

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

How does the need to double world crop production by 2050

compare with the growth in crop output of the last 40 years?

Current projections hold that the population of the world will increase from 6.9 billion in early 2011 to somewhere between 9.0 and 9.3 billion by 2050, an increase of over 30 percent. When that increase is coupled with increased prosperity in developing countries and the desire for a diet that includes more meat, it is projected that the production of agricultural crops will need to increase by 70 to 100 percent.

The question facing policy makers is what it takes to accomplish that amount of increase over the next 40 years. The multinationals that are engaged in seed research and sales argue that such an ambitious agenda will only be achieved if trade policies are liberalized and they are given free rein to sell their genetically modified seed everywhere. They also argue that farmers in the major grain exporting countries will be needed to feed the world.

Before moving forward, let us look at what has happened to grain production over the last 40 years. In 1970, the production of corn, milled rice, and wheat was 788 million tonnes. By 2010, the production of those three grains was 1.912 billion tonnes, an increase of 142 percent.

Looking at the grains individually, corn production increased from 268 million tonnes to 814 million tonnes, an increase of over 200 percent. The production of milled rice increased from 213 million tonnes in 1970 to 452 million tonnes in 2010—an increase of over 110 percent. Wheat production, the largest of the three grains in 1970, was 307 million tonnes. By 2010, wheat production had increased by over 110 percent to 648 million tonnes.

For all three grains, the 40-year increase was over 140 percent. If you had asked most people in 1970 if they thought that production would more than double over the next 40 years, they probably would have said, “No.”

In the 1970s, it was expected that grain production in India would lag consumption and India would continue to be dependent upon imports. In 1970, India was a net importer of 3.2 million tonnes of the three grains, mostly wheat. By 2010, India was a net exporter of 4.8 million tonnes of the three grains. The 2010 exports were almost evenly divided between corn and milled rice.

In addition, soybean production was 42 million tonnes in 1970. By 2010, world production of soybeans had increased to 258 million tonnes—that’s a whopping 513 percent increase. So, the two commodities

that are most critical to meat production have seen dramatic increases the last 40 years.

Can farmers worldwide make the make the 70 to 100 percent production increases that are projected to be needed? If the last 40 years is any indicator, the answer is yes, though perhaps a guarded yes.

Let us look at the guarded part first. In this area we start with climate change. As the result of a recent column on climate change we have become abundantly aware of the fact that this is a contentious issue for some and a matter of fact for others. That being said, as academics looking 40 years down the road, as one of our scenarios, we would be irresponsible if we did not look at the potential impact of climate change on agriculture.

Some research suggests that increased carbon dioxide in the atmosphere may aid in photosynthesis and crop yields as long as temperatures do not increase too much. A sharp increase in temperatures in a given location could result in lower yields despite the increased availability of carbon dioxide. The factors that could affect yield include higher temperatures, shifting production areas, increased weather variability, and the increased likelihood of severe weather events. In some sense, climate change is the wild card in the deck. We have never been there before and we don’t know exactly what to expect. Nonetheless we need to be prepared for the potential changes we face in this area.

A decade ago, there was a lot of talk about a yield plateau because it appeared that the rate of increase in yields was decreasing. Today we are seeing record yields every couple of years and the seed companies are talking about things like 300 bushel per acre corn. We have been able to move corn yields up dramatically. It remains to be seen how quickly we can move beyond the gains of the green revolution when it comes to wheat and rice.

The next area of concern is Sub-Saharan Africa (SSA). This vast area of the world was bypassed by the green revolution and yields remained stable or falling at about 1 tonne per hectare. Part of the problem is the north-south orientation of the continent so farmers fall into a large number of climatic zones compared to areas that benefitted from the green revolution. Yield gains elsewhere will still leave SSA impoverished

Originally published in *MidAmerica Farmer Grower*, Vol. 31, No. 14, April 8, 2011  
 2) Copy of reproduction sent to Information Specialist, Agricultural Policy Analysis Center, 309 Morgan Hall, Knoxville, TN 37996-4519  
 Reproduction Permission Granted with 1) full attribution to Daryll E. Ray and the Agricultural Policy Analysis Center, University of Tennessee, Knoxville, TN;

Cont. on p. 2

How does the need to double world crop production by 2050 compare . . .

**Cont. from p. 1**

and dependent upon charitable aid unless research is done to improve the yields of indigenous crops that are already adapted to the local climatic conditions.

Given the degree of environmental degradation in many areas and the nature of small plots, attention will need to be given to sustainable, conservation-based agricultural techniques that build soil and enable farmers to provide for the nutritional needs of their families. Because SSA has one of the fastest growing populations in the world, it is extremely important that attention is paid to improving agricultural production at the household level.

The doubling of grain and oilseed output over the next 40 years is not dependent simply upon yield increases in the US corn belt. Increasing yields by 1 tonne per hectare (national average US corn yields are in the range of 10 tonnes per hectare) in developing nations would go a long way toward achieving food security for the current population and developing the ability to meet future population growth needs. Simply reducing post-harvest loss with basic, but effective, storage options would bring about an immediate improvement in production numbers. The adoption of locally appropriate technologies that protect soil, increase water retention, and increase total nutritional output of a farm can result in the needed yield increases in SSA.

Increased production can also result from increased acreage devoted to crop production. We are just beginning to see what can happen when agricultural areas in the former Soviet Union are brought

back into production. Countries that once imported grain are now major exporters of wheat. In any one year they may face reduced production due to weather issues, but in the long-run they have the potential to significantly increase world production capacity.

Likewise, Brazil can increase its harvestable area in several ways. Farmers there can increase production through double and in some areas triple cropping, shifting current pastureland to cropland, rotating current pastureland between crops and grazing, and opening up new areas to production. It has been estimated that Brazil has the potential to bring an additional 300 million acres into production while still complying with current environmental laws.

As we look down the road 40 years from now, we are less worried about achieving an increase in production of 100 percent than we are concerned about how to manage all of this potential. For you see, we think it is important that we always have the proven potential to produce far more food than we need at any one time. We just don't need to use all of it all of the time. Then, if a crisis comes we can bring the additional capacity online. The question is, are we willing to develop policies that allow us to manage that overcapacity so that we maintain its availability while avoiding dragging prices down with overproduction?

Daryll E. Ray holds the Blasingame Chair of Excellence in Agricultural Policy, Institute of Agriculture, University of Tennessee, and is the Director of UT's Agricultural Policy Analysis Center (APAC). Harwood D. Schaffer is a Research Assistant Professor at APAC. (865) 974-7407; Fax: (865) 974-7298; dray@utk.edu; <http://www.agpolicy.org>.