

# The future of dryland cereals and legumes for the smallholder farmer in the semi-arid tropics

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Besides a major financial crisis since 2008, a major inflation and volatility of the price of the most important staple foods such as rice or wheat is threatening global food security, especially for the millions of poor in developing countries. Food production has returned to the top of the political agenda worldwide. Today, we are at a crossroads. About 850 million people still go to bed hungry. Food production needs to be increased by about 70% in the next 40 years to feed over 9 billion people by 2050 and food systems have to be more inclusive of the poorest population. To achieve this increase and food access for the most vulnerable, many challenges need to be addressed, including a changing climate and shrinking natural resources. Innovations such as high yield wheat and rice cultivars and fertilizers sparked a green revolution in South Asia in the 1960s but they are now showing certain limits in terms of sustainability and profitability. If we want global food security, new solutions are required and these need to be truly sustainable and accessible to the poor. This is even more challenging for one of the most resource-poor agriculture regions, the semi-arid tropics. Here a rapidly growing population, in majority poor smallholder farming families, face a warmer and drier climate, desertification, recurrent droughts and flash floods and land degradation. The semi-arid tropics are home to 2.5 billion people in 55 countries, representing over a third of the global population, out of which 644 millions are very poor. A large share of the food is produced by families that

farm on less than one hectare and the majority of smallholder farmers are at risk of poverty and malnutrition, having limited access to natural resources and being vulnerable to external shocks. The need of the hour is to focus on smallholder agriculture and the staple foods of millions of people in the semi-arid tropics, namely dryland cereals such as millets and sorghum and grain legumes like groundnut and peas. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) celebrated 40 years of agriculture research in 2012. As part of this anniversary, we developed this special issue to debate the research and development priorities to achieve a better food security for the population of the semi-arid tropics (SAT). Our main objective was to take a scientific view at a number of existing or upcoming challenges for cropping systems in the SAT with a particular focus to the sub-Saharan African SAT. Of course agriculture research for the semi-arid tropics has a long history and this special issue is firstly a means to take stock of the research and development advances, and then propose new research avenues for the future along with new research ideas that have not been in the main stream of research until now. For instance the paper on traditional knowledge and community initiative provides interesting insights on what could be done to bear shocks. It is also to highlight new research investment needs, like those related to the change in climate, to both adapt/tailor new crops to new challenges, but also to increase the

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precision of climate predictions. This issue is also a combination of topics that cover a research-to-development continuum, with the idea of linking research topics to a development perspective, and as a way to bring a number of potential partners from the development community to discuss research issues that have high relevance to development.

This special issue is very timely because it comes at a period when the global agricultural research partnership, CGIAR (Consultative Group on International Agricultural Research), is undertaking a major reform by reorganizing its research into international, multi-country CGIAR Research Programs (CRPs). These CRPs offer a somewhat less commodity-oriented tone and are more focused on a regional perspective and impact on food security, nutrition and environmental sustainability for the millions of smallholder farming families they target. Therefore this publication looks to broaden the scope of the CRPs, assessing the state of the art in a particular research domain or topic, taking a comprehensive view of issues and their links.

The first section deals with how to secure food at the smallholder farm level

covering different strategies to increase agricultural productivity while taking into account sustainability and climate resilience aspects. This therefore covers a set of papers on known “technical” constraints such as the climatic uncertainties, drought, fertility, and diseases. This section reviews how these problems have been treated so far, and what new research opportunity is now available. The first paper is particularly important because it shows the importance of combining both genetic and agronomic options to bring solutions to these challenging farming conditions.

The second section offers a broader view on issues and opportunities once food is secured, to ensure an equitable socioeconomic development, and covers some social implications related to securing food production, such as the role of communities. This section discusses the issues, challenges but also opportunities occurring once sustainable and resilient food production is achieved in the resource-poor SAT. It addresses the challenges of technology adoption and dissemination and highlights the importance of understanding people’s needs before developing new technologies. An important part is about the access to technology, seeds, input,

credit, but also about the adoption of these technologies and related bottlenecks. It illustrates some opportunities for economic development, presenting for instance some existing working models such as public-private partnership arrangements. Last but not least, it also provides a road map on the means to assess the effect of technological interventions and provides here a bridge between research and development. This special issue does not cover other problems such as the lack of infrastructures (roads, warehouse), services (banking institutions), recruitment of extension and research officers, and political stability.

As 2014 has been earmarked as the international year of family farming, we hope this special issue will fuel the debate, among the French and English-speaking research and development community, about the great contribution smallholder agriculture can bring to a food secure future. We also wanted to highlight the importance of investing in research on dryland cereals and grain legumes in the semi-arid tropics: these smallholder crops are neglected by agriculture decision-makers despite their great potential, resilience, and nutritional value. ■