares of forests were converted to other land uses, mainly agriculture, at the cost of a myriad of ecosystem services (FAO and JRC, 2012).

Water scarcity and pollution

Agriculture's current demands on the world's freshwater resources are unsustainable. Inefficient use of water for crop production depletes aquifers, reduces river flows, degrades wildlife habitats, and has caused salinization on 20 percent of the global irrigated land area. Inappropriate use of fertilizers and pesticides have translated into water pollution, affecting rivers, lakes and coastal areas. By 2025, an estimated 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world population could be living under conditions of water stress (Viala, 2008). With the rate of water consumption growing twice as fast as the global population, agriculture's share of water could be drastically reduced. The bulk of capture fisheries production comes from coastal waters, where both the productivity and quality of fish stocks are severely affected by pollution, much of which comes from agriculture. Capture fisheries and aquaculture are also threatened by competing demands from hydropower development and water diversion for industrial uses.

Loss of living resources and biodiversity

Biodiversity is essential to the productivity and adaptability of species and to the sustainability of agriculture. Most of the world's major crops and animal breeds have a very narrow genetic base. Up to 75 percent of the genetic diversity of crops has already been lost, and another 15 to 37 percent is "committed to extinction" by 2015 (Thomas *et al.*, 2004). Deforestation poses one of the gravest threats to biodiversity, as forests harbour three-quarters of the world's terrestrial biodiversity. Deforestation of closed tropical rainforests may account for the loss of 100 species a day (World Bank, 2004). Up to 22 percent of the world's 8 300 animal breeds are at risk and 8 percent are already extinct (FAO, 2012d). Freshwater ecosystems and wetlands are being threatened by excessive water depletion and pollution. In the oceans, close to 30 percent of stocks are overfished and 57 percent are fully exploited (FAO, 2012e). Moreover, an important share of aquatic animals caught every year are discarded and many deep-sea ecosystems are threatened by trawling (FAO, 2008).

Climate change

Agriculture contributes significantly to climate change, which is the most serious environmental challenge facing humanity. It is estimated that 25 percent of total global greenhouse gas emissions are directly caused by crop and animal production and forestry, especially deforestation (IPPC, 2014), to which can be added around 2 percent of emissions accounted in other sectors, from production of fertilizers, herbicides, pesticides, and from energy consumption for tillage, irrigation, fertilization,

and harvest (HLPE, 2012). Conversion of natural ecosystems to agriculture causes losses of soil organic carbon of as much as 80 tonnes per hectare, most of it emitted into the atmosphere (Lal, 2004). Agriculture also suffers the consequences of climate change – rising temperatures, pest and disease pressures, water shortages, extreme weather events, loss of biodiversity and other impacts. Crop productivity is expected to decline in tropical areas, where the majority of the world's food insecure and undernourished people live, with yields in Asia and Africa falling by 8 percent by 2050. Climate change will also increase market volatility, again affecting most those who are already vulnerable (Wheeler and von Braun, 2013). The negative impacts of climate change on agricultural production can be overcome only partly by adaptation measures (IPCC, 2014).

Stagnation in agricultural research

There is a growing divide between a small group of countries with high levels of investment in agricultural research and development, and a large number with very low levels (FAO, 2011b). Overall, global agricultural research and development spending in the public and private sectors increased between 2000 and 2008, but mainly in larger, more advanced, middle-income countries, such as China and India, masking negative trends in smaller, poorer and more technologically challenged countries. In smaller low and lower middle-income countries of Asia, research and development spending stagnated or declined, indicating that many of the region's countries are falling behind in their ability to generate new technologies. Some countries of sub-Saharan have such low investment and capacity levels that the impact of agricultural research and development is "questionable at best" (IFPRI, ASTI and GFAR, 2012).

A vision for *sustainable* food and agriculture

FAO has defined sustainable agricultural development as "the management and conservation of the natural resource base, and the orientation of technological change in such a manner as to ensure the attainment of continued satisfaction of human needs for present and future generations. Sustainable agriculture conserves land, water, and plant and animal genetic resources, and is environmentally non-degrading, technically appropriate, economically viable and socially acceptable" (FAO, 1988).

Our vision for sustainable food and agriculture is therefore that of a world in which food is nutritious and accessible for everyone and natural resources are managed in a way that maintain ecosystem functions to support current as well as future human needs. In our vision, farmers, pastoralists, fisher-folks, foresters and other rural dwellers have the opportunity to actively participate in, and benefit from, economic development, have decent employment condition and work in a fair price environment. Rural women, men, and communities live in security, and have control over their livelihoods and equitable access to resources which they use in an efficient way.

Sustainability, therefore, is much more than ensuring protection of the natural resource base. To be sustainable, agriculture must meet the needs of present and future generations for its products and services, while ensuring profitability, environmental health, and social and economic equity. Sustainable agriculture would contribute to all four pillars of food security – availability, access, utilization and stability – in a manner that is environmentally, economically and socially responsible over time.

As agriculture depends largely on the services provided by ecosystems, sustainable agriculture must minimize negative impacts on the environment while optimizing production by protecting, conserving and enhancing natural resources and using them efficiently. It must also strike a balance between protecting agro-ecosystems and meeting society's growing needs by offering decent and resilient livelihoods for rural populations.

Achieving sustainable agriculture requires, therefore, the development of strategies that make wise choices in order to reach those multiple objectives. That is why FAO and its key stakeholders need to share a common understanding of what sustainable food and agriculture means, and agree on the most appropriate strategies and approaches to its implementation, in different contexts and at different scales.

A conceptual model

Only through a conceptual model can we scrutinize our vision and propose ways to ensure transition towards sustainable food and agriculture. In **Figure 1**, agriculture is represented at the interface between the world's natural and human systems. The natural system, our environment, has been shaped by humans since at least the

dawn of agriculture, and the human system is itself part of the natural system. Agriculture is the mechanism that utilizes natural resources (land, water, biodiversity, forests, fish, nutrients and energy) and environmental services and transforms them into agricultural products (food, feed, fibre, fuel) and the associated economic and social services (food security, economic growth and poverty reduction, health and cultural values).

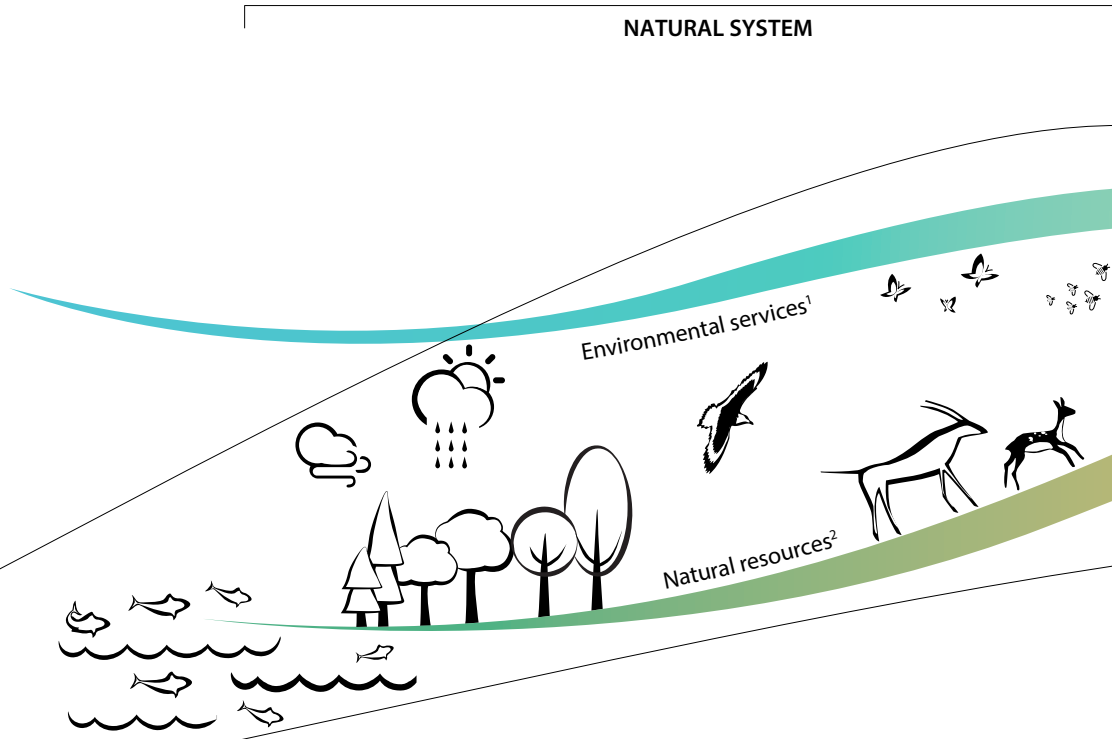
The institutions that govern agricultural production – determining what is produced, who produces it, with which type of technologies and practices, and the level of returns obtained – are key levers for regulating the type and distribution of the products and services that can be derived from agriculture. The benefits obtained from those services vary over different spatial scales, from individual farmers, to landscape/watershed or locality, to national and global levels, and may be immediate, near-term or long-term.

Approaches to sustainability must take account of a range of factors, from the relative importance of agriculture in national economies to the existing degree of intensification of agricultural production; from the constraints and opportunities that are determined by the availability of agricultural resources, to the needs of individuals in communities. The configuration of agriculture and the means of stimulating sustainability processes will be necessarily different across varying conditions. Sustainable agriculture will require continuous adjustment, innovation and improvement in strategies, policies and technologies in order to support the women and men engaged in agriculture, to maximize productivity and production, and to minimize agriculture's environmental footprint.

Achieving sustainability in food and agriculture is envisioned as an ongoing process of identifying and striking a balance between agriculture's social, economic and environmental objectives, and between agriculture and other sectors of the economy. The process reflects the evolution of society's values and accumulated knowledge, which have a major impact on how sustainability goals are set in practice. This implies a large, complex and dynamic set of interactions with multiple entry points. Within this complex system, specific constraints and natural and socio-economic boundaries will define what falls into the sustainable operating space (Holling 2000, Rockström *et al.*, 2009): there are hard boundaries as well as soft constraints within which human and natural systems must operate in order for the overall process to be sustainable.

