Technological Change in Agriculture: Orthodox Views

Introduction

Chapter 1 sought to show how the technological transformation of agriculture has persistently narrowed the genetic base on which agriculture rests. The question arises as to whether a theory can be formulated which attempts to account not just for the occurrence of change, but also the direction which change follows. Such a theory must appreciate that a variety of different solutions may be more or less appropriate for solving any given solution. It must therefore concern itself not just with the changes that actually occur, but with why alternatives do not occur.

This chapter begins with a brief historical discussion of the views of Smith, Marx, Malthus and Ricardo. It then reviews two of the more widely discussed theories of technical and technological change in agriculture, those of Ester Boserup, and of Yujiro Hayami, Vernon Ruttan and Hans Binswanger. In the context of critiques that are not intended to be comprehensive, they are shown to suffer from significant shortcomings, both on their own terms and by the criterion mentioned above.

Classical economists and Marxism

The classical political economists tended to accord technological change a more central role in their theories than their neo-classical successors, especially those of the first half of the twentieth century. For Adam Smith, agriculture seemed to have properties which prevented it from being subject to the type of division of labour that took place in industry:

the ploughman, the harrower, the sower of seed, and the reaper of corn are often the same. The occasions for those different sorts of
labour returning with the different seasons of the year, it is impossible that one man should be constantly employed in any one of them. This impossibility of making so complete and entire a separation of all the different branches of labour in agriculture is perhaps the reason why the improvement of the productive powers of labour in this art, does not always keep pace with their improvement in manufactures. (Smith 1976, 16)

In other words, the concentration of so many tasks in the hands of one person meant that the these tasks were not so susceptible to the sorts of division of labour that Smith famously analysed in the case of a pin factory.

Marx’s view was rather different. In a particularly prescient passage in the Grundrisse (Marx 1973, 527–8), he writes:

If agriculture rests on scientific activities – if it requires machinery, chemical fertiliser acquired through exchange, seeds from distant countries, etc., and if rural, patriarchal manufacture has already vanished – which is implied in the presupposition – then the machine-making factory, external trade, crafts, etc. appear as needs for agriculture ... Agriculture no longer finds the natural conditions of its own reproduction within itself, naturally, arisen, spontaneous, and ready to hand, but these exist as an industry separate from it ... This pulling away of the natural ground from the foundations of every industry, and this transfer of the conditions of production outside itself, into a general context – hence the transformation of what was previously superfluous into what is necessary, as a historically created necessity – is the tendency of capital.

By the second half of the nineteenth century, it had become clear to Marx that science was beginning to serve the process of commodity production. He postulated that, ‘Invention then becomes a business, and the application of science to direct production itself becomes a prospect which determines and solicits it’ (Marx 1973, 704). Ironically, therefore, it was Marx, not Smith, who envisioned the beginnings of the process by which tasks within agriculture would become specialised, and concentrated in the hands of different specialists. Crucially, Marx also observed that such specialists would often reside off the farm.

It was Malthus’ Essay on the Principle of Population (1976a) which sparked off a debate, which has waxed and waned in intensity ever