Chapter 2

The socio-economic context: the role of agriculture in developing countries
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2.1 In this section, we briefly review the economic and demographic evidence which guided our deliberations in the 1999 Report on the use of GM crops in developing countries. We considered possibilities for the improvement of agricultural practice, food security and reduction of poverty. We contrast the findings of the 1999 Report with recent evidence about the growth of populations, particularly the proportion of those of working age, in developing countries. We then discuss the relationship between the availability of food and the demand for labour, which leads to conclusions about the role of agriculture in reducing poverty. We also consider the impact of specific climatic and ecological conditions.

The framework of the 1999 Report

2.2 In the 1999 Report, we approached the question of whether GM crops can offer benefits for poor people in developing countries through the following argument. In developed countries, food production has kept ahead of growth in population during the past 60 years. This was also the case in much of Asia and Latin America, even where the area of available farmland could not be increased. Across these latter regions, a yield-enhancing Green Revolution (see Box 1.3) created considerable employment and greatly improved life for small-scale farmers and landless labourers. It also brought less expensive and more reliable staple foods to poor consumers. In consequence, crop yields of small-scale farmers and incomes for those in rural employment rose, and poverty and hunger fell dramatically in many countries between 1970-90.

2.3 However, Africa and some parts of Asia saw little gain and agricultural production grew no faster than population. In the 1990s, the improvement in yields and the rate of decline of global poverty were far less than in the previous two decades. Yield expansion had been curtailed by water shortages, soil erosion and new types of pests and diseases. In addition, the initial rate of improvement of the Green Revolution was not sustained between 1985-90. Semi-dwarf rice and wheat varieties had already been introduced to the best-suited lands, leaving less dynamic crops for use elsewhere. These trends looked set to continue, as did a rise in the population, and more significantly, in the number of persons of working age.

2.4 Even in countries with aggregate surpluses of food, people remained unable to afford enough to eat, unless they were able to increase their incomes from employment. India frequently has 60 million tons of staple foods, over a third of its annual consumption and production, in public grain stores. Yet, access is limited. Despite slow and steady improvements over the last few decades, over half of all children under five years old are stunted, an even higher proportion than in Africa.1 But this does not mean that extra food production is irrelevant to India’s undernourished. Most of them are poor, and therefore hungry, because they can neither produce enough food on their small farms, nor obtain sufficient employment by working on those of others. Enhancement of yields on small farms, which tends to increase the demand and hence rewards for poor labourers, addresses this problem. It does so much more affordably than alternative and less employment-creating routes to economic growth. This approach also increases the availability of food for poor people by reducing and stabilising the price of basic foodstuffs locally, which is of particular importance since food accounts for 60-80% of total expenditure by low-income groups.

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2.5 Employment can be provided most readily in industry or agriculture. However, it is normally much more expensive to create jobs in modern, especially urban, industries. This is due to high costs of related capital such as equipment, machinery and factory buildings. Investments in private and social infrastructure, such as policing, healthcare and urban roads are also required. The provision of employment in agriculture, on the other hand, can be achieved at lower costs. Furthermore, growth in rural non-farm jobs, which was the source of much reduction in rural poverty after the initial Green Revolution in China and elsewhere, depended mainly on demand from nearby small-scale farmers and their employees.

2.6 The above evidence and argument led us to the following conclusions in our 1999 Report, which have been reinforced by evidence accumulating from 1999-2003:

To resume the rapid reduction in poverty and malnutrition of the 1970-80s and to extend it to Africa, employment on farms and the growth of productivity in staple crops had to be revived, either through the expansion of farmland, or the increase in yields.

The expansion of farmland was seldom feasible, environmentally and otherwise.

Conventional plant breeding was still making very substantial contributions to growth in yield. But its effect was increasingly reduced by new types of pest, exhaustion of micronutrients, water shortages and unsuitability of land (especially in Africa) for important semi-dwarf varieties of rice and wheat. There was overall exhaustion of the huge potential created by the early breakthroughs of the Green Revolution.

GM crops as a tool of, and addition to, conventional plant breeding, could revive, stabilise and spread the growth in yields of food staples, and of other crops grown by poor people.

GM crops could be particularly relevant for areas so far untouched by the Green Revolution. Crops that were better suited to environmental constraints could be developed, leading to considerable increases in yield.
Growth in populations and demand for labour

2.7 Although growth in population has progressed somewhat more slowly than anticipated, the current global population of 6.3 billion people is expected to increase to 8.1 billion by 2030. Population growth in Asia and Africa in 2030 is expected to be 1.33 and 1.76 times its present level, respectively. Groups in those regions most subject to poverty and undernutrition are expected to increase the most rapidly. Hence, requirements for food are likely to rise substantially.

2.8 More important is the even faster growth predicted for the numbers of people of working age (15-59) in Asia and Africa. For example, in 2030, Africa’s population will have expanded by 1.76 times the level in 2000. However, the working-age population will be 1.97 times larger while the non-working-age population will only be 1.52 times as large. This higher ratio of workers can be advantageous if it is complemented by improved working opportunities. These are most affordable where agriculture raises yields and demand for labour, but they are a burden if it does not. Unless the rise in working age population is at least matched by rising numbers of jobs, employment or wage rates will fall. Poor people will then have even more difficulty in affording enough food.

