

Strategies to feed the nine billion mouths

With the world population set to exceed the nine-billion mark by 2050 in the not too distant future, a range of measures are becoming necessary to address the problem of sufficient food for all. At the same time, ecological threats to the planet are growing. Improved co-ordination of agricultural food security and climate change policy can help provided that a more focused food security strategy is in place.

The world's population will reach 9.1 billion by 2050, 34 percent higher than today. The problem of feeding this massive population frequently grabs the headlines. The recent crisis in the Horn of Africa highlights the vulnerability of millions of poor people around the world. Further, as the global resource landscape shifts, there is growing apprehension that an era of sustained high resource prices and its related sustainability (environmental, social and economic) risk is likely to emerge. Thus, agriculture is under pressure due to the demand dynamics, supply factors and a few of the unsustainable features known to be associated with the sector. The challenge includes producing more food, fibre and fuel to feed an affluent population whose consumption patterns are dynamic. This has to be done with a smaller rural labour force and under the conditions of increasing competition for ecosystem services. Further, the challenge is to adapt to climate

change, adopt efficient and sustainable production methods to scale and ensure that the poorest people are no longer hungry and micronutrient malnourishment is minimised. Underlying challenges include building resilience to changing food prices, improving livelihood opportunities for the poor and strengthening basic services, such as education, healthcare, and sanitation.

The Table on pages 28–29 delves into the immediate and underlying causes of this multifaceted problem of feeding the nine billion mouths along with a sustainability assessment of the strategies in place.

Sustainable intensification of global agriculture is essential to feed the growing population.



Photo: FAO/R. Foidutti

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Situation analysis and strategy assessment of the problem of feeding the nine billion mouths

