

From Population to Production: Scientists' Changing Views on How to Feed the World

Overpopulation Research Project [Food security](#), [Population growth](#), [Sustainable population](#)

March 12, 2020

Fifty years ago, in his 1970 [Nobel Peace Prize acceptance speech](#), Norman Borlaug said: “There can be no permanent progress in the battle against hunger until the agencies that fight for increased food production and those that fight for population control unite in a common effort.” Borlaug was insightful, but also a genuinely humble man. A recent study of the scientific literature on food security shows that most experts have learned the opposite lesson from the successes of the Green Revolution, appearing to assume that technological progress can sustain indefinite human population growth.

By Philip Cafaro

Food is a basic human need, with grave consequences for human well-being when it goes unmet and grave consequences for the existence of nonhuman species when it is met. Recently, [Lucia Tamburino](#) from the Swedish University of Agricultural Sciences in Uppsala and several colleagues published the first comprehensive overview of the scientific literature on food security. “[From population to production: 50 years of scientific literature on how to feed the world](#)” undertakes a quantitative textual analysis of a comprehensive data set of over 12,600 studies from 1969 through 2018, a period of fifty years. The results are revealing.

The authors identify three primary “levers” to address food security in the literature: limiting human numbers through birth control and demographic policy, limiting per capita food consumption through dietary modifications, and increasing total food production through technological and managerial improvements. They note: “All three levers — population, per capita demand, and food production — affect the potential to meet global food needs, and are active areas in both public debate and scientific research. However, the emphasis on different levers — and the degree to which they are considered together — potentially implies different visions and paradigms on how to tackle sustainability issues.” Their main finding involves changes in the relative importance of the three levers in the literature.

For publications during the first decade of this period, limiting population growth was the lever most often discussed, in about 60% of publications. By the most recent decade, however, this had fallen off considerably, with only about 15% of publications considering it. Over this same period, technologically-driven food increases went from a

focus in 25% papers to a focus in about 70%. The third lever, dietary changes to reduce consumption (either of total calories or of animal food, which is particularly resource intensive), remained steady throughout the entire period, being considered as a factor in ensuring food security in about 25% of all papers (figure 1).