Interactions and trade-offs

A growing challenge to sustainability is to identify and balance interactions, benefits and trade-offs that result from different configurations of agriculture. Trade-offs occur at three levels: between the human and natural systems, within both, and over



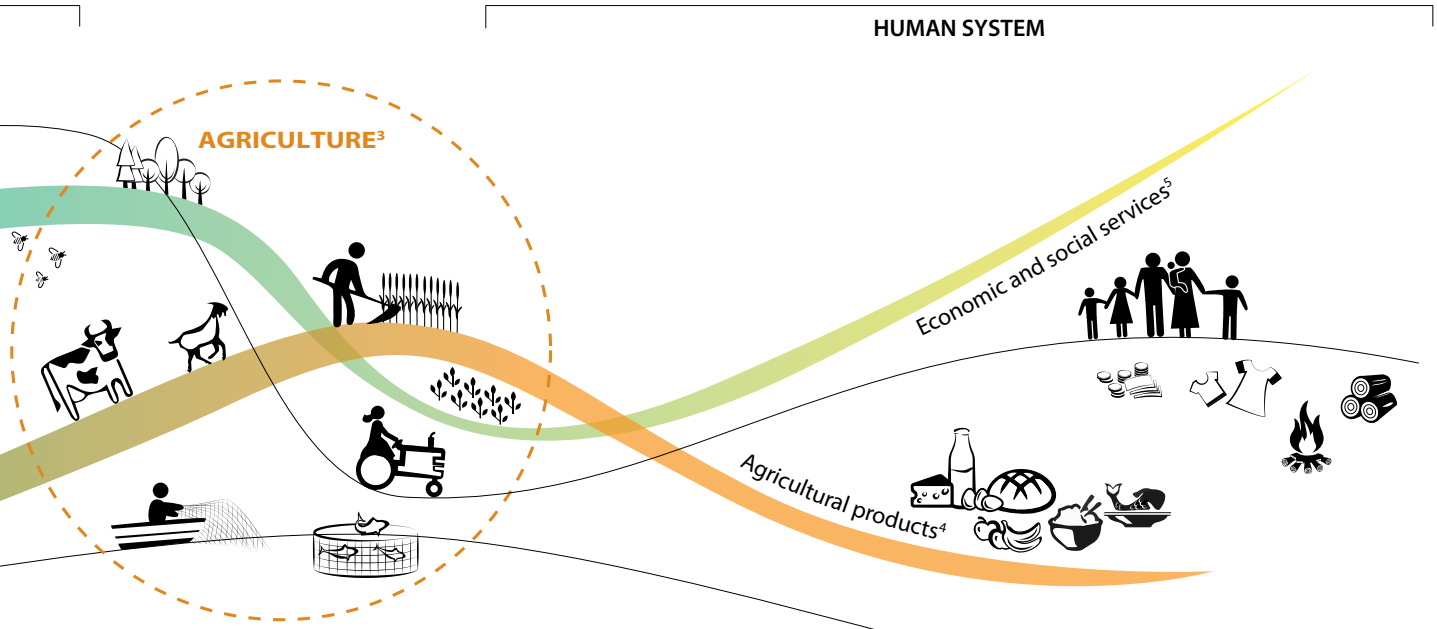
time. Trade-offs between human and natural systems have gained the most attention – the human system's level of consumption has grown to unprecedented levels, leading to the rapid depletion of natural resources and the disruption of ecosystem services through, for example, climate change and loss of biodiversity.

Examples of trade-offs inherent to the human system include the allocation of use rights or access rights, policies that favour small or large holders, and top-down versus bottom-up governance. Choices that lead to greater production efficiency – for example by concentrating the right of access to land or fishing grounds in the hands of a few large operators – may improve efficiency but risk undermining both the livelihoods of smallholders and social stability.

Trade-offs within the natural system include reducing land use through intensification, at the cost of increased water use, or choosing between production of food or biofuel. There are also trade-offs between the use of natural resources and ecosystem services. Intensification of production on cultivated land spares large areas of forest, but is also associated with pollution and high levels of energy and nutrient use.

FIGURE 1.

THE CONCEPTUAL MODEL UNDERPINNING THE VISION



[1] Environmental services: Climate, Nutrient cycling, Biodiversity, Water cycles, Coastal protection…

[2] Natural resources: Land, Oceans, Water, Genetic resources, Forest resources, Aquatic systems, Nutrients, Energy

[3] Agriculture: Crops, Livestock, Forestry, Fisheries, Aquaculture

[4] Agricultural products: Food, Feed, Fiber, Fuel

[5] Economic and social services: Growth, Poverty reduction, Employment, Stability, Health and nutrition

Trade-offs in any of those categories occur over time. Immediate benefits are often traded for later costs. For example, the impacts of the depletion of natural resources and ecosystem services may only be realized over decades. In other cases, the impact of trade-offs is immediate, as when water scarcity leads to the loss of food production capacity and human benefits within a very short time frame. Conservation, on the other hand, often entails immediate costs for future benefits. Trade-offs also occur in space when allocating areas for agriculture, recreation or conservation.

Cross-sectoral integration and synergies

Past emphasis on individual agricultural sectors has allowed for focused productivity improvements, and most of improvements in agriculture's products and services will continue to come from those sectors (crops, livestock, forestry, fisheries, and aquaculture). However, their excessive separation has often created a "silo syndrome" in which crop production, livestock, forestry, capture fisheries and aquaculture compete with each other for space, political support and natural resources, often resulting in conflicts and in sub-optimal allocation and management of resources (**Figure 2**).

BOX 1. **THAILAND: INTENSIFYING TO PROTECT THE FOREST**

Sustainable intensification of crop and livestock production can reduce the need for additional land and with it the rate of deforestation. A number of productive mixed cropping and agro-forestry systems produce more food and feed from the same area of land, helping mitigate climate change through increased carbon sequestration and improving ecosystem services such as soil fertility. In Thailand, dairy farmers have developed a "food-feed" system of cassava intercropped with cowpeas, which produces up to 2.4 tonnes of fodder per hectare. The system produces generally lower cassava yields, compared with monocropping, but increases land use efficiency and gives higher economic returns (FAO, 2013c).

Crops and livestock compete for land and water, and expansion of both sectors is usually at the expense of forests, which results in erosion of biodiversity, increased emissions of carbon dioxide and the elimination of carbon sinks. Water pollution generated by crops and livestock production also has strong negative impacts on capture fisheries. Fisheries and aquaculture increasingly interact as people shift from fishing to aquaculture and compete in the same ecosystem and markets with comparable products. The expanding culture of high-value carnivorous species has increased demand for fish feed, which adds to the already high exploitation pressure on wild stocks.

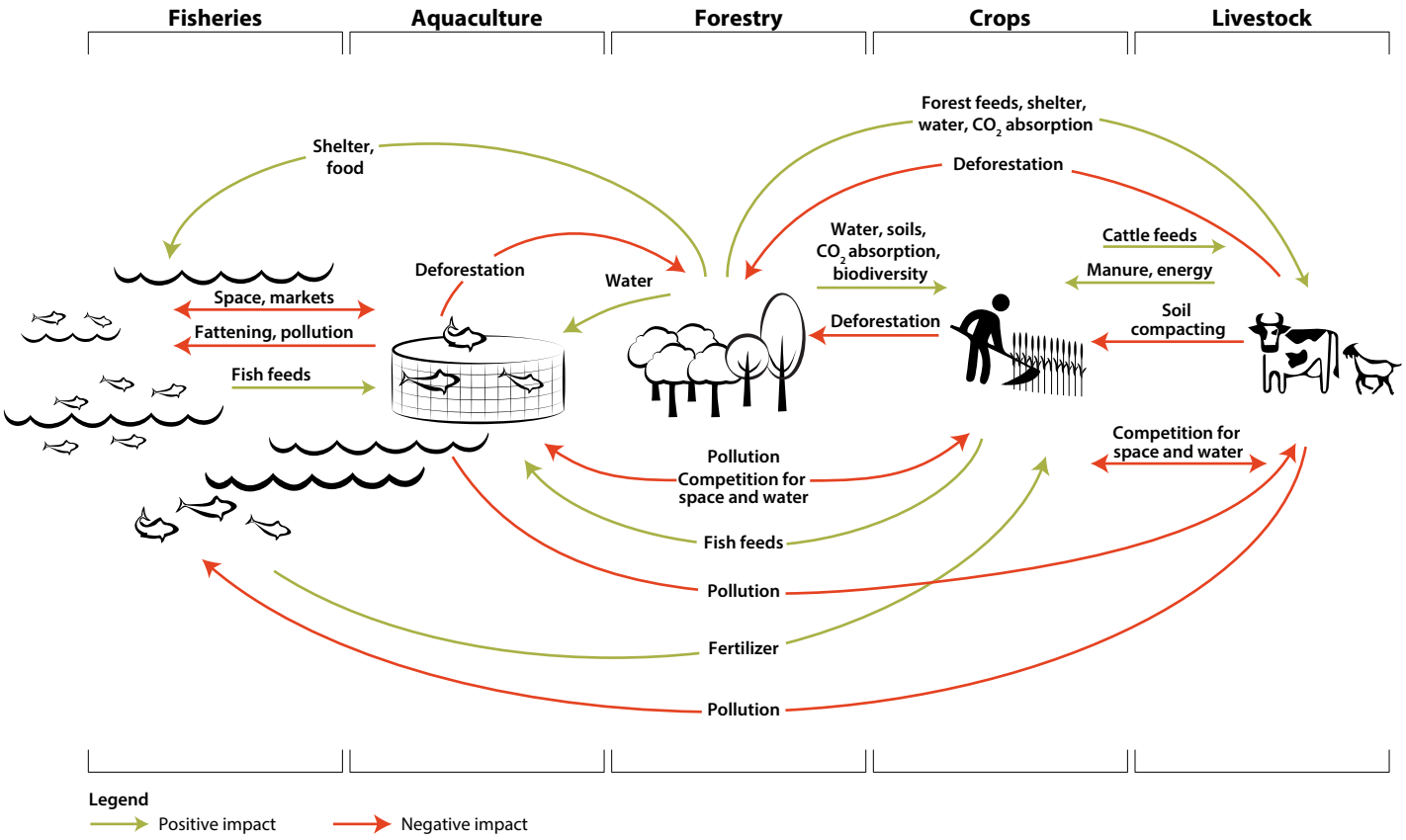
A holistic vision of sustainability must look beyond simply balancing trade-offs and explore, as well, opportunities for creating synergies that would reduce or even eliminate them, much as natural ecosystems already do. Important synergies and complementarities can be managed between crops and livestock, and between capture fisheries and aquaculture (Boxes 1 and 2). All of them are 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 (FAO, 2011b). Manure can also be used to produce bioenergy, which reduces the need for fossil fuels in crop and aquaculture systems.

While in theory the idea is simple, optimizing synergies is complicated. Shifting from trade-offs to synergies requires knowledge of where synergies are possible, and political processes that support a redistribution of benefits and costs across different groups locally and globally, and between the long and short terms. It also requires innovative technologies, multidisciplinary interventions, and institutions that are geared to capturing synergies rather than maximizing individual objectives.

FIGURE 2.

