Science for Agricultural Development
Changing contexts and new opportunities

The Science Council of the
Consultative Group on International Agricultural Research

Executive summary

Science for agricultural development has, over the last four decades, delivered real benefits to farmers, processors and consumers through the development and implementation of new knowledge and technologies. However, there remain over 800 million undernourished people mostly in developing countries who will need significant increases in local production to reduce their food insecurity. It is in these areas that increases in agricultural production are needed most and technologies that can improve disease-resistance, drought tolerance and reduce pressure on natural resources are going to be essential for meeting this challenge. The Millennium Development Goals (MDGs) present steeper challenges today than have been faced in the past, both in terms of the focus on truly disadvantaged groups (such as the poor, women and children) and the timescale in which they are to be achieved (by 2015). This report contributes to that challenge by analysing and sharing knowledge about recent trends, current status and emerging issues related to the application of science to agricultural production.

The report is written with four main worldwide audiences in mind: decision makers in the development community, the public sector research community, the private sector research community and the community of development practitioners. If the report can help these groups to understand each others' approaches and aspirations a little better, it will have contributed to the 8th MDG: *Develop a global partnership for development*.

The report recognizes that for research to have meaningful impact, many players in the afore-mentioned groups have to be involved. In research communities, scientists from disciplines far beyond agricultural science all have a major contribution to make. Natural and social scientists increasingly need to work in partnership, and they also need to communicate with national and regional policy makers, local communities and development experts working with bilateral and multilateral donors. All those involved in the research and development (R&D) chain from discovery to adoption need to learn lessons from past successes and failures by improving the way they measure the impacts of different research projects and programmes (Chapter 2).

The science of the 20th century has enabled today's farmers to feed almost twice as many people from virtually the same area of land as 40 years ago; the science of the 21st century has much more to offer. Future increases in agricultural production can only hope to impact on poverty reduction in the long term if they contribute directly to improving both local and global natural resource management. This report highlights a number of the most innovative partnerships in science for agricultural development, including the publicly funded International Rice Genome Sequencing Project, which has helped to unravel the rice genome. Because of this, scientists now have the opportunity to incorporate beneficial traits such as drought- and disease-tolerance into rice and other staple crops. Genomics research also forms the basis of recombinant vaccines, which offer advantages over conventional vaccines in terms of safety, specificity and stability. An example is given of research on East Coast Fever, a disease of cattle that threatens an estimated 25 million animals. Case studies of partnership approaches are also given, illustrating how bringing together farmers or fishers with researchers and communication specialists can help to transform scientific progress into lasting benefit for poor

communities, which translates into economic development for poor countries. Passing reference is made to emerging technologies (e.g. nanotechnology) that give a glimpse of exciting new scientific opportunities for the future (Chapter 3).

The potential benefits that these advances can bring, however, have to be understood in the context of a changing global environment. Although the rate of population growth is slowing worldwide, variable weather patterns caused by climate change will make it more difficult to increase food production in many parts of sub-Saharan Africa, South Asia and Latin America. It should not be forgotten though, that sustainable land use for agriculture and forestry can contribute to global efforts to reduce human impact on the climate system. To this end, research is needed to develop crop and livestock systems that can adapt to changing local environments. Such systems have also to take into account the consequences of globalization, related to trade and changing consumer preferences (Chapter 4).

Crucially, it requires funding to take advantage of these scientific opportunities for agricultural development. Chapter 5 analyses trends in science funding from 1981 to 2000. Over the past 5 years, worldwide investment in science has risen by a third to reach US$ 725 billion. However, there are marked regional variations: spending on science is falling in sub-Saharan Africa and rising in Asia and the Pacific. For agricultural R&D specifically there is a disparity between rich and poor nations that reflects marked differences in investment levels. And within regions, relatively few countries account for the majority of investments. For example, in 2000 France, Germany, Japan and the United States undertook two-thirds of the public research among developed countries, while Brazil, China, India and South Africa undertook more than a quarter of all developing-country public agricultural research. Furthermore, the majority of developing countries are spending less on agricultural R&D, both as a proportion of all developing countries and in relation to the rest of the world. Chapter 5 also draws attention to some of the partnerships, formed in response to funding challenges, that are led by developing countries.

The report ends with a chapter that highlights conclusions and then outlines specific messages for each of the four intended audiences in turn. It concludes that agricultural R&D has done a lot in recent decades to help feed the world. It has not been a cheap process, but it is clear that the benefits greatly outweigh the costs. However, to keep the process going, governments must invest more – not just in terms of amount, but also over longer periods and on the most promising areas in terms of socio-economic impact. And it is vital that the ongoing scientific processes take into consideration not only the immediate need to raise production, but also the wider picture; we must consider the needs of those people who do not yet have food security, and ensure that we care for the environment that we all share. These take-home messages are found in Chapter 6.