

## PolicyPennings by Daryll E. Ray & Harwood D. Schaffer

# Increasing agricultural production across the ages: population pull followed by fossil fuel

Just over 200 years ago, a British cleric, Thomas Malthus published a book, *An Essay on the Principle of Population*, in which he examined the relationship between population growth and the increase in the production of food. In that book he argued that, over time, the production of food increased arithmetically while population increased geometrically. As a result, he argued that the growth in population was dependent upon the growth in the production of food.

We see that concern about the relationship between the production of food and the increase in population reflected in the current question of whether or not we will be able to feed a world population increase from 7 billion today to 9 billion in 2050, while also accommodating the increase in the demand for grain-fed meat by a growing middle class in developing countries.

Following WWII, Danish economist Ester Boserup went to work for the Research and Planning division of the Economic Commission for Europe where noted economist Nicholas Kaldor served as Director. Her work there led to a study of peasant agriculture in Asia under Swedish sociologist, Gunnar Myrdal—his book, *American Dilemma: The Negro Problem and Modern Democracy*, had an impact on the 1954 US Supreme Court decision *Brown vs Board of Education of Topeka* that led to school desegregation in the US. In the foreword to her 1965 book, *The Conditions of Agricultural Growth: the Economics of Agrarian Change under Population Pressure*, Kaldor wrote “she regards the growth of population as the autonomous factor making for a steady intensification in agriculture, which in turn brings a whole host of economic and sociological changes in its train.”

Contrary to Malthus, Boserup asserted that it was the increase in agricultural production that was dependent upon an increase in population, not the other way around. Her observation of preindustrial societies is that there is no incentive for people to intensify their production methods as long as they are able to “meet the immediate needs of their families.” Surplus production just results in increased work and a decline in labor productivity for no benefit.

Boserup points out numerous examples of technologies that were known long before they were finally put into use when a group of people experienced an increase in population requiring the extra food that could be produced using the long-known technology on land they already had in production. In times of an increase in population, the extra people could be put to work growing more food. Implementing the long-known technology, they would have to work harder for those additional units of production, but they could then produce enough food to feed the larger population.

In industrial societies, we have been able to accelerate this process through the substitution of fossil fuel for human and animal labor, resulting in an increase, rather than a decrease, in the marginal product of labor—each unit of labor produces more food rather than less. Combined with modern research technology, we face a situation where it is very easy for commercial farmers to produce more food than can be purchased at a price that covers their cost of production. To clear that excess production from the market, farmers have switched from grassfed meat production systems to ones that increase animal weight using grains and oilseeds. They have lobbied for the support of biofuel production to use up corn that was in excess supply in the 1998-2001 time period.

A Boserupian analysis of hunger in rural areas of sub-Saharan African and other continents suggests that rather than skip steps in the development process by introducing technologies that people cannot afford, development specialists may need to focus on ways to enable those who cannot afford to buy enough food to meet their nutritional requirements to produce their own food using low-cost technologies. It may also require making sure that they have access to the required land. That suggests that rather than leasing large tracts of land to organizations in other countries—a process called land-grabbing and amounts to millions of acres in countries, many of whose citizens are among those who are most vulnerable to hunger and undernutrition—the leaders of those countries ought to make that land and the appropriate agricultural technology available to their own hungry citizens.

Once this population is able to meet its own nutritional needs it will be in a position to move up the technology ladder. We currently have sufficient technical capacity to meet the demand for food in 2050 without bringing game-changing agricultural technologies online. We will, however, need to find ways to manage the use of available and new technologies in order to avoid over production and low prices.

In our own work, we find that the analysis of Ester Boserup matches up more closely to our observations of the nature of agriculture than does the ideas of Thomas Malthus. Globally, we are more likely to be faced with ongoing excess production—and the resulting low prices—than we are with extended, multi-year production shortfalls.

That being said, climate change may force us to deal with unprecedented pressures on production systems and changes in production locations.

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**Cont. from p. 1**

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