# Building a common vision for *sustainable* food and agriculture

PRINCIPLES AND APPROACHES

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2014

ISBN 978-92-5-108471-7 (print)
E-ISBN 978-92-5-108472-4 (PDF)



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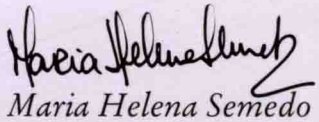
# *Foreword*

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.



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# 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