SELECTED SYNERGIES (IN GREEN) AND CONFLICTS (IN RED) AMONG THE AGRICULTURAL SECTORS

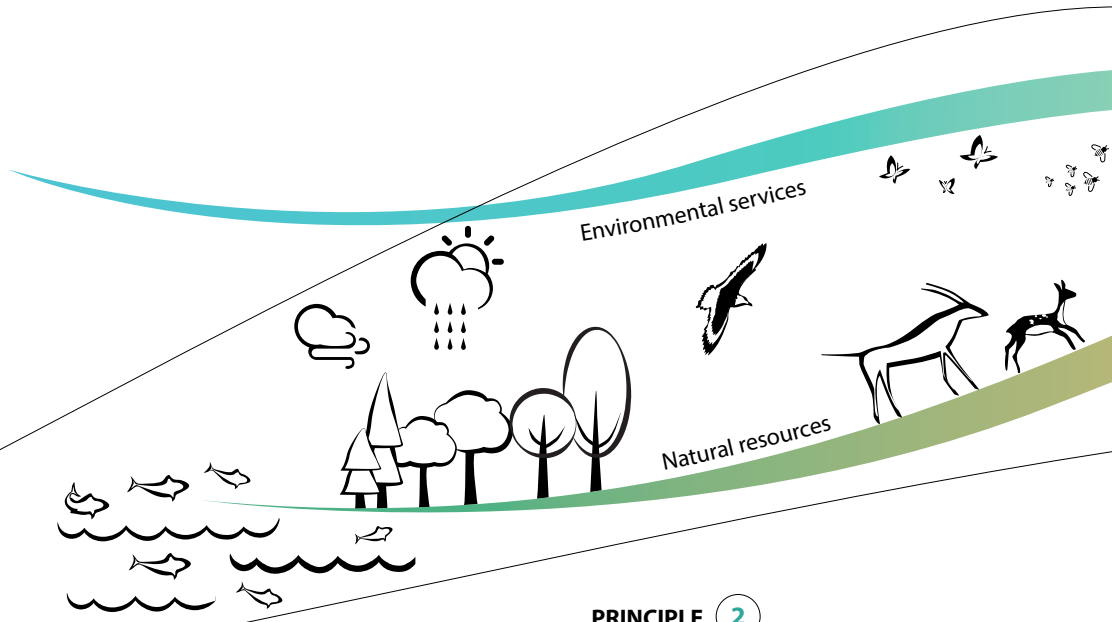


BOX 2. **ACHIEVING SYNERGIES THROUGH RICE-FISH FARMING**

Traditional aquaculture in rice-based farming systems in Southeast Asia boosts the productivity of rice by increasing nutrient availability to the plants. Rice-fish farmers generally enjoy higher incomes than those who produce only rice. The fish also provide a readily available source of protein, fatty acids and micronutrients that are especially needed by children and pregnant women, and biological control of mosquitoes that transmit malaria. Although rice-fish systems may use more water than would be required for rice cultivation alone, the fish also feed on snails, weeds and insects in the rice fields, which reduces or eliminates the need for pesticides, which in turn protects water quality. Taken together with improved income, this is an example of synergy between sectors that improves livelihoods and promotes sustainability (FAO, 2005).

Key principles for *sustainability* in food and agriculture

NATURAL SYSTEM



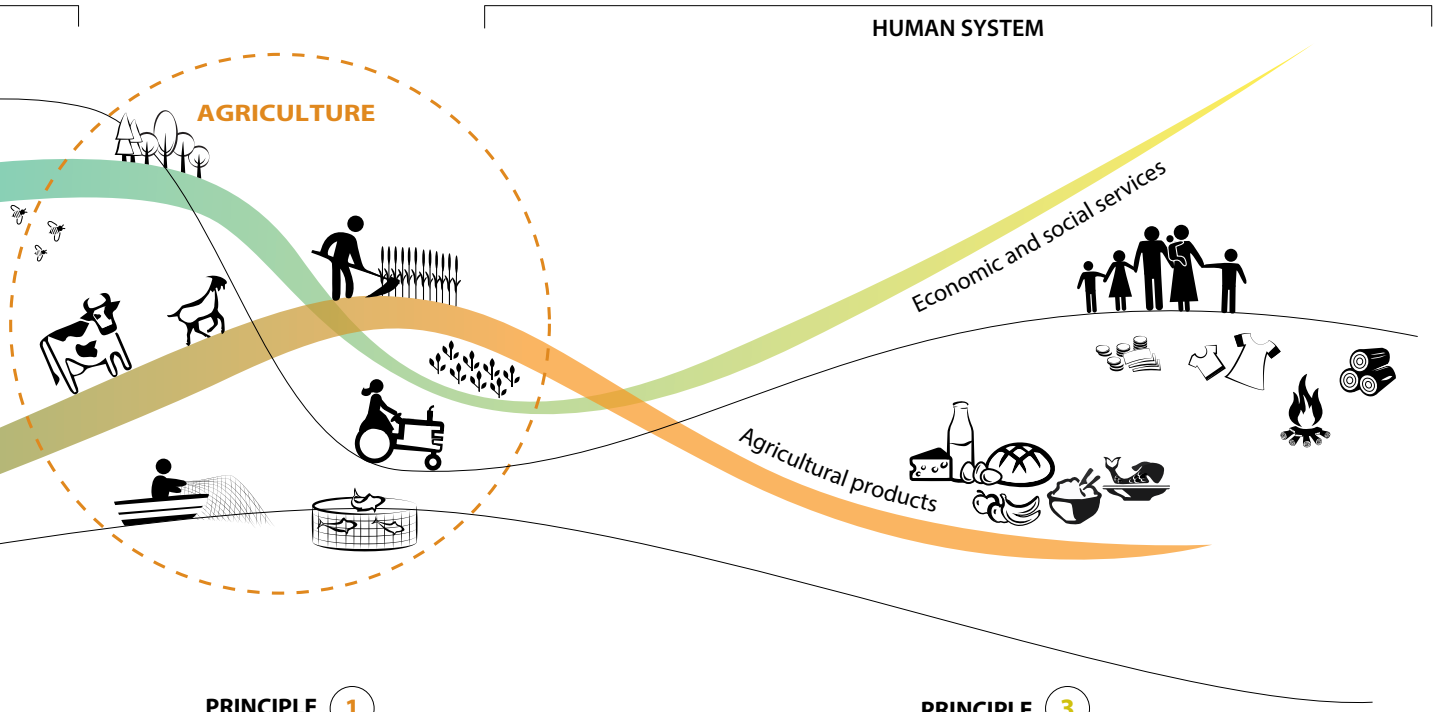
PRINCIPLE 2

Sustainability requires direct action to conserve, protect and enhance natural resources

Our vision provides the basic conditions for sustainability but it does not tell us how sustainable food and agriculture is to be achieved, and the rather limited success of past strategies suggests that we need to re-think our approach. This document proposes five interconnected principles for the transition toward sustainable food and agriculture. They balance the social, economic and environmental dimensions of sustainability in agriculture, and provide a basis for developing policies, strategies, regulations and incentives to guide the transition to sustainability, while promoting resilience through an adaptive response to shocks and opportunities (**Figure 3**).

FIGURE 3.

APPLICATION OF THE VISION AND THE FIVE PRINCIPLES OF SUSTAINABLE AGRICULTURE



PRINCIPLE 1

Improving efficiency in the use of resources is crucial to sustainable agriculture

PRINCIPLE 3

Agriculture that fails to protect and improve rural livelihoods, equity and social well-being is unsustainable

PRINCIPLE 4

Enhanced resilience of people, communities and ecosystems is key to sustainable agriculture

PRINCIPLE 5

Sustainable food and agriculture requires responsible and effective governance mechanisms

The five principles are complementary – Principle 1 and Principle 2 directly support the natural system, while Principle 3 directly supports the human system; Principles 4 and Principle 5 underpin both the natural and human systems. For application of the five principles, a range of actions should be taken to enhance sectoral as well as cross-sectoral productivity and sustainability.

To be sustainable and productive, agriculture will need to adopt a single, systems vision that maximizes synergies, mitigates negative externalities and minimizes harmful competition between its sectors. Examples of key strategies, policies and technologies are presented under each of the five principles. The proposed approach, when properly localized, would help identify cross-sectoral synergies, negative externalities and actions that would minimize their impacts in the source sectors or mitigate them in the affected sectors.

PRINCIPLE 1

Improving efficiency in the use of resources is crucial to sustainable agriculture

Agricultural production is the transformation of natural resources into products for human benefit. That process requires management, knowledge, technologies and external inputs, with considerable variation in their relative importance and mix across production systems and regions of the world. The level and mix of inputs, and the type of technologies and management systems used, have major implications for the level of productivity as well as for the impact of production on natural resources and the environment. Getting the "right mix" – one that reflects the value of natural resources and the real costs of environmental impacts and external inputs – is essential for sustainability.

Agricultural intensification in the 20th century represented a paradigm shift from traditional farming systems, based largely on the management of natural resources and ecosystem services, to the application of genetics, chemistry and engineering to crop production. While Green Revolution technologies led to great increases in production, they were driven by the objective of increasing productivity, and largely ignored the efficiency of use of other resources than land, including inputs and water. In China, for example, the uptake efficiency of mineral fertilizer is about 26-28 percent for rice, wheat and maize and less than 20 percent for vegetable crops. The rest is simply "lost to the environment", resulting in high rates of nitrate contamination of water (FAO, 2011b) and high GHG emissions.

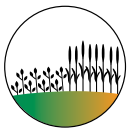
The Green Revolution also relied extensively on irrigation to raise yields and secure production. While it has successfully allowed for increase in productivity, it has also contributed to rapid depletion of water resources, with dramatic impact on water bodies, including wetlands, and reduction of aquifer levels. With above 70 percent of all water withdrawal, agriculture is the single most important cause of the degradation of freshwater ecosystems. In the future, much more attention will need to be given to raising the efficiency of use of water so as to secure future production gains, adapt to increasing competition from other water users, including cities, and restoring the health and quality of freshwater ecosystems (Box 3).

PRINCIPLE 1 *Examples of key policies and practices*

Sustainable development

Sustainable development in agriculture

Innovative governance and technologies that sustainably increase agricultural production

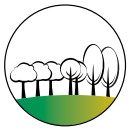


CROPS

1. Genetically diverse portfolio of varieties
2. Conservation agriculture
3. Judicious use of organic and inorganic fertilizers, improved soil moisture management
4. Improved water productivity, precision irrigation
5. Integrated pest management (IPM)

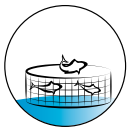
LIVESTOCK

1. Genetically diverse base of breeds
2. Improved resource use efficiency
3. Balanced and precision animal feeding and nutrition
4. Integrated animal health control



FORESTRY

1. Sustainable management of natural and planted forests
2. Forest area increase and slowing deforestation
3. Improved efficiency of use of wood-based energy
4. Development of innovative renewable forest products
5. Tree improvement to support productivity and resilience



AQUACULTURE

1. Aquafeed management
2. Integrated multi-trophic aquaculture
3. Robust biosecurity/aquatic animal health
4. Use of best management practices (BMPs), good aquaculture practices (GAPs), codes
5. Domestication of aquaculture species
6. Aquaculture certification for animal health and welfare, and food safety
7. Implementing the Ecosystem Approach to Aquaculture (EAA)

FISHERIES

1. Fuel efficiency increase and use of static gears
2. Reduction of fishing costs and capacity
3. Reduction of waste and discards
4. Integration of inland fisheries in water and land planning & management

BOX 3. **MOROCCO: PRODUCING MORE WITH LESS WATER**

In Morocco, water resources are stretched to their limits and climate change projections indicate a reduction in available water. Through its National Programme for water saving in irrigation, Morocco has embarked on an ambitious programme of enhanced water productivity in agriculture, providing farmers with technologies, approaches and market support that allow them to increase their production and their benefits while reducing their water consumption.

A sustainable approach to intensification seeks to raise productivity through a balanced use of resources and inputs, harnessing the potential benefits of ecosystem services. For example, excessive use of nitrogen fertilizer is a major cause of water pollution and greenhouse gas emissions. In addition, production of the estimated 110 million tonnes of nitrogen used as fertilizer in 2013 (FAO, 2011c) required the use of some 96 billion cubic metres of natural gas, with additional greenhouse gas emissions (Vance, 2001). However, nitrogen can also be added to soil by integrating N-fixing legumes and trees into cropping systems. Since legumes fix up to 40 kilogrammes of nitrogen per hectare, their use as green manure on succeeding crops reduces the need for mineral fertilizer, produces good yields, and contributes to climate change mitigation.