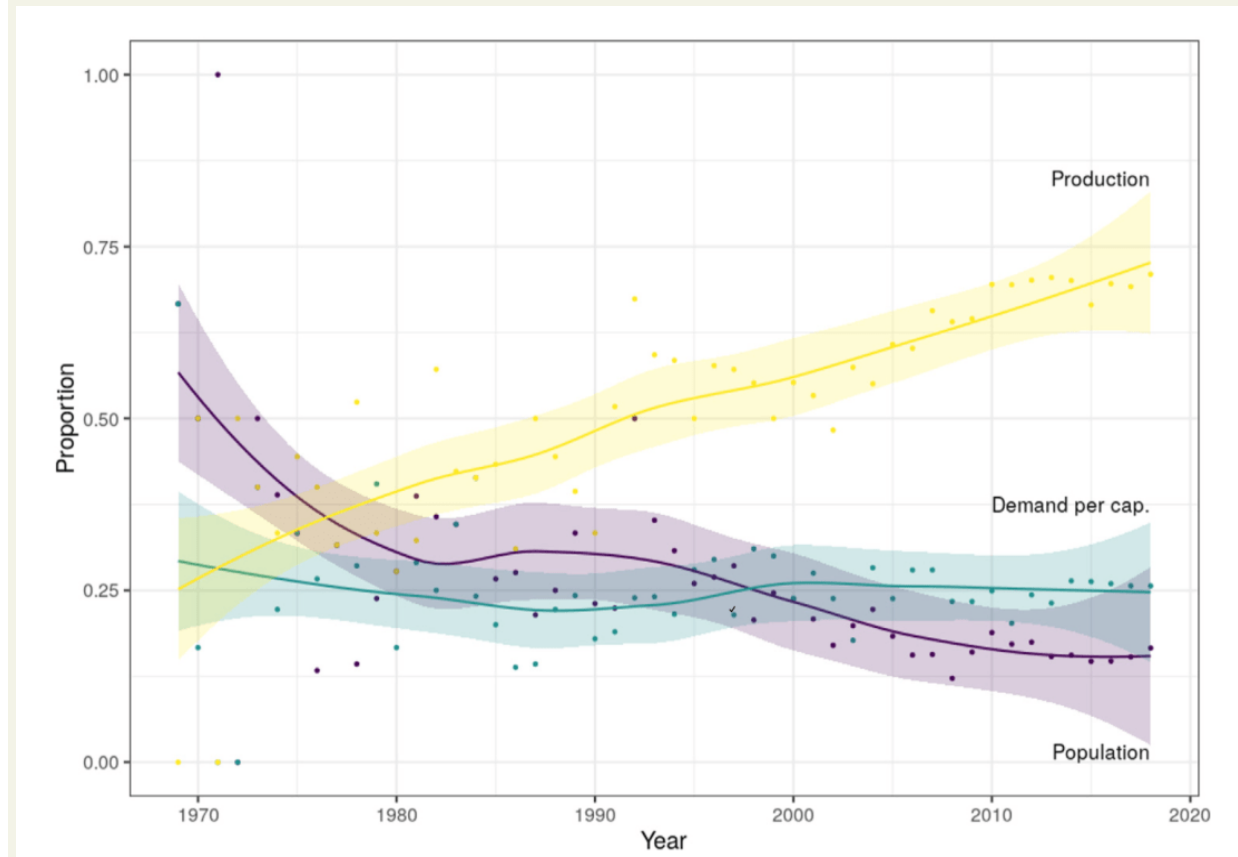


Figure 1. Cluster distribution showing proportion of papers in the food security literature discussing three main levers to achieve food security. Points report the proportion of the documents from the main dataset included in each cluster per year. Curves represent LOESS smoothing with 95% confidence intervals. Documents could be classified into more than one of the three clusters. Source: Lucia Tamburino et al., “From population to production: 50 years of scientific literature on how to feed the world.” *Global Food Security* 24 (2020): 100346

The conclusion of “From population to production” is clear: discussions of food security have shifted from a primary focus on *limiting* demand through limiting human numbers to a focus on *accommodating* demand through increased production. As Tamburino and colleagues note, this has two important implications—both negative.

First, “the dominance of production-oriented studies may undermine achieving food security” around the world, if production increases fail to keep up with increased demand. This is particularly worrisome in a world facing unprecedented ecological

degradation, which could impact global food production. A 2013 study by University of Minnesota agricultural researchers showed that current yield improvement trends for major grains are far below projected future global needs (figure 2). But as the new study notes, “it might not be possible to sustain current rates of agricultural productivity increases under degraded environmental conditions due to climate change, soil depletion, and water scarcity. A synergistic approach to improve productivity and reduce the global food demand at the same time might be more prudent and effective.”

