

Policy pointers

Give at least equal weighting to sustainability issues — including livelihoods, social justice, economic viability and environmental soundness — as to intensification.

Understand that the concept can only address one facet of the global food system, namely production, and it is equally important to address consumption and waste, access and entitlements, markets and power.

Develop clear criteria for carrying the concept forward in different countries through multi-stakeholder dialogue involving representatives of food insecure/vulnerable groups and building on local knowledge and priorities.

Recognise that public sector funding for agricultural research has an important role to play in generating the knowledge and technology necessary for implementing sustainable intensification, especially in areas where there is little incentive for private sector involvement.

Sustainable intensification revisited

Sustainable intensification is receiving growing attention as a way to address the challenge of feeding an increasingly populous and resource-constrained world. But are we asking too much of it? Nearly 20 years after the concept was developed, this briefing revisits the term and asks what sustainable intensification is — a useful guiding framework for raising agricultural productivity on existing arable land in a sustainable manner; and what it is not — a paradigm for achieving food security overall. The paper summarises the history of and controversy surrounding the term, its main assumptions and risks, as well as its value for the future. We call for a rerooting of sustainable intensification as one key element of a sustainable food system situated within a green economy.

Sustainable intensification: then and now

Sustainable intensification involves increasing output levels from the same area of land while decreasing the negative environmental impacts of agricultural production and increasing the provision of environmental services. Although this definition seems innocuous enough, sustainable intensification has become a controversial term. For proponents, it is a promising new paradigm to guide agriculture in an era of burgeoning food demand and resource scarcity. For detractors, it is an oxymoron — an excuse for perpetuating the current corporate model of intensive farming with a sugar coating of sustainability.

The term sustainable intensification was originally coined in the 1990s in the context of smallholder agriculture in the developing world (particularly Africa), where productivity was predominantly low and degradation of natural resources a major concern.¹ Its original conception placed equal emphasis on sustainability and intensification; in

fact, sustainability was seen as a prerequisite for intensification given the degraded state of many agricultural lands. Moreover, livelihoods were accorded a central place.

Recently, several high-level reports and many major institutions — both public and private — have endorsed sustainable intensification as a mainstream concept.² But whereas the early work took a decidedly pro-smallholder stance, sustainable intensification is now being treated as a global framework for agricultural production. For example, in 2010 the United Nations Food and Agriculture Organization (FAO) adopted 'the Sustainable Intensification of Crop Production' as Priority Objective A.³

The use of sustainable intensification in current debates is based upon three fundamental assumptions about agricultural production systems in the 21st century:

- The world must produce significantly more food in the coming decades to feed a growing, increasingly affluent population.

- The arable land base cannot be expanded significantly.
- Agricultural production must become more sustainable and resource use efficient to preserve the natural capital on which agriculture relies.

Considered together, these three assumptions imply that agricultural production on existing arable land must intensify in order to meet higher demand, but in a manner that does not damage the environment. While the latter two assumptions are sound, the first requires some qualification.

Demand for food is likely to increase significantly owing to population growth, rising affluence and changing food consumption patterns, but estimates of the additional food required vary widely (between 60 and 110 per cent).⁴ These estimates hinge on assumptions about rates of population growth, urbanisation, affluence, consumption patterns, food waste, biofuel demand, and so on. But such projections of future food demand typically assume the continuation of current trends and neglect to take into account how changes in any of these parameters would affect the demand for food and its availability. Furthermore, given current problems with access to food,⁵ there is no guarantee that higher levels of production will mean more people are food secure unless distributional, political and economic issues in the food system are addressed.