Food security and the role of agriculture

2.9 Improvement in the diet of poor people depends on growth not only in the supply of food and nutrients, but also in demand for their labour. Yet it has become even clearer since our 1999 Report that the extent of undernourishment is substantial, and that the previous decline in undernourishment has stalled. According to the FAO, 815 million people worldwide were undernourished in 1997-1999, of whom 777 million were living in developing countries. One third of the population of sub-Saharan Africa is undernourished.

2.10 Seventy per cent of the world’s poor live in rural areas and depend mainly upon agriculture for their livelihood. Despite increasing urbanisation, over half will remain there in 2035. The role of agriculture in reducing poverty is therefore crucial. Its rapid growth can lower and stabilise the cost of food to poor consumers living in rural and urban environments. Where, as in the Green Revolution, small-scale agriculture has been a major
beneficiary, it has been associated with an unprecedented reduction of poverty.

Rapid agricultural growth, achieved on smallholdings using labour intensive methods, remains the best hope for poor people to enhance their prospects to achieve sufficient availability of food, and sufficient access to work or land to afford it. But this will happen only if farming is more lucrative. In view of the fact that expansion of the current agricultural area is uneconomic in most parts of the world, this can be achieved only by the enhancement of yields (see also Appendix 2).

2.11 Land reforms and fairer agricultural policies in the developed world can help in several ways. First, more equitable distribution of land and access to it could enable more people to benefit from agriculture. Secondly, trade barriers to agricultural imports from poor countries could be lowered, which would increase markets for developing countries. Thirdly, reducing subsidies to farmers in developed countries would reduce the glutting of world markets for agricultural products, which depresses prices and consequently the attractiveness of agricultural production in developing countries. However, history suggests that these situations will improve only slowly. Moreover, even changes in global trading rules will do little to help the many very poor farmers in developing countries, especially those in Africa, who are in substantial food deficit. Many of those with significant land operate with such poor quality seeds, and such recalcitrant soil-water environments, that their land and labour productivity are too low for them to feed themselves adequately. While conventional plant breeding has achieved some improvements for parts of Africa, especially for maize, similar advances are lacking with respect to the most important crops of the very poor, such as millet, sorghum, yams and cocoyams. We conclude that resuming and spreading rapid sustainable growth of farm yields, especially for food crops in developing countries, still remains crucial to achieving better income and food security for the world’s poor.

Climatic and ecological challenges for agriculture in developing countries

2.12 Physical conditions for agriculture appear to be becoming increasingly difficult. Despite distinguished dissenters, the majority of agro-climatologists (as represented in the UN International Commission on Climate Change) believe that extreme weather conditions are becoming more frequent, especially in and near the inter-tropical convergence zone. Even in normal years, water shortages are worsening in tropical areas, probably due to higher air temperatures, and therefore higher rates of evaporation and plant transpiration. Both trends are expected to accelerate. Even if the majority view on ‘global warming’ may be too pessimistic, the demand for water from expanding urban populations and industries adds to the problem. Work subsequent to our 1999 Report confirms an even sharper increase in the proportion of people and countries facing water shortages than anticipated. In almost all of Asia, and most of Africa, expansion into marginal lands is unprofitable and increases environmental hazards. Moreover, the

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9 This has been evident in the case of China in 1975-96, India in 1975-90 and Indonesia in 1970-95.
10 This is because conventional plant breeding is limited in part by the characteristics of plant genomes that are adapted to robustness at the expense of yield.
11 The inter-tropical convergence zone (ICTZ) is a region that encircles the earth, near the equator, where the trade winds of the Northern and Southern hemispheres come together, resulting in an almost perpetual series of thunderstorms. Examples of countries affected by the ICTZ include Zaire, Kenya and the People’s Democratic Republic of the Congo.
quality of soil is in many places poor or actually decreasing, due to erosion, salination, loss of micronutrients and accumulation of heavy metals.\textsuperscript{13} Agricultural progress therefore has to depend on increased yields.

2.13 To safeguard the environment from degradation, it is increasingly important to achieve higher agricultural production by more productive and more conservative use of water and land already devoted to farming.\textsuperscript{14} GM technology may well have a significant contribution to make towards such progress by producing plants that are more resistant to moisture stress or highly salty soils. However, commercial companies are unlikely to be interested in producing such varieties, primarily because it would be difficult to enforce property rights and to secure profitable markets for improved seeds. We note with concern that research on GM crops which provide employment, income and food for poor people in developing countries, especially rice, wheat, millet, sorghum, cassava, yams and white maize has been neglected. New research will have to be supported, and also provided primarily by the public sector (see Chapter 6). In the next chapter, we outline the potential of contemporary plant breeding and examine recent developments relating to GM crops which could be of use to developing countries.