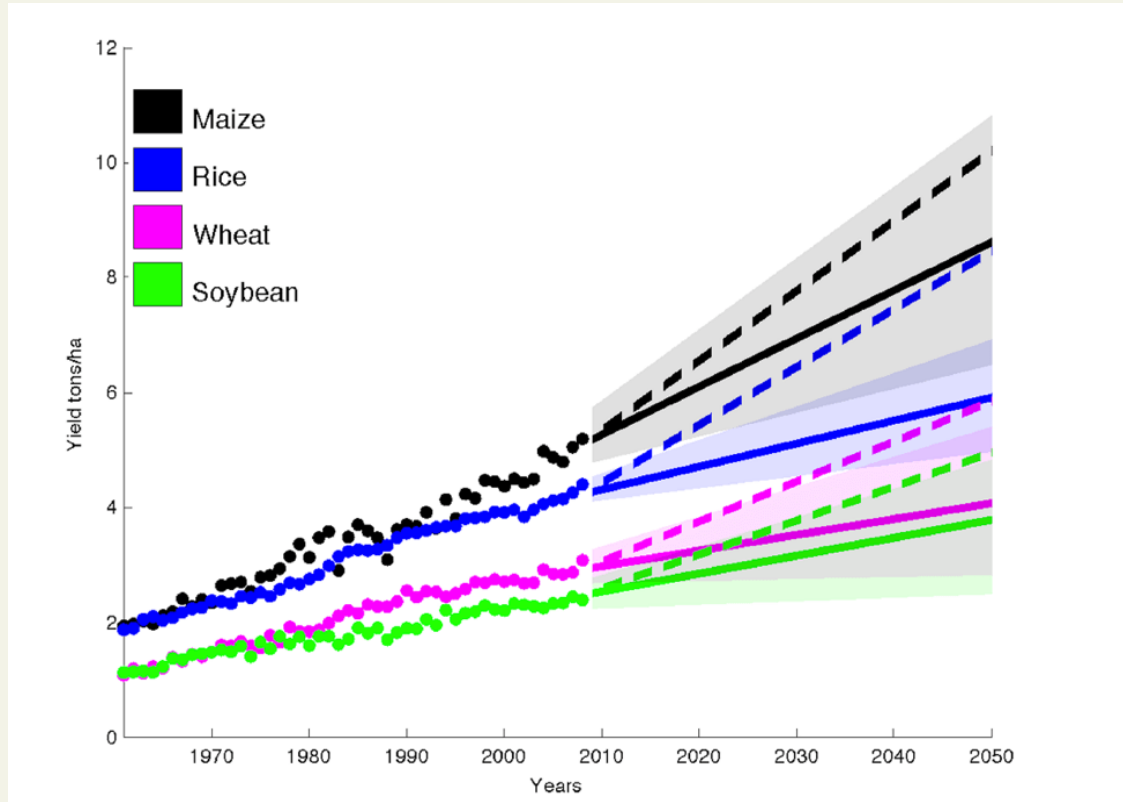


Figure 2. Projections for global grain yields. Observed area-weighted global yield 1961-2008 shown using closed circles and projections to 2050 using solid lines for maize, rice, wheat, and soybean. Shading shows the 90% confidence region. The dashed line shows the trend of the 2.4% yield improvement required each year to double production by 2050 without bringing additional land under cultivation starting in the base year of 2008. Source: Deepak Ray et al., “Yield Trends Are Insufficient to Double Global Crop Production by 2050.” PLoS ONE 8 (2013): e66428

Second, even if humanity manages to feed itself in the coming decades, increased agricultural production could undermine other Sustainable Development Goals (SDGs), particularly those focused on environmental quality. As the authors report, research has shown that “for the environment, food production is currently the main global driver of biodiversity loss, water use, and land use change, and drives a quarter of climate change.” But in the face of increased human numbers, limiting agricultural production becomes difficult, making environmental problems more intractable. Measures to curb

population growth, on the other hand, could further both environmental SDGs and SDGs focused on improving the lives of girls and women. Tamburino and colleagues write that “support for the ‘universal access to sexual and reproductive health and reproductive rights’ (SDG Target 5.6) could help improve women’s conditions, especially in developing countries where unmet contraception demand is highest.” They note that according to the [United Nations Population Fund](#), “there is a strong synergy between actions to reduce fertility rates and actions that support gender equality (SDG 5), and access to education for girls and women (SDG 4).”

The problem is obvious: human societies continue to try to fit continuously growing food demands within a physically finite system. The solution almost surely will have to involve limiting demand: either through limiting human numbers, limiting per capita food demands, or both. Yet the scientific literature on food security, for the most part, ignores this. Here it resembles the scientific literature on global climate change, with its focus on technological fixes and its general unwillingness to consider reducing human demands on nature.

In the face of this learned neglect, Tamburino and her colleagues are the souls of reason. They admit they do not know the optimal way to balance the three levers at humanity’s disposal for addressing food security, and conclude mildly: “our results suggest that increasing research focus on diets and population size is likely necessary to provide an adequate evidence-base for policy. To reverse a long-term trend whereby population, diet, and food production have been tackled in isolation, we suggest strengthening interdisciplinary research that jointly addresses these three leverage points.”

This is good advice: food researchers do need to broaden their focus. But so do policymakers, who almost surely will have to make greater demands on their societies in order to avoid the twin disasters of mass starvation and mass extinction. Humanity is trying to eat the world, and in the process we are vomiting up an [Anthropocene epoch](#) of unprecedented ecological destruction and ugliness. More of the same is not [the solution](#).