Today's use of the term raises some risks

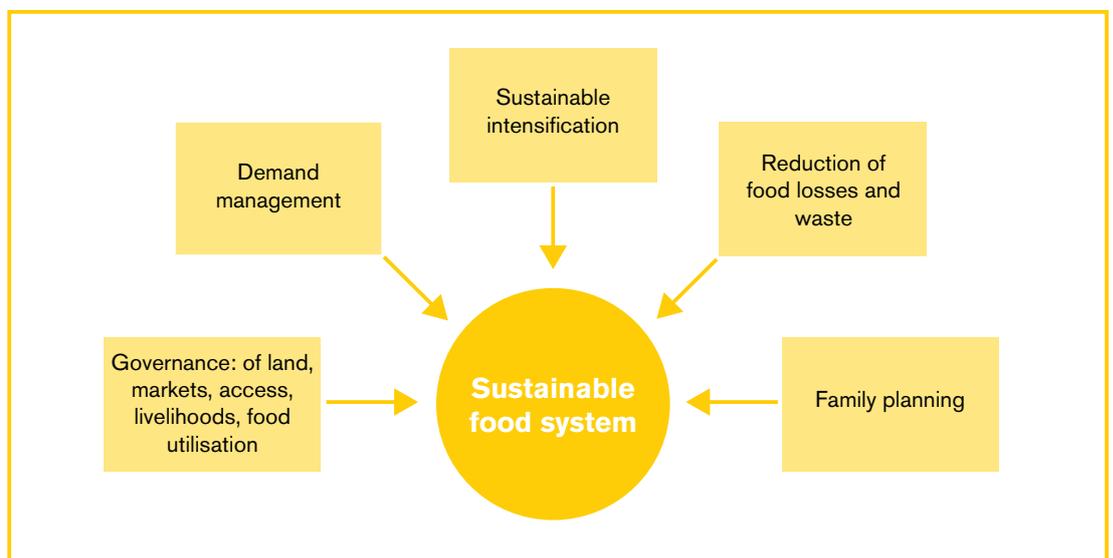
Few would dispute the need to boost food production in sustainable ways or to increase the efficient use of resources, but there are troubling

aspects to the way the term 'sustainable intensification' is currently being used. It is, for example, coming under severe criticism from NGOs working on agriculture and food security. So what are the risks with the way sustainable intensification is being used today?

- Some actors are using sustainable intensification to justify a repackaging of intensive, high-input models and the use of proprietary technologies, such as biotechnology, as the means to achieve it.
- Although agroecology⁶ as well as genetics are proposed as means to increase productivity, very little money actually goes to developing and scaling out agroecological practices.
- Sustainability is often defined too narrowly, neglecting its vital social and economic elements, for example, livelihoods, equity, social justice and economic viability.
- An exclusive focus on crop production risks not addressing the farming system as a whole, including livestock, which is a necessity for achieving food security.
- Given that sustainable intensification will require reduced use of agricultural inputs in many parts of the world, the incentives for private sector involvement remain unclear. Hence public sector funding has a vital role to play in contributing towards the knowledge and technology needed to deliver sustainable intensification.
- A skewed focus on intensification rather than sustainability may be used to legitimise high-input conventional agriculture with only slightly reduced environmental impacts. But the rationale that 'to feed one billion hungry people, global food production must significantly increase over the coming decades' ignores the evidence that hunger is more an issue of

Is sustainable intensification a useful concept to achieve food security?

Figure 1. The place of sustainable intensification within a larger food system perspective¹¹



access and entitlement to food rather than total availability. Despite plentiful supplies of food globally, more than 800 million people remain hungry, so producing more food is no guarantee of worldwide food security, particularly for people suffering from deprivation. Approximately one third of all food produced is lost or wasted⁷ — halving these losses would save enough food to feed one billion people.⁸ At the same time, nearly two billion people worldwide are overweight and over 600 million are obese.⁹ If access, consumption and waste are not addressed, further intensification will be needed, leading to worsening degradation of the natural resource base that sustains food production.

Where next for sustainable intensification?

