

## Food Security and Land Use in the 21st Century: The return of Malthusianism?

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The coming century is set to pose many important problems regarding population, food requirements and land use. In many ways, the problem facing us is a stark reminder of Malthus' predictions regarding the importance of resource constraints in the face of population growth.

Despite questions concerning the core of the problems to be solved, there is little issue concerning the manifestations of these problems. First, we are seeing the culmination of a long-term process of human population growth, which commenced in earnest about 250 years previously (about the time of Malthus) and escalated thereafter, continuing to this day. A global population that was only about a million individuals in 1750, escalated to about two billion individuals in 1950, and has since increased to approximately seven billion.

More importantly the global population is expected to increase to about eight to ten billion individuals by the year 2050. This projection is based on the inherent momentum built into a population of the current size and demographic structure (i.e. age distribution). More strikingly the UN mid-point projections find that the population by the end of the century will be peaking in the region of eight to twelve billion people. So we can anticipate an approximate doubling of the human population over the course of the 21st century, at a time when the globe is already experiencing human pressures that have been previously unknown.

The earth has never before experienced population pressures of this nature. The amount of land in use for agricultural production reached about 1.3 billion hectares in 1960, and has since expanded to nearer 1.6 billion hectares. Most analysts have suggested that the limit to arable land available is about 2 billion hectares, or a further 25 percent increase in land availability.

In line with population changes, the primary locations for further land use allocations have been in developing countries, with sub-Saharan Africa being the main source of new agricultural lands. On the other hand, the developed world has used less land for agriculture due to a slowing of population growth in that region and advances in agricultural research and development.

To ascertain whether research and development can avoid resource constraints, we have estimated the global agricultural production function for the period 1960-2010, and then extrapolated from it to the globe for the remainder of this century. The results are striking, in that they indicate that vast amounts of global land may be released from agricultural

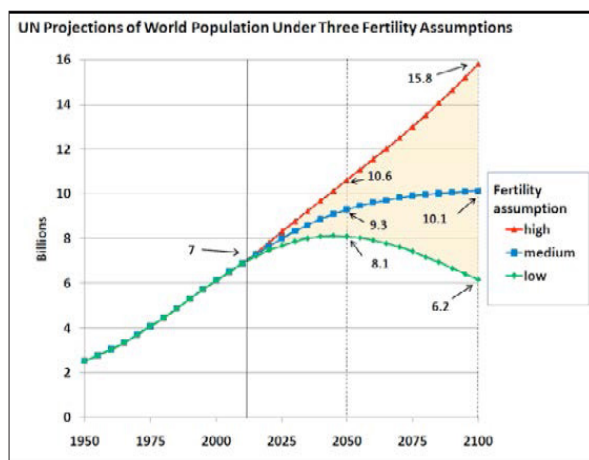
production, with relatively minor consequences for overall food production. It is feasible to substitute R&D for land use to a large extent.

This brings us to the fundamental problem facing the 21st century – which (ironically) is the declining population growth rates that are accompanying the currently increasing levels of population. It is the combination of high population levels and low growth rates that will effectively “invert” the population pyramid in coming decades, resulting in vastly increasing dependency rates in the global population.

An inverted population pyramid implies a very large older population, unlikely to contribute to the R&D sector, reliant upon a reduced labour force. This means that the source of the solutions to the food security problems of previous decades is now significantly handicapped by this switch in sizes.

Is there a solution to this problem of increasingly constrained resources (human and natural) in the context of increasing global populations? If there is, it lies in the immediate investment of global funds into the human capital of developing nations. It is only in these regions of the world that both resources will continue to increase – with both populations and arable lands increasing in certain parts, principally sub-Saharan Africa.

The solution to the problems of the 21st century probably lies in replicating the experience of the developed world in the developing. If the developed world has been successful at substituting human capital (and resulting R&D) for natural capital in the recent past, then this is likely to be possible in the developing as well. The human capital in developing regions needs to be a crucial part of the solution to the food security problems of the 21st century.





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