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AGRICULTURE AT THE CROSSROAD: CHALLENGES FOR CROP IMPROVEMENT

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The past century has seen the rapid industrialization of agriculture, whereby abundant cheap energy progressively substituted for both labour and land. The process started in the developed world and through the Green Revolution spread into much of the developing world. The industrialization of agriculture has been accompanied by huge advances in crop productivity per unit arable land and per unit labour, which in turn has enabled movement of labour into urban industry and averted widespread systemic food scarcity.

Productivity advances were achieved in about equal measure through both improved crop management (agronomy) and improved plant genetic potential (breeding). The gains were based on major advances in understanding how plants respond to climatic, edaphic and biotic pressures and translated through competitive pressures into lower real food prices. There were also some major costs, most particularly the degradation of soil and water resources and damage to the wider environment.

Yet a range of new pressures, including rising energy costs, the degradation of arable land, environmental and climate change, all threaten food security for a burgeoning population over the next half century. Given its role in modern agriculture, as the cost of energy rises, food costs will inevitably follow, as recently before the global financial crisis (temporarily) deflated oil prices. Any emergence of food scarcity would further escalate food prices dramatically, with dire consequences for the urban poor.

The challenges for crop improvement are thus immense if food security is to be ensured. There is cause for optimism. The vast store of scientific knowledge generated over the past century has yet to be exploited to anywhere near its limit, and many regions are yet to fully implement technical advances made elsewhere. The huge investment in biotechnology over the past 20-30 years is only now just starting to show real promise. Even rising food costs have a positive, in that the value of arable land and the cost of reversing its degradation and alienation from agriculture all become more affordable. Nonetheless, productivity gains sufficient for future food security will not be easy, and will require major investment in agricultural R&D. Needless to say, any serious attempt to return to a romanticized past, low-input, agriculture would expose millions to food scarcity.