The livestock sector is a large user of natural resources, such as land, water and nutrient, and a source of greenhouse gases and pollution. The use of proven technologies, if more widely practiced, can substantially reduce resource use and greenhouse gas emissions.

Aquaculture is rapidly becoming the main provider of fish at global level. Like the crop and livestock sectors, it has the potential to enhance the efficiency of use of resources, but it also requires careful management in order to ensure that such intensification is done in an efficient way, while preserving the integrity of the resources it uses. There is huge potential for synergies between crops, livestock and aquaculture that result in overall enhancement of resources use efficiency.

The role of research, development and innovation in the transition to sustainable agriculture cannot be overemphasized. Countries will need to assign very high priority to strengthening their agricultural education and innovation capacities, and ensure the availability of affordable technologies that are locally adapted.

Solutions to the problems of low productivity are needed at large scale, but the replication of sustainable practices must consider the vast range and diversity of site-specific conditions. Linking local, national and international research and site-specific extension services will be particularly important in promoting the adoption of technologies and practices that improve resource use efficiency (FAO, 2011b). In developing countries, the transfer of relevant knowledge could be dramatically increased with better access to information and communication technologies (ICT) (Chapman and Slaymaker, 2002). The potential of continuous and new developments in the field of ICT in raising the levels of efficiency and effectiveness is large.

PRINCIPLE 2

Sustainability requires direct action to conserve, protect and enhance natural resources

While improved resource-use efficiency can help reduce pressure on ecosystems and natural resources, it also increases profitability, which can lead, in turn, to the expansion of production and a subsequent increase in resource depletion and degradation. The degradation of agro-ecosystems directly affects the food supply and income of the poor, increasing their vulnerability and creating a vicious cycle of poverty, further degradation and hunger (United Nations, 2013b). That is why direct action is needed to conserve, protect and enhance natural resources.

Protecting and restoring the ecosystems that naturally capture, filter, store and release water – such as rivers, wetlands, forests and soils – is crucial to increasing the availability of water of good quality. A study showed that, each year, the world's tropical forests remove from the atmosphere 4.8 billion tonnes of carbon dioxide, or about 18 percent of annual emissions from burning fossil fuels (Lewis, *et al.,* 2009). Reforestation and reducing the rate of deforestation are essential, therefore, to climate change mitigation and adaptation, as well as contributing to soil formation, water purification, biodiversity and pollination (Box 4).

The world's marine capture fisheries are an underperforming global asset. The difference between the potential and actual net economic benefits from marine fisheries is in the order of USD50 billion per year – equivalent to more than half the value of the global seafood trade (World Bank and FAO, 2009). Overexploitation of capture fishery resources is found both in developed and developing fishing countries, regardless of their economic systems. Eliminating perverse subsidies and reducing the global fishing capacity would increase the profitability and sustainability of the sector provided social safety nets are put in place.

Strategies for conserving, protecting, and enhancing natural resources should be based on the specific resource constraints faced in any given location, as well as the current and desired improvements in the reduction of the rate of depletion and degradation. Policies and institutions will need to be strengthened in order to provide the enabling environment and incentives for managing natural resources to reflect scarcities and their full ecological and social values. This can be achieved through a variety of means, including reforms to land tenure systems or the elimination of

BOX 4. **A PRACTICE THAT CONSERVES SOIL AND ENHANCES PRODUCTIVITY**

Techniques like conservation agriculture offer a means of enhancing productivity while protecting the soil and mitigating climate change. Soil carbon sequestration, which transfers atmospheric carbon dioxide into long-lived pools and stores it securely, is enhanced by management systems that add large amounts of biomass to the soil, cause minimal soil disturbance, conserve soil and water, improve soil structure and enhance soil biological activity. Conservation agriculture practices, such as reduced or zero tillage, cover crops and diversified cropping systems, minimize soil disturbance, promote soil health and can result in higher and more sustainable yields (FAO 2011b; Lal, 2004).

perverse subsidies on chemical inputs. Policy-makers can do much to promote sustainability including by ensuring payment – especially to smallholders – for their environmental services, such as soil conservation and biodiversity protection. The appropriate mix of actions will depend on existing institutional infrastructure, since it will have an important effect on the costs and effectiveness of any one instrument.

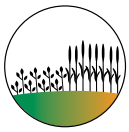
Applying this principle calls for action within the sector as well as strong coordination with the authorities responsible for the environment at national, regional and international levels. Global instruments that have been adopted by many governments – including the Convention on Biodiversity, the International Treaty on Plant Genetic Resources for Food and Agriculture and the IUCN Red List – provide for inter-country collaboration in the conservation of natural resources.

PRINCIPLE 2 *Examples of key policies and practices*

Sustainable development

Sustainable development in agriculture

Innovative governance and technologies that sustainably increase agricultural production

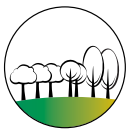


CROPS

1. Use better practices for biodiversity, such as in-situ and ex-situ conservation of plant genetic resources, IPM…
2. Use better practices for soil: land rehabilitation, appropriate cropping systems…
3. Use better practices for water management: deficit irrigation, preventing water pollution…
4. Set payments for using and for providing environmental services such as pollinators, carbon sequestration…
5. Set policies, laws, incentives, and enforcement to promote the above

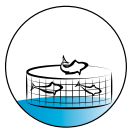
LIVESTOCK

1. Conserve animal genetics in-situ and ex-situ
2. Use grassland for biodiversity, carbon storage and water services
3. Protect water from pollution through waste management
4. Use better practices for reduced emission intensity
5. Set payments for using and for providing environmental services, e.g. grazing fees
6. Set policies, laws, incentives, and enforcement to promote the above



FORESTRY

1. Conserve biodiversity and forest genetic resources
2. Restore and rehabilitate degraded landscapes
3. Enhance the role of forests in soil protection and conservation
4. Enhance the role of forests in the protection and conservation of water resources
5. Use reduced impact harvesting techniques
6. Certification of forest management



AQUACULTURE

1. Conserve aquatic genetic resources
2. Promote aquaculture certification for environmental protection
3. Ensure biosecurity: pathogens, escapees, use of veterinary drugs, invasive species, biodiversity
4. Use integrated aquaculture-agriculture systems
5. Implementing the Ecosystem Approach to Aquaculture (EAA)

FISHERIES

1. Assess non-target resources
2. Develop and use low-impact fishing gears
3. Build fish passes in dams
4. Rebuild depleted stocks and protect critical habitats
5. Restock inland fisheries
6. Implement the Ecosystem Approach to Fisheries (EAF): protect Vulnerable marine ecosystems (VMEs), use MPAs in fishery management, implement ecolabelling
7. Implement the Code of Conduct for Responsible Fisheries (CCRF) and international action plans
8. Deter illegal (IUU) fishing

PRINCIPLE 3

Agriculture that fails to protect and improve rural livelihoods, equity and social well-being is unsustainable

Agricultural development is, by definition, unsustainable if it fails to benefit those whose livelihoods depend on it by increasing their access to resources and assets, their participation in markets and their job opportunities. Since 75 percent of the world's poor live in rural areas, broad-based rural development and the wide sharing of its benefits are the most effective means of reducing poverty and food insecurity (World Bank, 2007).

Of critical importance is the extent to which rural people have secure and equitable access to the natural resources they need to produce food for their consumption and to increase income. The livelihoods of many of them are based on access to and control over these resources, like land, water, forest and fishery resources. Inadequate and insecure tenure rights to natural resources often result in extreme poverty and hunger. In addition, secure tenure of land often results in enhanced investment by farmers, higher yields and reduction in soil degradation.

The status of women, who make up the majority of the world's hungry and have disproportionately low levels of resource ownership, requires special attention (Box 5). With equal access to resources and knowledge, female farmers could produce enough additional food to reduce the number of the world's hungry by 150 million (FAO, 2011d).

Institutional and policy reforms may be needed to increase rural people's participation in agricultural development and to ensure that they enjoy its benefits. However, building an enabling environment that addresses both social and environmental issues – thus connecting principles 2 and 3 – presents major challenges. It may take several years to realize the benefits of sustainable agricultural production systems and, in some cases, there may be reductions in income over the short term, which poses a significant barrier to adoption by the poor (McCarthy, 2012). Likewise, low-income producers can be discouraged from entering "green" value chains, if standards and criteria are set too high. Policy and institutional responses are needed to reduce the trade-offs between social and environmental objectives.

BOX 5. **MANAGEMENT OF POULTRY PRODUCTION BY WOMEN IN AFGHANISTAN**

Backyard poultry production is a major contributor to family nutrition in Afghanistan, and women have responsibility for more than 90 percent of village production of eggs and poultry meat. The Government recognized the potential of village production managed by women to reduce poverty and improve food security in the country. Together with FAO, it engaged in a poultry training programme specifically targeting women. The approach proved successful: during the first three years, participants produced 106 tonnes of poultry meat and 21 million eggs.

Today, the thousands of women who participated in the projects are connected to markets and to suppliers through their poultry producer groups. Lessons have been used in the preparation of the National Poultry Production Plan.

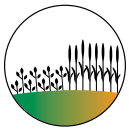
Building the capacity, including the entrepreneurial and managerial capacity, of producers to participate in local, regional and international markets is essential. Higher rural incomes boost demand for local products and services which, in turn, stimulates business, generates employment and income, and alleviates poverty. Initiatives such as "local production for local consumption", and government procurements from family farmers for school meals programmes, have been very effective in increasing production and income, while improving food security, in Brazil and other countries (Ministry of Agrarian Development, 2011).

PRINCIPLE 3 *Examples of key policies and practices*

Sustainable development

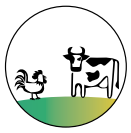
Sustainable development in agriculture

Innovative governance and technologies that sustainably increase agricultural production



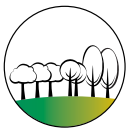
CROPS

1. Increase/protect farmers' access to resources, e.g. through equitable land and water tenure systems
2. Increase farmers' access to markets through capacity-building, credit, infrastructure
3. Increase rural job opportunities e.g. in small and medium enterprises sustainability and related activities
4. Improve rural nutrition: production of more and affordable nutritious and diverse foods, including fruits & vegetables



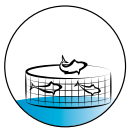
LIVESTOCK

1. Increase/protect farmers' access to resources, such as pasture, water, credit
2. Increase farmers' access to markets through capacity-building, credit, infrastructure
3. Increase rural job opportunities e.g. in small and medium enterprises sustainability and related activities
4. Improve rural nutrition: production of more and affordable nutritious and diverse foods, including fruits & vegetables



FORESTRY

1. Improve forest tenure rights and access to forest resources
2. Promote engagement of local stakeholders incl. communities and women's groups
3. Promote the development of small and medium-scale enterprises
4. Provide forest-based employment including health and safety provisions
5. Establish payment schemes for environmental services (PES)
6. Integrate forestry in poverty reduction strategies



AQUACULTURE

1. Aquaculture business-model, especially for small-scale producers
2. Aquaculture certification including gender considerations
3. Cooperative marketing
4. Mainstream aquaculture into rural development processes
5. Technological, trade, institutional, infrastructure, capacity development, investment and other support services
6. Aquaculture and nutrition programmes
7. Implementing the Ecosystem Approach to Aquaculture (EAA)

FISHERIES

1. Improve access and tenure rights
2. Improve local markets
3. Promote small/medium enterprises
4. Enhance gender equity
5. Integrate fisheries in poverty reduction strategies

PRINCIPLE 4

Enhanced resilience of people, communities and ecosystems is key to sustainable agriculture

Resilience has emerged as a key factor in sustainability. It is defined as the ability of a system and its component parts to anticipate, absorb, accommodate or recover from the effects of a hazardous event in a timely and efficient manner, by ensuring the preservation, restoration or improvement of its essential basic structures and functions (IPCC, 2012). In the context of sustainable food and agriculture, resilience is the capacity of agro-ecosystems, farming communities, households or individuals to maintain or enhance system productivity by preventing, mitigating or coping with risks, adapting to change, and recovering from shocks.