	Factors	Present situation and projected trend	Criteria for delivering intervention and strategy	Action, choice or examples
Demand	Population growth	Every day, 200,000 people are added to the world food demand. Due to population growth and rising incomes, annual cereal production has to grow by a billion tonnes from 2.1 billion tonnes today, and meat production by over 200 million tonnes to reach 470 million tonnes in 2050.	<ul style="list-style-type: none"> a) Increasing investment in primary agriculture; agri-biotechnology, Research and Development. b) Improving agronomy for smallholders. c) Raising awareness of the pressures of increasing population growth. 	Production has kept pace with food demand in the past. It can certainly do so again, provided free trade and technological progress co-exist.
	Hunger and poverty	Presently, an estimated 925 million hungry people exist in the world. Poverty is the principal cause of hunger.	<ul style="list-style-type: none"> a) Investments in sectors linked to agricultural productivity growth. Establish enabling environment for farmers. b) Developing targeted policies/programmes to assist populations vulnerable to climate change and food insecurity. 	MGNREGA – the Mahatma Gandhi National Rural Employment Guarantee Act – has provided jobs to over 50 million rural households in India. The company Danone has floated a new unit to develop products for masses.
	Changing consumption patterns; urbanisation	Consumption patterns have had significant impacts on food supply. There is an exponential effect on grain (and water) demand, an increased use of fertilisers and associated sustainability risks such as degradation of soil/water and the marginalisation of small farmers. About 70 percent of the world's population will be urban in 2050 (compared to 49 % today). Income levels will rise.	<ul style="list-style-type: none"> a) Reshaping of consumption patterns; influencing population to shift to wider types of food, to build resilience of the food system. b) Emphasis on nutrients intake rather than calories intake. c) Shifting diets from meat to fish. 	Reducing the use of cereals and food fish in animal feed. Re-allocating fish currently used for aquaculture feed directly to human consumption, where feasible.
	Government imperatives	Government fiscal and regulatory intervention ideally requires societal consensus.	<ul style="list-style-type: none"> a) Innovative and targeted safety-net mechanisms. b) Making government policies predictable and inclusive. 	Conditional cash transfers.
Supply	Water	Water withdrawals for irrigated agriculture are projected to increase by 11 percent by 2050.	<ul style="list-style-type: none"> a) Increasing crop-per-drop: replacing flood irrigation with micro-irrigation systems. b) Growing crops suited to the local climate. 	Planting sorghum instead of rice or wheat in drought-prone areas.
	Climate change	Food productivity is influenced; changes in pest population, ozone damage.	<ul style="list-style-type: none"> a) Adopting climate-smart agricultural practices; minimising pollution. b) Modifying farming systems to mimic natural ecosystems. 	Higher levels of CO ₂ can boost plant growth and also help with water retention.
	Land availability; productivity	Approximately, a 90-percent growth in crop production is projected to come from higher yields and increased cropping intensity. Arable land in use in developed countries is expected to decline by some 50 million hectares.	<ul style="list-style-type: none"> a) Reducing land conversion by increasing farm productivity. b) Arable land will have to expand by around 120 million hectares in developing countries. 	Investments to bring land into production which is not yet in use.
	Oil and biofuels	Energy use at the farm has increased. Oil is a source of this energy and the base for other chemicals (pesticides, fertilisers); demand factor for certain food crops that can be converted into biofuels.	<ul style="list-style-type: none"> a) Deriving biomass from agriculture for electricity co-generation. b) Designating lands for food production, animal feed, and biofuel. 	Encouraging higher generation biofuels based on waste.
	Fertilisers	Fertilisers cause environmental problems like algal blooms in rivers and lakes. Potash is a finite resource; nitrogen fertilisers are manufactured using coal, oil or gas; Phosphorus takes millions of years to return to the soil.	<ul style="list-style-type: none"> a) Satellite mapping can detect changes in soil nutrient levels, making fertiliser use more efficient, and b) reduces dependence on fertilisers. 	Using Mycorrhiza, vermicompost etc.
	Declining fish stocks	The United Nations reports that three quarters of the world's fish stocks are in distress.	<ul style="list-style-type: none"> a) Expanding aquaculture in poor countries, since fish account for 20 to 30 percent of the total animal protein consumed. b) Establishing conservation zones; banning trade in threatened species. c) Establishing industry-wide principles for sustainable fishing. 	Tougher fishing controls; shrinking the size of fishing fleets. The company Unilever purchases fish only from sustainably managed fish stocks.
Environmental sustainability	Toxicity	Soil tillage releases methane; nitrate from fertiliser leaches into groundwater and threatens human health; farm animal waste pollutes land and water.	<ul style="list-style-type: none"> a) Promoting zero or minimal tillage practices. b) Global investment in sustainable agriculture. 	Controlled and measured application of animal waste on agricultural lands; waste lagoons with liners. Using bio-yield enhancers, biofertilisers, biopesticides, etc.
	Deforestation and loss of biodiversity	UNEP predicts that agricultural land area could increase by 25 percent in the Asia-Pacific region by 2050, much of it at the expense of forests. Forest conversion is especially associated with a higher incidence of certain infectious diseases, including malaria.	<ul style="list-style-type: none"> a) Increasing overall productivity and efficiency in existing production systems. E.g. improving feed-efficiency ratios in livestock systems through use of better timings; mix of feedstock and additive nutrients to support animal growth. b) Creating biodiversity reserves that benefit local farming communities; developing habitat networks in non-farmed areas. 	Moratorium on clearing natural forests in Indonesia as part of Reduced Emissions from Deforestation and Forest Degradation (REDD). Halting farmland expansion and land clearing for agricultural purposes, especially in tropical rainforests.