In light of its contested status, is sustainable intensification a useful concept to achieve food security, and if so, under what conditions? Sustainable intensification has been endorsed by many powerful institutions with influence over the global food system — its use as a term is here to stay. But to ensure that it is not allowed to become a vehicle for promoting high external input agricultural models or policies that have negative impacts on local livelihoods (for example, commercial agriculture for export on land that pastoralists depend on for survival), it must be remembered that:

- Sustainability is at least as important as intensification, because natural resource degradation caused by intensive agriculture leads to reduced productivity over time.
- Sustainability should include social and economic dimensions (such as livelihoods, equity, social justice, economic viability), as well as environmental dimensions: they are all inter-dependent.
- Sustainable intensification can only address one aspect of the global food system, namely production (Figure 1). The global food system is multifaceted, and it is essential to complement the current lopsided focus on production with a whole food systems perspective encompassing access, distribution and governance, consumption and waste, markets and livelihoods. Achieving global food security¹⁰ requires that each facet of the food system be addressed simultaneously.
- Many non-agricultural factors exert a powerful influence on our future ability to feed ourselves, including population growth, urbanisation, loss of arable land to development, global trade rules,

Box 1. High returns from low-input, low-cost approach

Participatory plant breeding (PPB) is one approach with the potential to make a great contribution to sustainable intensification. A collaborative research process for crop improvement, PPB allows farmers and breeders to participate equally in decision making at every stage, from identifying desirable traits and parent lines, to evaluating the resulting varieties. This approach enables the use of resilient local varieties in developing new high-yielding varieties with greater resilience. It also has the potential to tailor crop breeding to diverse local environments, greatly improve technology adoption rates and generate incentives for agrobiodiversity conservation.

To take one example, in Guangxi province in southwest China, a maize PPB programme initiated in 2000 has increased yields by 15–30 per cent. When we include the new revenue stream of supplying organic restaurants in provincial towns, the programme has enhanced participants' incomes by 30 per cent (compared with non-PPB villages growing hybrid maize). The programme has also created incentives for villages using PPB to adopt agroecological farming practices, such as using ducks to control pests, inter-cropping and use of manure instead of chemical fertilisers.¹⁴

and a global energy system heavily dependent on fossil fuels. Climate change is already affecting food production and is expected to have a significant impact in many regions, particularly Africa. We will need to address all of these factors and their intersections to ensure adequate food supplies in the coming decades.

In order to meet the above criteria, decision makers should consider the following points when implementing sustainable intensification. The most appropriate measures will depend on the locality and the specific agroecosystem, as well as the social and cultural context.

- **Provide incentives to drastically reduce the environmental impacts of crop and livestock production.** Unsustainable food production is arguably the biggest threat to the health of the planet. Reversing it will require curbing agricultural sprawl, rebuilding soils, restoring degraded lands, reducing agricultural pollution, increasing water use efficiency, decreasing the use of external inputs, and greening entire commodity chains.
- **Promote low-cost approaches that farmers can control.** Indebtedness is a major problem for farmers worldwide, partly arising from the need to purchase inputs such as seeds, pesticides and fertilisers. Many farmers would be better served by techniques — such as participatory plant breeding (see Box 1), seed saving, using cover crops or green manures — that rely on on-farm resources, reduce their costs and prevent environmental damage.

- **Enable and invest in local innovation and adaptation using both local/traditional knowledge and science.** This is more likely to result in appropriate technological and institutional solutions. While both government and private sector institutions and investments have an important role to play, sustainable intensification requires effective partnerships between different actors. Giving farmers more influence and power within these partnerships is likely to favour locally adapted and affordable solutions.
- **Discourage the use of highly productive croplands to grow animal feed.** Using such land to produce corn, soybeans and other crops for animal feed rather than to grow food for direct human consumption is a colossal inefficient use of resources. In addition to favouring meat production on pasture and grazing lands, one way to at least partially address this conundrum is to return to the practice of feeding food waste rather than grain to omnivorous animals such as pigs.
- **Address the energy needs of smallholders while limiting fossil fuel intensity and reducing greenhouse gas emissions.** Many of the world's smallholder farmers, and their production chains, face a huge deficit in access to energy services. Technologies and equipment that make use of renewable energy (for example, watermills for grinding grain, solar-powered water pumps and drip irrigation) and locally available materials (for example, agroprocessing industries powered by farm waste) should be favoured.
- **Strengthen the voice of smallholders and vulnerable groups in decisions about agriculture and land use, and focus on enhancing the economic value of farming as well as its productivity.**