Phenomena such as climate variability, extreme weather events and market volatility, as well as civil strife and political instability, impair the productivity and stability of agriculture, which in turn increases uncertainties and risk for producers. Decisions taken in the wake of disasters or crisis can have consequences for households and communities that can become long term "poverty traps" (Carter and Barrett, 2006). Individuals may lose their assets, such as land, trees, water or fishing rights, or overuse them or trade them in order to meet their immediate needs, despite the potential negative impacts on natural resources and on their own future. Policies, technologies and practices that build producers' resilience to risks and uncertainties, including climate change and market volatility would also contribute to sustainability (Box 6). Resilience can be enhanced through co-constructed policies, strategies and plans, including risk management strategies, and specific measures such as flexible fishing strategies, the introduction of pest-resistant varieties and breeds, improved market governance, social safety nets, insurance and credit.

BOX 6. **COMBATING DESERTIFICATION IN THE THREE-NORTHS REGION, CHINA**

Desertification in the rural Three-Norths Region of China was caused mainly by overgrazing, wood cutting, shifting agriculture and tillage agriculture. Very strong winds in spring and winter are the chief agents of desertification and are associated with the generation of dust storms. The Chinese Government recognized that to maintain crop and livestock productivity and the livelihoods of expanding communities, it was essential to enhance ecosystem resilience and to integrate forests and trees for shelter and shade with agriculture and livestock management. From 1991 to 2002 thousands of hectares of the sparsely wooded shrub grasslands were reforested with drought-tolerant and cold-resistant tree species to establish a living wall to curb sandstorms and, at the same time, improve the socio-economic well-being of the population living in the area. The project demonstrated land-use systems integrating tree, shrub, pasture and cash crops. Shrubs were used as fences and hedgerows around and in pastureland and shelterbelts established to reduce wind erosion and to implement controlled rotational grazing. Wind erosion in the reforested areas was reduced by 75 percent in comparison with adjoining lands and the annual grain production increased considerably.

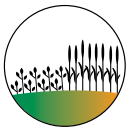
PRINCIPLE 4

Examples of key policies and practices

Sustainable development

Sustainable development in agriculture

Innovative governance and technologies that sustainably increase agricultural production

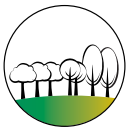


CROPS

1. Generalize risk assessment/management and communication
2. Prepare for/adapt to climate change
3. Respond to market volatility, e.g.: encouraging flexibility in production systems, and savings
4. Contingency planning for droughts, floods, and pest outbreaks; development; social safety nets

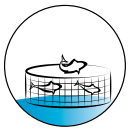
LIVESTOCK

1. Generalize risk assessment/management and communication
2. Prepare for/adapt to climate change
3. Respond to market volatility, e.g.: encouraging flexibility in production systems, and savings
4. Contingency planning for droughts, floods, and pest outbreaks; development; social safety nets



FORESTRY

1. Increase resilience of ecosystems to biotic and abiotic hazards including climate change phenomena, pests and diseases, forest fires
2. Prevent the transmission of pathogens to other countries through international trade
3. Integrate risk prevention and management into sustainable land-use planning



AQUACULTURE

1. Assess risks in aquaculture (pathogens, food safety, ecological, environmental (including climate change), genetic, social and financial)
2. Set early warning, preparedness, surveillance systems and contingency plans for aquatic emergencies
3. Implementing the Ecosystem Approach to Aquaculture (EAA)

FISHERIES

1. Generalize risk assessment/management and communication
2. Develop multipurpose industries
3. Assess/value ecosystems & services
4. Maintain stocks at high level
5. Adopt precautionary approach
6. Enhance social safety nets
7. Prepare for climate change

PRINCIPLE 5

Sustainable food and agriculture requires responsible and effective governance mechanisms

Good governance is needed to ensure social justice, equity and a long-term perspective on the protection of natural resources (IFAD, 1999). When sustainability processes are dominated by abstract environmental concerns, without adequate attention to social and economic dimensions, they are unlikely to be implemented. A transition to sustainable agriculture that follows the five principles requires enabling policy, legal and institutional environments that strike the right balance between private and public sector initiatives, and ensure accountability, equity, transparency and the rule of law.

Broad consultation and transparent discussion will be needed to build consensus around sustainability objectives, the need for trade-offs and the means of mitigating them. Developing a broad agenda for sustainable agriculture will provide the basis for formulating policies and putting in place effective institutions, operational programmes and instruments, including legislation, that support the adoption of appropriate practices on the ground. Institutional frameworks will need to ensure enforcement and compliance with requirements and commitments (Box 7). Promoting and improving people's ownership of the natural resources they need and use, through appropriate rights recognition and allocation policies, and their full participation in decisions on their management, will contribute to the efficient use, conservation and protection of natural resources. The participation of women, who make up less than 20 percent of land holders worldwide, needs to be greatly increased.

Co-constructed knowledge and social learning, which combine scientific and informal information and experience, are essential for establishing legitimacy and obtaining compliance. Many countries will need to increase their participation in international governance mechanisms, and follow up on implementing international commitments.

BOX 7. **ADOPTING THE ECOSYSTEM APPROACH TO FISHERIES AND AQUACULTURE IN NICARAGUA**

The Ecosystem Approach to Fisheries (EAF) and to Aquaculture (EAA) are holistic strategies that integrate ecological, socio-economic and institutional dimensions and facilitate sustainable use of natural resources. Integrated with other users of coastal ecosystems, they lead to increased coastal resilience and food security. One of the EAF and EAA core outcome is a strengthened governance.

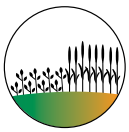
By implementing EAF and EAA in a tropical estuary in Nicaragua, the Government is now working with shrimp farming companies and cooperatives, fishermen and local communities in a joint effort to improve conservation of natural resources while increasing aquaculture productivity and improving livelihoods. It has jointly developed and agreed on a management plan for this ecosystem which addresses the social, and environmental issues that were prioritized through a risk assessment.

PRINCIPLE 5 *Examples of key policies and practices*

Sustainable development

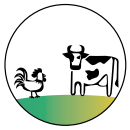
Sustainable development in agriculture

Innovative governance and technologies that sustainably increase agricultural production



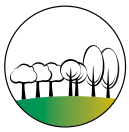
CROPS

1. Increase effective participation
2. Encourage formation of associations
3. Increase frequency and content of consultations among stakeholders
4. Develop decentralized capacity



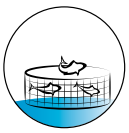
LIVESTOCK

1. Increase effective participation
2. Encourage formation of associations
3. Increase frequency and content of consultations among stakeholders
4. Develop decentralized capacity



FORESTRY

1. Develop personnel and institutional capacity
2. Support good governance of rural areas
3. Decentralize decision-making and empower local communities to promote participatory forestry
4. Develop financial incentive packages to support private investment and enable equitable distribution of benefits
5. Apply mediation and other conflict resolution mechanisms in resource governance
6. Enhance communication to better articulate the benefits of forests



AQUACULTURE

1. Compliance with international treaties, standards, agreements on sustainable aquaculture, animal health, food safety
2. Voluntary adoption of BMPs, GAPs
3. Contribution and impact assessments
4. Implementing the Ecosystem Approach to Aquaculture (EAA)

FISHERIES

1. Develop local governance capacity
2. Empower local communities
3. Adopt Good Governance Principle
4. Decentralize decision-making

The transition to *sustainable* food and agriculture

Implementation of the five principles requires a range of actions to enhance sectoral as well as cross-sectoral productivity and sustainability. Over the past 25 years, FAO has developed a number of frameworks and approaches that have strengthened the capacities of Member Countries to increase agricultural productivity in a sustainable manner (see Annex). The full range of FAO's sustainable development tools – methodologies, guidelines, indicators – can support countries in making the transition, and can be used in mainstreaming sustainability into national agricultural development programmes.

The lessons learned confirm that the transition to sustainability requires conviction, political commitment, knowledge and people's participation. It is therefore important that programmes aiming at building sustainability be designed and driven by the countries themselves, in order to guarantee that the approach is coherent, comprehensive and adapted to their needs and specificities.

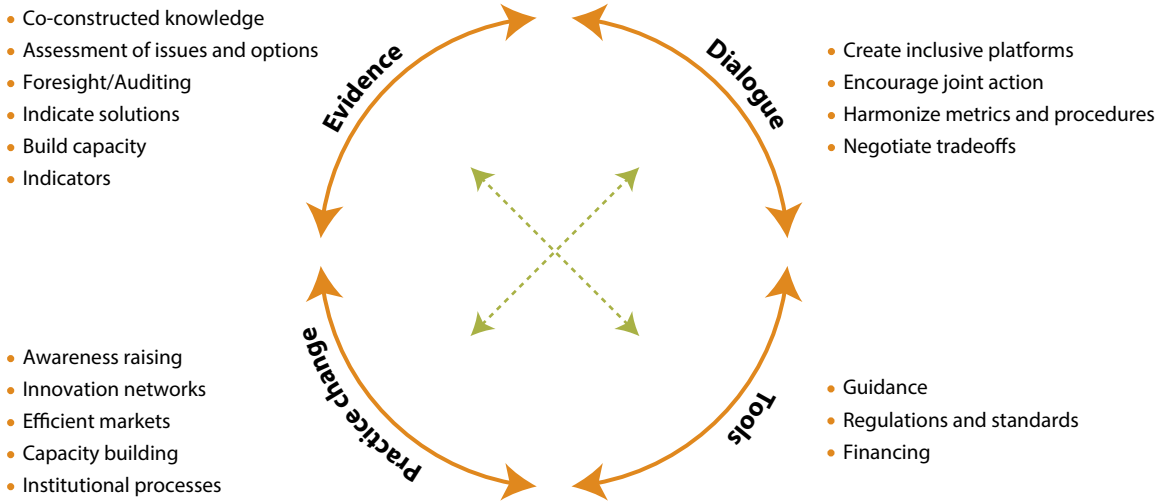
Four areas of action to ensure practice change

In order to identify issues and possible interventions, build partnerships and ensure buy-in from critical stakeholders, the application of the five principles described above requires four types of action: building relevant, co-constructed and accessible evidence; engaging stakeholders in dialogue to build common understanding and joint action; developing innovative approaches and solutions; and formulating tools and levers to enable and incentivize changes in food and agricultural systems. The process is not necessarily sequential: the exact succession of actions will differ according to location and scale (community, national or global level), and interaction can take place between any two action areas at any time during implementation (**Figure 4**). Coordination among the different scales – from global to local levels – is essential.