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E. sustainability	Waste & emissions	Roughly one-third of food produced is lost or wasted globally, which amounts to 1.3 billion tons per year. Food losses mean lost income for small farmers and higher prices for poor consumers.	<ul style="list-style-type: none"> a) Raising awareness among food industries, retailers and consumers. b) In developing countries, reducing food waste in the value chain, investing in transport infrastructure, and in developed countries, reducing end of supply-chain waste. 	In the United Kingdom, the Waste Resources and Action Programme works with businesses and communities to reduce food waste.
	Changing diets; obesity and diabetes	The consumption of rich and processed foods can lead to the many diseases of affluence, particularly diabetes.	<ul style="list-style-type: none"> a) Public policy can be used to change unhealthy eating habits. b) Sustainable consumption has to be promoted. 	In 2004, France passed legislation requiring advertisements for processed food and drink containing added sugar, salt or artificial sweeteners to include health information.
Social sustainability	Food safety and access to nutrition	There is particular concern in developing countries where social costs can be especially high for those lacking access to proper medical care.	<ul style="list-style-type: none"> a) Enforcing and harmonising food safety legislation. Nutrient labelling. b) Creating products for the poorest socio-economic group (bottom of the pyramid). 	Hong Kong issued guidelines to reduce acrylamide in food; Food Safety Labelling in Thailand; PepsiCo's EthioPEA – a public-private partnership to increase chickpea production in Ethiopia.
	Child labour and labour rights	70 percent of working children are in agriculture, totalling over 132 million girls and boys aged 5 to 14 years old.	<ul style="list-style-type: none"> a) Companies should ensure local buy-in and implementation of responsible supply chains. b) Lobbying local governments to set regulations. 	Many NGOs are working on making companies responsible and taking action on sustainability. Sustainable Food lab (see: www.sustainable-foodlab.org)
	Land rights	Legal rights to land give assurance and incentives to make investments in land. Land acquisitions have multiple implications for the affected societies. For example, water prices may rise to reflect the true cost or value of water, with particularly severe consequences for the urban and rural poor.	<ul style="list-style-type: none"> a) Companies buying agricultural commodities should ensure that the land from which their suppliers are sourcing has a free and clear title and that local villagers and tribes have received a fair price. b) Consultation rounds with civil society groups. 	Women and Land Rights Project by Action Aid. In India and Nepal, joint forest management programmes (JFM) that have allocated rights to forest products to local groups. Landesa is an NGO that ensures that poor families have secure rights over the land they till.
Economic sustainability	Food price volatility	Food represents a large share of farmer income, and the budget of poor consumers; changes in income due to price swings can reduce children's consumption of key nutrients, leading to a permanent reduction of their future earning capacity, increasing the likelihood of future poverty and thus slowing economy.	<ul style="list-style-type: none"> a) Price regulation and larger cereal stocks should be created. b) Reorganising food market infrastructure. c) Global fund to support micro-finance to boost small-scale farms. d) Investing in sustainable small-scale agriculture. e) Improving livelihood opportunities for the rural and urban poor. f) Strengthen the provision of basic services. 	Purchase for Progress under World Food Programme (WFP). Vodafone's use of communications to drive sustainability in the food chain.
	Agricultural finance	Current and projected financing and insurance cover is substantially insufficient to meet challenges faced by the agricultural sector.	<ul style="list-style-type: none"> a) Synergistically combining financing from public and private sources, earmarked for climate change and food security. b) Integrating food security and sustainable agriculture into global and national policies. c) Community based financial organisations. 	M-Pesa, a mobile-phone based money transfer service in Kenya. Micro-insurance innovation like ENSO insurance in Peru.

Discussion and conclusion

The UN Food and Agriculture Organization (FAO) states that the required increase in food production can be achieved if the necessary investment is undertaken and policies conducive to agricultural production are put in place. It further suggests that these must be complemented by policies that enhance access to food by reducing poverty. The need for a sustainable intensification of global agriculture in which yields are increased without adverse environmental impact and without the cultivation of more land

has been highlighted by the Royal Agricultural Society of England.

Due to the scale of the challenge, no technology should be ruled out, and different strategies may need to be employed in different regions and circumstances. Bringing about better uniformity between agriculture, food security and climate change policy-making at national, regional and global levels will help. A food security strategy backed by choices that relies on a combination of increased productivity in agriculture, greater policy certainty and broad-spectrum openness to trade

is needed. In addition, adopting an ecosystem approach, a focus on local strategy and ensuring inter-sectoral coordination and co-operation is crucial to an effective solution to the problem – feeding of the nine billion. Supporting farmers in developing diversified and resilient eco-agriculture systems that provide critical ecosystem services will help to deliver adequate food to meet local and global consumer needs.

The views expressed herein are the personal views of the authors and are not intended to reflect the views of any organisation.