Conclusion

As long as we are clear about what sustainable intensification is and is not, it can serve as a useful guiding framework for addressing one critical aspect of the global food system in the 21st century, namely food production. Agricultural production in the coming decades will take place under increasingly adverse conditions due to land degradation, pollution, water scarcity, climate change, as well as volatile commodity prices. Climate change is already threatening global agricultural production, but fossil fuels underpin the food system around much of the world, and agriculture is one of the major contributors (directly and indirectly) to greenhouse gas emissions.¹² Agriculture is also the single largest cause of biodiversity loss.¹³

Therefore the challenge of producing more food will likely be a challenge of sustainability, not just intensity. This is where sustainable intensification can add value, provided that its implementation in particular localities is defined by a broad set of actors, including poor and vulnerable groups.

At the same time, sustainable intensification is not an adequate framework for achieving food security overall, because it can only address one component of the food system. Action is also needed to ensure access to food for vulnerable groups, bolster property rights for farmers, curb food waste and over-consumption (particularly of meat and dairy products), preserve agricultural land and stem population growth. Achieving food security requires nothing less than a food system perspective situated within the wider context of a green economy.

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Notes

¹ Pretty, J (1997) The sustainable intensification of agriculture. *Natural Resources Forum* 21(4) 247–256; Reardon, T *et al.* (1995) Promoting farm investment for sustainable intensification of African agriculture. Michigan State University. / ² Sustainable intensification has recently been endorsed by: governments such as the UK and the US; international institutions such as FAO and IFAD; research institutions including the Consultative Group on International Agricultural Research (CGIAR) and its 15 research centres; agribusiness companies and organisations such as the International Fertilizer Industry Association and the Agricultural Biotechnology Council; and foundations such as the Bill and Melinda Gates Foundation. / ³ See www.fao.org/docrep/meeting/024/md300e.pdf / ⁴ Alexandratos, N and Bruinsma, J (2012) World Agriculture: Towards 2030/2050 – the 2012 revision. FAO, Rome; Tilman, D *et al.* (2011) Global food demand and the sustainable intensification of agriculture. *Proceedings of the National Academy of Sciences of the United States of America* 108:20260–20264. / ⁵ More than 800 million people are hungry and at least one third of the world's population suffers from micronutrient malnutrition, although the world currently produces enough food to feed everyone. Sources: www.wfp.org/hunger/stats; Allen, L *et al.* (2006) Guidelines on food fortification with micronutrients. World Health Organization, Geneva and FAO, Rome. / ⁶ 'Agroecology' has been defined as "the application of ecological concepts and principles to the design and management of sustainable agro-ecosystems". Source: Altieri, MA (1995) *Agroecology: The science of sustainable agriculture*. Westview Press, Colorado. / ⁷ Gustavsson, J *et al.* (2011) Global food losses and food waste: Extent, causes and prevention. FAO, Rome. / ⁸ See www.rockefellerfoundation.org/blog/smallholder-farmers-food-loss-hits / ⁹ See www.who.int/mediacentre/factsheets/fs311/en/ / ¹⁰ "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." World Food Summit, 1996. / ¹¹ Garnett, T and Godfray, C (2012) Sustainable intensification in agriculture: navigating a course through competing food system priorities. Food Climate Research Network and the Oxford Martin Programme on the Future of Food, Oxford University, UK, p15. / ¹² McIntyre, BD *et al.* (2009) Agriculture at the crossroads: Synthesis report with executive summary: a synthesis of the global and sub-global IAASTD reports. International Assessment of Agricultural Knowledge, Science and Technology for Development, Washington DC. / ¹³ European Commission (2011) Sustainable food consumption and production in a resource constrained world. 3rd SCAR Foresight Exercise. / ¹⁴ Song, Y and Li, J (2011) The role of biodiversity, traditional knowledge and Participatory Plant Breeding in climate change adaptation in karst mountain areas in SW China. Chinese Centre for Agricultural Policy; Swiderska, K *et al.* (2011). Adapting agriculture with traditional knowledge. IIED, London. <http://pubs.iied.org/17111IIED>



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