Since sustainable development is a value-based concept with multiple objectives, the products and services from agriculture will be valued in different ways with differing implications for priorities and actions. Given the multiple objectives of sustainability an approach that enables dialogue between key stakeholders is required at international, country and local levels. Dialogues should be focused on identifying major trade-offs or differences in priorities across stakeholders taking both bio-physical and socio-economic factors into account. For stakeholder dialogue to be effective, meaningful and fair, it should be underpinned by science-based ***evidence***, complemented as necessary by traditional knowledge. The dialogues should be geared towards negotiation and consensus building. The dialogue should gen-

FIGURE 4.

OPERATING SUSTAINABILITY: FOUR BROAD AREAS OF ACTION



erate a set of action points for enhancing the sustainability process at national or other scales as relevant.

The stakeholder ***dialogue*** needs to be translated into innovative approaches for the development of enabling conditions and incentives that can foster the needed changes identified from the dialogue process. Specific options for addressing these changes need to be analysed and put forward – and addressed in the dialogue. At international level, the process may lead to binding (or hard) law in the form of formal treaties, conventions and agreements, which will need to be translated into national law to become effective, and non-binding (soft law) instruments (Box 8). The latter instruments, in the form of declarations, agendas, agreed principles and targets, influence national policies without imposing obligations.

Better understanding of issues and options feeds into the stakeholder dialogue and enhances decision-making by stakeholders, individually or collectively. These decisions can improve the rules, both legal and voluntary, that govern human activities

and provide signals and incentives. In turn, agreed rules induce ***practice change*** in technology, policies, and institutions. The decisions need to be tailored to the local realities of ecosystems and of the populations that will bear costs and enjoy benefits.

While innovation and practice change may take many forms and directions, ideally multi-stakeholder decisions at global levels provide guidance for solutions at the regional, national and local levels, and vice-versa. As part of ***practice change***, institutional frameworks and consultative processes will help monitor and report on progress made and adjust and adapt as required. ***Practice change*** needs to be supported by effective management systems designed to reflect national priorities and policies. It must be based on clear operational objectives and address the most relevant issues, after some risk and impact assessment. Such management systems require stakeholder participation and enhanced ownership of the agreed options and decisions.

BOX 8. **CLIMATE CHANGE: LINKING GLOBAL AND LOCAL LEVELS**

Climate change and agricultural models provide evidence of the potential impacts of climate change on agriculture in specific locations. This evidence is incorporated into Intergovernmental Panel on Climate Change (IPCC) reports, which seeks to generate a common understanding and a basis for discussions and joint action at international level, in particular in the United Nations Framework Convention on Climate Change (UNFCCC). Individual countries can then incorporate this evidence and the outcome of discussions into their national planning and investment strategies, which in turn might be translated into changes in practices in, for example, irrigation management or disaster preparedness.

Four pillars of implementation

Guiding the transition towards sustainability requires flexibility, autonomy and creativity on the part of those who implement it. The following pillars should underpin the design of practical interventions "on the ground".

Integration across scales and disciplines

The need for national approaches. Inter-sectoral integration should be promoted by the adoption, at national level, of an overarching approach. An integrated approach facilitates collaboration among sectors and ensures that policies and programmes for sectoral development are compatible. Work on agricultural sustainability needs to be embedded in Country Programming Frameworks, National Strategic Plans, or similar strategies that reflect countries' priorities, in order to encourage national buy-in and contribute to their development goals.

Shared visions and values at local level. Implementation needs to be based on a national vision of sustainability – including issues, threats, values, principles and solutions – that is shared by all stakeholders from the outset. A local-level shared vision is not a pre-requisite but, where it does not exist, it should be encouraged in the early phases of the initiative. This requires formalizing a *modus operandi* that is multi-stakeholder, interdisciplinary, participatory and inclusive, and which inte-

grates different sources of knowledge and different perceptions and values. Tools for conflict-resolution and consensus-building may be needed.

Multiple forms of knowledge. Evidence and management have co-evolved for more than a century. The increasing complexity of agricultural development has led to segmented visions of agriculture in different sectors and disciplines. Instead, the evidence needed for a successful transition to sustainable agriculture should be integrated, drawing on the knowledge, experience and perspectives of scientists, administrators, jurists, economists, managers and – not least – agricultural producers. The right mix of knowledge will depend on factors such as the type of issue addressed by the initiative, the data available, the people involved and the research capacity.

Multiple scales of intervention. Implementation will need to take account of cross-scale interactions, paying particular attention to transboundary impacts, whether imported by external drivers or exported in the form of positive or negative externalities from the sector or the area of sustainability initiatives; the long-term strategic implications of short-term operational measures; and interactions between governance systems, at inter-sectoral level and across jurisdictional scales, from local to global. Implementation will also need to consider the impact of measures taken at a local scale on the national scale and of the effect of global drivers on local performance.

Collaboration

Participative processes and co-construction. The world's farmers, foresters and fishers will ultimately determine whether our vision of sustainable food and agriculture is realized. Policy-makers and innovators can only facilitate it by providing legal and institutional frameworks, incentives, rights, infrastructure and support services. Field implementation should ensure ownership by the communities that will ultimately decide the relevance of the issues identified and the legitimacy of the responses proposed. Participation helps to mobilize and empower stakeholders, build consensus and improve the knowledge base. It is essential for identifying expectations and perceptions, improving problem formulation and finding solutions, reducing social and economic risk, increasing equity and transparency, and facilitating conflict resolution, public scrutiny and auditing.

Participation improves scientific understanding, and stores and builds upon it through social learning. However, it has a cost, and the optimal degree of participation will depend on factors such as the nature and complexity of the issues to be dealt with, and the number and diversity of potential stakeholders. Early transparent recognition of the main diverging interests, conflicting views and hidden agendas of stakeholders will help prevent hostility toward the participatory process itself. Meticulous preparation can turn this risk into an opportunity by creating group dynamics that transform initial tensions into solutions (Toth, 2001).

Partnerships. Effective delivery calls for partnerships, coalitions and creative modes of collaboration. Stakeholders in agriculture at the community and country levels may need to work together in new ways. Partnerships will bring together actors from the public and private sectors, producers, research and academic insti-

tutions, civil society and community organizations. They should engage the expertise and entrepreneurial skills of the private sector in alliance with the public sector and civil society, using innovative forms of capacity development, including national roundtables and technology and knowledge exchange initiatives such as South-South cooperation. Partnerships should leverage expertise and resources and win support for innovation and investment.

Transparency

The entire process, and particularly assessments, options analysis, decision-making and performance evaluation must be transparent. Available data, the methods and processes used, results and interpretations, should all be documented and made easily available to stakeholders. That is particularly important for making informed trade-offs when dealing with uncertainty, multiple sources of knowledge and competing uses. Transparency also requires formal recognition of roles and responsibilities. Dissent and concerns should be documented and, if set aside, a justification provided. Together with active participation, transparency and accountability contribute to credibility, legitimacy and trust.

Adaptability

With decisions unavoidably taken on the basis of incomplete information and, often, left to suboptimal implementation systems, the outcomes of policies and programmes cannot, in most cases, be exactly known. In addition, the performance of FAO and its Member Countries will be affected by factors over which they have little or no control, such as changes in the macroeconomic environment, the natural environment, technologies, consumer concerns and governance.

Those complexities, along with multiple and scale-dependent points of view and cross-scale issues, create uncertainty, affect the replicability of approaches, limit the usefulness of blueprints, delay responses and spring surprises. The strategy, institutions and approaches adopted must, therefore, have the capacity to adapt to changing conditions, selecting actions that are most robust to error, leaving room for local adaptation, mainstreaming impact and risk assessment, and institutionalizing performance assessment.

FAO support to Member Countries

Through its new Strategic Framework, FAO will support countries in making the transition to sustainability. Member Countries will be encouraged to consider the need for a new strategic vision to address growing resource scarcity, climate change and changes in the broader socio-economic environment. It will also build the necessary capacity to provide countries with a multi-sectoral perspective and multi-disciplinary tools that will drive the transition. The approach will be evidence-based and include systematic and explicit consideration of synergies, as well as trade-offs, between objectives. This includes integrated assessments of the options available to decision-makers, so that they can identify production and conservation priorities, objectives, strategies, plans and measures, and duly balancing social, economic and environmental concerns.

Build institutions and processes to drive the transition to sustainability

Developing and implementing policies and strategies for sustainable agriculture will require national institutions and processes that identify issues and incentives appropriate to their situations and which are capable of innovative responses. FAO will assist Member Countries in building their institutional capacity and in carrying out performance assessments for existing institutions. The experience of countries that have successfully developed capacity for improving sustainability may be useful to others in similar economic, ecological and social circumstances. Partnerships among countries and institutions, especially through South-South cooperation, have an important role to play in capacity building.

Promote appropriate practices and priority-setting

The transition to sustainable agriculture will require policies, mechanisms, instruments, approaches and methods that decision-makers, at national and community levels, can use to prioritize their production and conservation concerns and agree on objectives, strategies, plans and measures. Member Countries will need multi-disciplinary and multi-sectoral tools to identify and evaluate synergies and trade-offs between sustainability objectives and agricultural sub-sectors, using an evidence-based approach.

Satisfying all environmental, social and economic demands at all times is virtually impossible. A formal, transparent and participatory assessment of trade-offs is important for legitimacy and future compliance. The negative effects of trade-offs can also be mitigated by good governance and innovation – for example, through compensations and offsets that reduce costs to stakeholders, or by introducing more cost-effective and sustainable technologies such as Integrated Pest Management, by reducing transaction costs, or by developing integrated production systems such as agro-forestry or rice-fish farming.

Given the importance of innovation in the transition to sustainability, FAO will assist countries and communities in strengthening their technical capacity to evaluate, select and implement innovative practices. Many such technologies and practices are already available. However, as sustainability is of an evolving nature, they will need to be continually fine-tuned and new ones will need to be developed.

Strengthen capacities for data collection and analysis, disseminate information and monitor progress

Collection, analysis and interpretation of data and information are essential for making informed and evidence-based decisions. The results of inquiry and decisions made should be communicated in a timely and effective manner. Recent developments in the field of information and communication technology, including internet, social media and cell phones, provide an ideal means for broadly communicating and disseminating information and also channels for feedback and sharing. FAO will develop relevant tools and methodologies, provide them to its Member Countries, and help strengthen their capacity to use them.

"Smart" indicators – specific, measurable, attainable and relevant – are particularly powerful tools for monitoring the social, economic and environmental impacts of policies and technologies. They can also assist policymakers in decision-making

and in monitoring progress toward sustainability. However, building an objective, efficient, easily accessible and user-friendly set of indicators is a complex task. FAO will assist countries, therefore, in the development and use of effective indicators relevant to their situations. A *sine qua non* for the legitimacy of indicators, and of the actions taken on the basis of their analysis, is that they are co-constructed and analysed with stakeholders at the scale of implementation – community, national, regional, or global.

