Crops and varieties: approaches that save and grow

Farmers will need a genetically diverse portfolio of improved crop varieties that are suited to a range of agro-ecosystems and farming practices, and resilient to climate change.

Improving the conservation and use of plant genetic resources

The success of SCPI will depend on the use of plant genetic resources (PGR) in new and better ways. However, the crucial importance of genes from local varieties and crop wild relatives in development of new varieties is matched by rising concern over the loss of diversity worldwide, and the need for its effective conservation. International recognition of PGR is reflected in the conclusions of the World Summit on Food Security, held in 2009, the ratification by more than 120 countries of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), and the strategic goals of the Convention on Biological Diversity (CBD).

In mobilizing plant genetic resources for sustainable intensification, the international dimension will play a fundamental role. The international framework for conservation and sustainable use of PGR has been greatly strengthened by the International Treaty, the Global Crop Diversity Trust and the programme of work on agricultural biodiversity of the CBD. A global system that can provide support for SCPI is emerging. Since much of the diversity that will be needed may be conserved in other countries, or in the international genebanks of the CGIAR, national participation in international programmes will be indispensable.

Developing countries need to strengthen their national PGR programmes by enacting legislation to implement fully the provisions of the ITPGRFA. Guidelines on implementation have been prepared and the Treaty Secretariat, Bioversity International and FAO are working on implementation issues in collaboration with some 15 countries. Implementing the revised Global Plan of Action on Plant Genetic Resources for Food and Agriculture and Article 9 of the ITPGRFA on Farmers’ Rights will make an important contribution to the creation of the national operating framework for implementing sustainable intensification.

In order to adopt sustainable intensification strategies, countries will need to know the extent and distribution of the diversity of crop species and their wild relatives. Technologies for mapping diversity and locating diversity threatened by climate change have improved. A major project supported by the Global Environment Facility in Armenia, Bolivia, Madagascar, Sri Lanka and Uzbekistan has established and tested ways of improving the conservation and use of crop wild relatives. The project developed and implemented area and species conservation management plans, identified climate change management actions to conserve useful diversity, and initiated plant breeding programmes using new materials identified thanks to the conservation and prioritization work.

Intensification will require an increased flow into breeding programmes of germplasm and promising varieties. The multilateral system of access and benefit sharing under the ITPGRFA provides the necessary international framework, although — given the increased importance of diversity to SCPI — it may need to be extended to a greater number of crops than those currently covered in Annex 1 of the Treaty. On the technical side, a number of procedures are available to identify useful materials in large collections, such as the Focused Identification of Germplasm Strategy now under development. Moving genetic material will also require improvements in the phytosanitary capacity and practices, as well as the distribution capacities, of genebanks.

FACTSHEET 3
SUSTAINABLE CROP PRODUCTION INTENSIFICATION (SCPI)

To feed a growing world population, we have no option but to intensify crop production. But farmers face unprecedented constraints. In order to grow, agriculture must learn to save.
Developing improved and adapted varieties

Sustainable intensification requires crop varieties that are suited to different agronomic practices, to farmers’ needs in locally diverse agro-ecosystems and to the effects of climate change. Important traits will include greater tolerance to heat, drought and frost, increased input-use efficiency, and enhanced pest and disease resistance. It will involve the development of a larger number of varieties drawn from a greater diversity of breeding material.

An important step forward will be a significant increase in public support to pre-breeding and breeding research. SCPI requires new materials, a redefinition of breeding objectives and practices, and the adoption of population breeding approaches. Properties such as production resilience and stability will need to be inherent, and not dependent on external inputs.

It is unlikely that traditional public or private breeding programmes will be able to provide all the new plant material needed or produce the most appropriate varieties, especially of minor crops which command very limited resources. Participatory plant breeding can help fill the gap.

For example, the International Centre for Agricultural Research in the Dry Areas (ICARDA), together with the Syrian Arab Republic and other Middle East and North African countries, has undertaken a programme for participatory breeding of barley which maintains high levels of diversity and produces improved material capable of good yields in conditions of very limited rainfall (less than 300 mm per year). Farmers participate in the selection of parent materials and in on-farm evaluations. In Syria, the procedure has produced significant barley yield improvements and increased the resistance of the barley varieties to drought stress.

Policies and regulations are needed to support the production of new varieties and ensure adequate returns to both public and private sector plant breeding. However, they may need to be more open and flexible than current patent-based procedures or arrangements under the International Union for the Protection of New Varieties of Plants (UPOV). The uniformity and stability properties of varieties adapted to SCPI may be different from those currently envisaged under UPOV, and Farmers’ Rights, as identified in the ITPGRFA, need to be recognized.

Most of all, policies and regulations must support the rapid release of SCPI adapted materials; in many countries far too much time is spent on the approval stage for new varieties.

The institutional framework that supports variety development and release is weak in a number of countries. University and other training programmes will need to be adjusted to furnish a greater number of plant breeders and breeding researchers trained in using crop improvement practices for SCPI. Farmers should be involved both in the identification of breeding objectives and in the selection process. Extension services will need to be strengthened in order to respond to farmers’ expressed needs and to provide sound practical guidance on the cultivation of new varieties.

Improving seed production and distribution

A key issue when planning SCPI programmes is to determine the status of the national seed system and its capacity to improve the provision of high quality seed of adapted varieties to farmers. An initial step should be the development, in consultation with all key stakeholders, of an appropriate seed policy and regulations for variety release.

The policy should provide a framework for better coordination of the public and private sectors, as well as an action plan for development of a seed industry that is capable of meeting farmers’ needs for high quality seed. In many developing countries, the policy will also need to recognize farmer-saved seed as a major source of propagation material.

Because regulations and legislation should favour the rapid deployment of new planting material, and the transfer of new varieties from one area to another, harmonization of legislation among countries is important. For example, 12 member countries of the Economic Community of West African States have adopted harmonized seed laws. The maintenance and use of a larger number of varieties may strain seed quality management systems; therefore, the development of a quality-declared seed system will help ensure that, in the process of adapting seed practices to sustainable intensification, quality does not suffer.

One likely consequence of sustainable intensification will be the increased importance of local seed producers and local markets in supplying farmers. The role of markets in maintaining diversity is increasingly recognized. Markets can be supported through local diversity fairs, local seed banks and community biodiversity registers, which encourage the maintenance and distribution of local materials and favour improvements in their quality.