Strengthen capacities and develop mechanisms for effective international collaboration

Many international instruments aim at building global or regional consensus, fostering national approaches, improving governance and strengthening the capacities of stakeholders to deal with issues of climate change, trade, conservation and sustainable use of natural resources. Those instruments have an impact on the productivity and sustainability of agriculture. However countries differ in their capacities to contribute to, implement and benefit from them. FAO will work, in partnership with others, to strengthen country capacities as needed.

FAO will contribute to informed discussion and decision-making by providing the technical input on important issues identified by Member Countries. Relevant FAO instruments and approaches could facilitate assessments of the state of natural resources critical to sustainability and provide the tools and parameters needed for monitoring their conservation and use. For example, the Commission on Genetic Resources for Food and Agriculture could produce periodic state-of-the-world reports identifying and promoting appropriate policies and technologies for the sustainable use of genetic resources, and propose options for maximizing synergies and minimizing negative externalities.

Member Countries might also consider placing the transition to sustainable agriculture as a standing item on the agendas of the FAO Conference, the FAO Council and sessions of its Technical Committees on agriculture (COAG), fisheries (COFI) and forestry (COFO). Experiences, constraints, opportunities and progress in sustainable agricultural development could be discussed regularly also by the Committee on World Food Security (CFS), which would be an appropriate forum for analysing cross-sectoral issues and their implications for food security. The committees would also support countries in implementing and further strengthening their sustainable agriculture development plans, at national and local levels.

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Annex

FAO's *sustainability* frameworks and approaches

The quest for sustainable models of production has been pursued for many decades in the different sectors covered by FAO (crops, livestock, forestry, fisheries and aquaculture), following the specific realities of each sector, and within the context of the international legal and institutional frameworks (including international and regional conventions). The various FAO sectoral sustainability frameworks are elaborated and adapted as required by the FAO Technical Committees, supported by the relevant technical Departments, and their overall coherence is controlled by FAO Conference. The main frameworks and approaches guiding the programme of FAO in its work with member countries are briefly presented below.

Cross-sectoral frameworks and approaches

Climate Smart Agriculture (CSA) and FAO-Adapt

CSA[1] covers all agricultural sectors and brings together practices, policies and institutions that are not necessarily new but are used in the context of climatic changes.

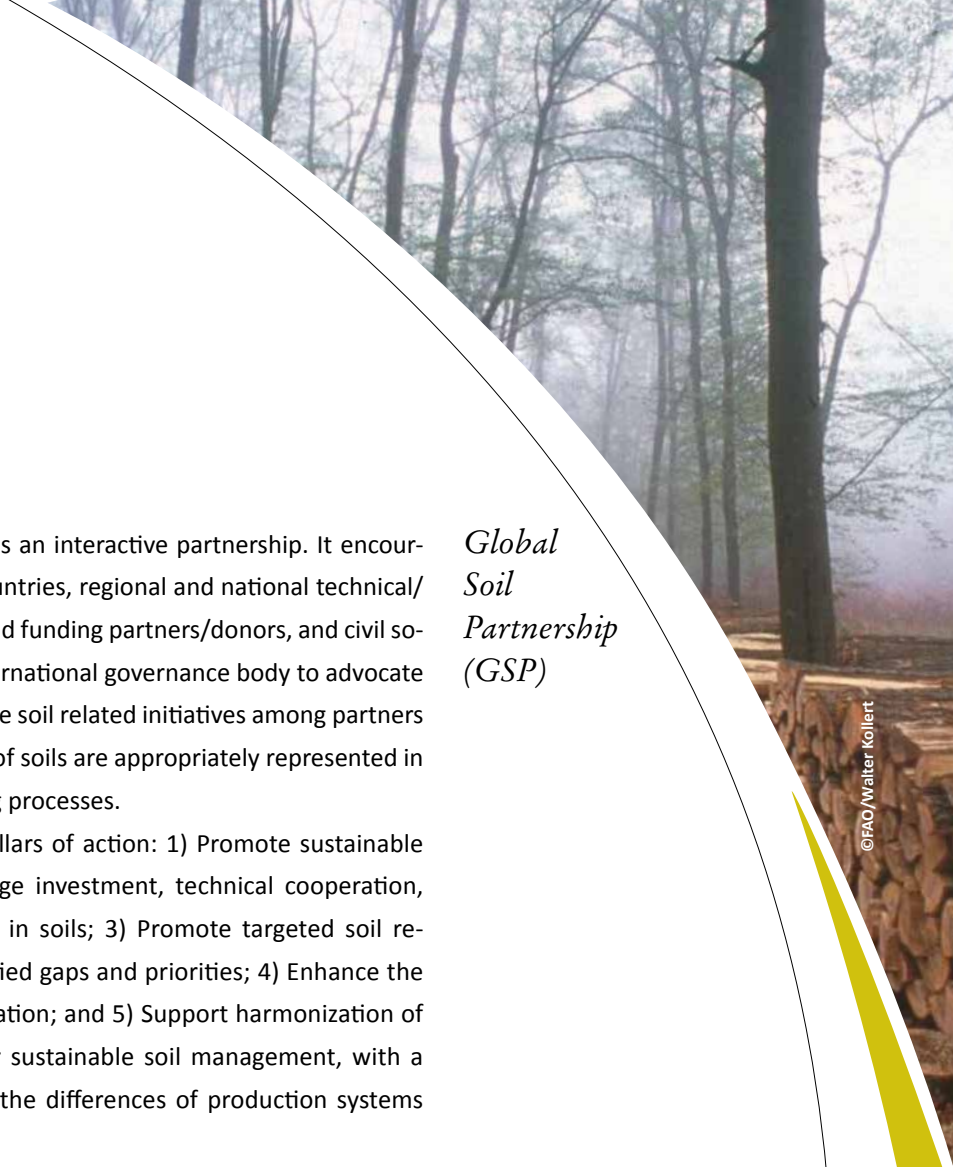
It is conceived to develop the technical, policy and investment conditions to address the interlinked challenges of sustainably increasing food production, achieving food security and development targets while addressing the challenges of climate change. The three dimensions of sustainable development are integrated through three main pillars: 1) Sustainably increasing agricultural productivity and incomes (especially of smallholders); 2) Adapting and building resilience to climate change; and 3) Reducing and/or removing greenhouse gases emissions, where possible.

Principles that are more specific to CSA include:

- The need to identify site-specific solutions to achieve food security under climate change; and
- Increasing resilience in social as well as production systems and broad-based strategies to manage risk ex-ante and ex-post.

Although the description above is in regards to CSA, it should be noted that FAO-Adapt is a FAO-wide framework programme that is closely linked to the CSA approach. Many of the elements of the FAO-Adapt programme support the achievement of a CSA approach. Its main themes are in line with the priorities of CSA: 1) Data and knowledge to assess impact and vulnerabilities; 2) Institutions, policies and financing to strengthen capacities to adaptation; 3) Sustainable climate-smart management of land, water and biodiversity; 4) Technology, practices and processes for adaptation; and 5) Disaster risk management.

[1] Sources of information include: 1) FAO-Adapt: www.fao.org/docrep/014/i2316e/i2316e00.pdf; 2) Climate-Smart Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation: www.fao.org/docrep/013/i1881e/i1881e00.htm; 3) Climate-Smart Agriculture (CSA) sourcebook: www.fao.org/docrep/018/i3325e/i3325e.pdf; and 4) Developing a Climate-Smart Agriculture at the country level lessons from recent experience: www.fao.org/docrep/016/ap401e/ap401e.pdf



Global Soil Partnership (GSP)

FAO established the GSP[2] during 2012-13 as an interactive partnership. It encourages active participation of FAO member countries, regional and national technical/scientific bodies working on soils, advisory and funding partners/donors, and civil society organizations. It aims to provide an international governance body to advocate for soils with a unified voice and to coordinate soil related initiatives among partners and ensure that knowledge and recognition of soils are appropriately represented in global change dialogues and decision making processes.

The GSP is organized around five main pillars of action: 1) Promote sustainable management of soil resources; 2) Encourage investment, technical cooperation, policy, education awareness and extension in soils; 3) Promote targeted soil research and development focusing on identified gaps and priorities; 4) Enhance the quantity and quality of soil data and information; and 5) Support harmonization of methods, measurements and indicators for sustainable soil management, with a national validation that takes into account the differences of production systems and ecosystems.

Sustainable Land Management (SLM)

Sustainable land management (SLM)[3] can be defined as *"the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions*" (UN Earth Summit, 1992). This cross-sectoral approach to land resources management[4] aims at enhancing productivity and sustainability of land resources use across all production systems through improved governance, management and planning. It encompasses protection, conservation and sustainable use and restoration or rehabilitation of

[2] This section is based on the following documents: 1) FAO Programme of work and budget 2012-2013 (FO1G202 Global Soil partnership); 2) FAO June 2013 Reviewed Strategic Framework (C 2013/7) adopted at 38th Session FAO Conference; 3) FAO website http://www.fao.org/globalsoilpartnership/en/ (access Sept. 2013) and 4) UNCSD, 2012 The Future We Want – Rio+20 Outcome document, A/RES/66/288, Resolution adopted by the General Assembly on 27 July 2012.

[3] This section is based on the following documents: 1) FAO. 2011. Programme of work and budget 2012-2013 (FO1G206 Tools and policies for land degradation assessment and scaling up Sustainable Land Management); 2) FAO. 2013. Reviewed Strategic Framework. Document C 2013/7 adopted at the 38th Session of the FAO Conference; 3) TerrAfrica. 2009. Country support tool for scaling up SLM in sub-Saharan Africa, prepared by FAO and World Bank and Policy and Financing for SLM prepared by GM, UNCCD Secretariat and FAO; 4) FAO. 2013. Sustainable Land Management. Accessed September 2013 at: http://www.fao.org/nr/land/sustainable-land-management/en/ and 5) UNCSD. 2012 The Future We Want – Rio+20 Outcome document, A/RES/66/288, Resolution adopted by the General Assembly on 27 July 2012.

[4] Land encompasses the soil and terrain, water resources, biodiversity (animal, plant and microbial resources) and near surface climate/atmospheric conditions, and their spatial array in relation to human populations and land use. It includes the components of land units that are of direct use for human populations (productive services, settlement, etc.) and the less tangible ecosystem services that support or regulate nutrient, hydrological and carbon cycles, climate, pest and disease control etc. It includes resources that have an intrinsic/future value such as biodiversity (e.g. in protective areas, for research, etc.) or are of value for longer term sustainability of land use locally, regionally and globally.

degraded resources and can be applied at a range of scales from local to catchment, landscape national and transboundary levels.

There are a number of principles for action to guide the SLM programme:

- Knowledge: assessments and pilot work with stakeholders to generate clear understanding of land condition, causes of land degradation and impacts of current measures to guide SLM strategies and response options;
- Capacity development of stakeholders for good governance and decision making, technical support and adoption of adapted SLM measures;
- Coherence: ensure alignment of policies, programmes and actions across agriculture, environment, land, water and development sectors.

Coping with water scarcity

FAO's water scarcity programme is aligned with UN-Water's programmes. This programmatic approach to agricultural water management aims to enhance the agricultural productivity and advance the sustainable use of water resources in agriculture through their improved governance, management, development and conservation. In its water programme, FAO applies the principles of integrated water resources management (IWRM) to the agriculture sector.

FAO's water scarcity programme focuses primarily on resources use efficiency, conservation and protection. Six principles for action guide the programme: 1) Knowledge (base strategies on a clear understanding of the causes and effects of water scarcity and of their response options); 2) Impact (assess the full range of benefits and costs and use systematic and comprehensive decision criteria); 3) Capacity (ensure that the right level of water governance and institutional capacity is in place); 4) Context specificity (adapt response to local conditions); 5) Coherence (ensure policy alignment for water, agriculture and food security); and 6) Robust decision-making and adaptive management.

Energy-Smart Food for People and Climate (ESF)

The increasing demand of food is expected to have serious implications on energy, water availability, and global GHG emissions. At the same time the energy demand for electricity and fuels is increasing, and so is the impact of thermal power generation on water resources and climate. Given this water-energy-food ''nexus'' challenge, efforts to attain food security need to be water, land, and energy smart. FAO is investigating the energy-food-water nexus in a changing climate, in order to inform related decision-making processes at both global and national levels.

The FAO multi-partner programme on "Energy Smart Food for People and Climate (ESF)" addresses the above challenge by: 1) Improving energy efficiency at all stages of the agri-food chain; 2) Increasing the use of renewable energy; and 3) Improving access to modern energy services including through integrated food and energy production.

Energy-smart food systems are also 'climate-smart' since they help mitigate climate change by reducing greenhouse gas emissions. They can also help rural communities adapt to climate change by increasing their reliance on local energy sources and diversifying incomes.

The Ecosystem Approach (EA)

The CBD[5] defines the EA *as a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (...). It is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems.*

It is being progressively mainstreamed in all conservation programmes and economic sectors using natural renewable resources, including in FAO. In 2007, the FAO Commission on Genetic Resources for Food and Agriculture acknowledged the ecosystem approach in FAO's programmes and activities, particularly in forestry, fisheries and agriculture. It stressed the importance of the ecosystem approach in assisting the Commission to address biodiversity for food and agriculture. It also acknowledged that the approach is relevant for integrating cross-cutting issues, such as the impact of climate change on agricultural biodiversity, recommending continued FAO efforts to mainstream that approach in agriculture. In forestry, sustainable forest management has been recognized by CBD to be a concrete means of applying the ecosystem approach to forest ecosystems.

Conservation and Sustainable Use of Biodiversity and Genetic Resources

Aware of the importance of biodiversity for food and agriculture for global food security, FAO established the Commission on Plant Genetic Resources for Food and Agriculture in 1983. The Commission's initial mandate – to address plant genetic resources for food and agriculture – was broadened in 1995, to include all components of biodiversity for food and agriculture. For 30 years, the Commission has provided a unique intergovernmental forum to reach global consensus on policies relevant to biodiversity for food and agriculture. It has prepared global assessments, negotiated global plans of action, codes of conduct and other instruments relevant for the conservation and sustainable use of genetic resources for food and agriculture[6]. It monitors the implementation of its Global Plans of Action with agreed process and resources indicators.

The Commission has adopted a Strategic Plan and a Multi-Year Programme of Work until 2024 that includes:

- Vision: Conserving biodiversity for food and agriculture and promoting its use in support of global food security and sustainable development, for present and future generations.
- Mission: Cognizant that genetic resources for food and agriculture are a common concern of all countries, in that all countries depend on genetic resources for food and agriculture that originated elsewhere, the Commission strives to halt the loss of genetic resources for food and agriculture, and to ensure world food security and sustainable development by promoting their conservation, sustainable use, including exchange, and the fair and equitable sharing of the benefits arising from their use.

[5] Fifth CBD Conference of the Parties (COP5, 2000) Decision V/6y.
[6] http://www.fao.org/nr/cgrfa/cgrfa-home/en/

The Sustainable Food Systems Program

The FAO/UNEP sustainable food systems program promoted jointly by FAO and UNEP, together with the Agri-food Task Force on Sustainable Consumption and Production (SCP), is catalysing partnerships among United Nations agencies, other international agencies, governments, industry and civil society whose activities, together, can promote the necessary transition of food systems to sustainability.

The program, within its further development and implementation through the 10YFP on Sustainable Consumption and Production (SCP), adopted at the Rio+20 Conference, in 2012, aims at building capacity for the uptake of more SCP practices across food systems and facilitate access to financial and technical assistance, bringing together existing initiatives and developing new multi-stakeholder engagement to build synergies and cooperation to leverage resources towards mutual objectives.

It is working in four major focus areas: Information platforms; Consumer communication; Enabling conditions for uptake; Market-based approaches. Its system's approach employs a holistic view, embracing resource use efficiency, nutrition, environment and health, as well as ensuring equitable distribution of economic and social benefits along the supply chain. An approach that encompasses activities that positively impact the common elements of the food systems (production, processing, distributing, marketing and consumption of food) – whether it be in highly modern systems or local markets in developing countries – contributes to the strengthening of the four pillars of food security – stability of the food system, accessibility and availability of food and its utilization.

Sectoral frameworks and approaches

Save and Grow: Sustainable crop production intensification

In 2011, FAO launched Save and Grow (FAO, 2011b) as a new paradigm for intensive crop production for that would enhance both productivity and sustainability. Save and Grow calls for greening of the Green Revolution through an ecosystem approach that draws on nature's contribution to crop growth, such as organic matter, water flow regulation, pollination and bio-control of insect pests and diseases.

It offers a rich toolkit of relevant, adoptable and adaptable ecosystem-based practices, that encourages judicious and efficient use of chemical inputs, builds resilience to climate change and reduces greenhouse gas emissions. It proposes farming systems based on conservation agriculture practices, the use of good seed of high-yielding adapted varieties, integrated pest management, plant nutrition based on healthy soils, efficient water management, and the integration of crops, pastures, trees and livestock. It advocates policies that build capacity through extension approaches; remove incentives that encourage mechanical tillage and wasteful use of fertilizers and water; provide farmers seed of superior and adapted varieties on time; and make it easier and profitable for smallholders to produce and market their products through improved infrastructure and appropriate pricing.

Global Agenda for Sustainable Livestock

The Agenda is a partnership of livestock sector stakeholders committed to the sustainable development of the sector. Livestock are critical to building sustainability. Sustainability is a process of continuous practice change that addresses social, eco-

nomic and environmental objectives simultaneously. To be sustainable, livestock sector growth needs to support the livelihoods of an estimated 1 billion people, contribute to enhancing economic and social well-being, protect public health through balanced diets and the reduction of health threats from livestock, and protect the natural resources. The Agenda is working in three major focus areas: Global food security and health; equity and poverty reduction; and resources and climate.

Stakeholders of the Agenda include the private sector, NGOs and social movements, government partners, research institutions, international agencies and foundations. The Agenda catalyzes policy dialogue into practice change. FAO supports the Agenda through dialogue, analysis and policy advice as well as through pilots and investment strategies. Within FAO, the Agenda cuts across all Strategic Objectives.

Sustainable Forest Management (SFM)

The Sustainable Forest Management (SFM) approach covers forestry, with strong linkages to other sectors including agriculture, water, soil, energy etc. The United Nations General Assembly defines SFM as a "*dynamic and evolving concept, which aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations*". The SFM concept encompasses both natural and planted forests in all geographic regions and climatic zones, and all forest functions.

Among the underpinning broad principles are multiple use, sustainability, equity, fair and well informed stakeholder engagement and good governance. It promotes a broad range of activities at all levels, including the administrative, legal, technical, economic, social and environmental aspects of the conservation and use of forests. SFM has seven globally recognized thematic elements: 1) Extent of forest resources; 2) Biological diversity; 3) Forest health and vitality; 4) Productive functions of forest resources; 5) Protective functions of forest resources (notably water and soil); 6) Socio-economic functions; and 7) Legal, policy and institutional framework.

Reducing emissions from deforestation and forest degradation (REDD+)

The United Nations Framework Convention on Climate Change (UNFCCC) defines REDD+ activities as *"mitigation actions in the forest sector by undertaking the following activities, as deemed appropriate by each Party and in accordance with their respective capabilities and national circumstances: (a) Reducing emissions from deforestation; (b) Reducing emissions from forest degradation; (c) Conservation of forest carbon stocks; (d) Sustainable management of forests; and (e) Enhancement of forest carbon stocks."* The REDD+ activities encompass all activities in the forest by developing countries that may lead to contributions to mitigate climate change. They cover both natural and planted forests in all geographic regions and climatic zones in developing countries.

Like other sustainable forestry activities, REDD+ approach promotes best management practices for conservation, production and enhancement of carbon stocks while providing a range of forest ecosystem goods and services at the local, national, regional and global levels, thus contributing to sustainability in the forest and land

use sectors. REDD+ activities cover many aspects of sustainable development: environmental, economic and social, as well as encompasses policy and institutional issues (i.e. governance, land tenure).

The Code of Conduct for Responsible Fisheries (CCRF)

The Code of Conduct for Responsible Fisheries was drawn up by FAO, following a call from the International Conference on Responsible Fishing (Cancun, Mexico, 1992), to strengthen the international legal framework for more effective conservation, management and sustainable exploitation and production of living aquatic resources. The CCRF is directed towards all stakeholders of the fishing and aquaculture industries. It is intended to help countries to develop or improve their fisheries and aquaculture, whilst ensuring the long-term sustainable use of fisheries resources while minimizing the collateral impact on the rest of the ecosystem. The objective is to ensure a long-term contribution of fisheries and aquaculture to food supply, food security and poverty alleviation particularly in fishing and coastal communities.

The CCRF sets out principles and international standards of behaviour for responsible practices, with due respect for the ecosystem and biodiversity, and recognizes the nutritional, economic, social, environmental and cultural importance of fisheries, and the interests of all those concerned with the fishery sector. FAO has, so far, produced 28 detailed technical guidelines in support of the CCRF, to assist fishers, industry and governments in taking the necessary practical steps to implement it.

The Ecosystem Approach to Fisheries

The Ecosystem approach to fisheries (EAF) is based on a risk management framework, also being developed for aquaculture (EAA). It covers the principles of the CCRF and provides a methodology for their practical implementation. It covers the ecological, social and economic dimensions of sustainability and identifies the most appropriate governance arrangement in the given context.

Within an agreed sustainability 'envelope', tradeoffs between environmental, economic or social objectives will depend on the country/stakeholders' own priorities and policy objectives. The EAF provides an approach to identify what the major threats may be, in a given context. It is usually applied at the level of practical fisheries management/decision making. Based on the outcomes of the EAF planning process, identification of most appropriate technologies/practices/management measures follows. The EAF directly deals with governance by carefully examining existing arrangements and identifying, in a participatory way, institutional, legal and other aspects that need improvement/revision.

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Sustainability is at the heart of FAO's new Strategic Framework and is the specific focus of Strategic Objective 2, which aims at sustainably increasing the provision of goods and services from agriculture, forestry and fisheries.

This report is the outcome of intensive consultations and discussions aimed at developing a common approach to FAO's work on sustainability. That process was conducted in a climate of cross-sectoral collaboration that drew on the contributions of leading FAO and external specialists in crops, livestock, forestry, capture fisheries, aquaculture and natural resources. The report provides the vision, the key principles and indications on the way forward to transition towards sustainable food and agriculture. It builds on the Organization's long experience in developing sustainability concepts, approaches and tools, and offers a common platform for a vision of the agriculture sector and of the inter-sectoral synergies that will eventually make agriculture more productive and sustainable.

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