

Is Organic Beef and Dairy Production a Responsible Use of Our Resources?

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Introduction

Land is by far the most significant natural resource used in agriculture. In the U.S., 937 million of our 2.96 billion acres (excluding Alaska) are utilized in one way or another to produce our own food supply and the food we export around the world.ⁱ Almost one-third of our total U.S. land base is currently needed to feed ourselves, and much of the remainder is in deserts, mountains, swamps, cities, roads or otherwise unavailable.

On a global scale agriculture is by far the largest use of land. About 1.5 billion hectares are currently harvested every year to provide the world's food and fiber supply.ⁱⁱ That area, large as it is, does not include pasture lands used by ruminants to produce meat and milk.

Land used for agriculture represents both a monetary cost and a major alteration of our natural environment. There are significant trade-offs involved in the production practices we decide to use. Extensive agriculture uses land to substitute for technology, and results in lower yields. Intensive agriculture disturbs less land, but uses more inputs that have the potential to cause environmental issues. We have tended to opt for intensive systems because they are more cost-effective, but the fact is that intensive agriculture also conserves land for uses other than food and fiber production.

In order to see what intensive agriculture has done for land conservation in the U.S., data needs to be looked in a slightly different way. When we look at the use of land we normally think about how productive the land is at producing crops. For feed crops the productivity of land is not the end of the story. We also need to look at how productive land is at producing the meat, dairy and poultry products that we actually consume. We also need to look at land in terms of not only how much feed it produces, by also how many people it can feed.

In 1961 the U.S. population was about 184 million people. In 2006 we now number about 300 million, a 63% increase.ⁱⁱⁱ If agriculture today was no more productive than it was in 1961 we would either need to expand land in farms by 63%, or our food supply per person would be 63% smaller.

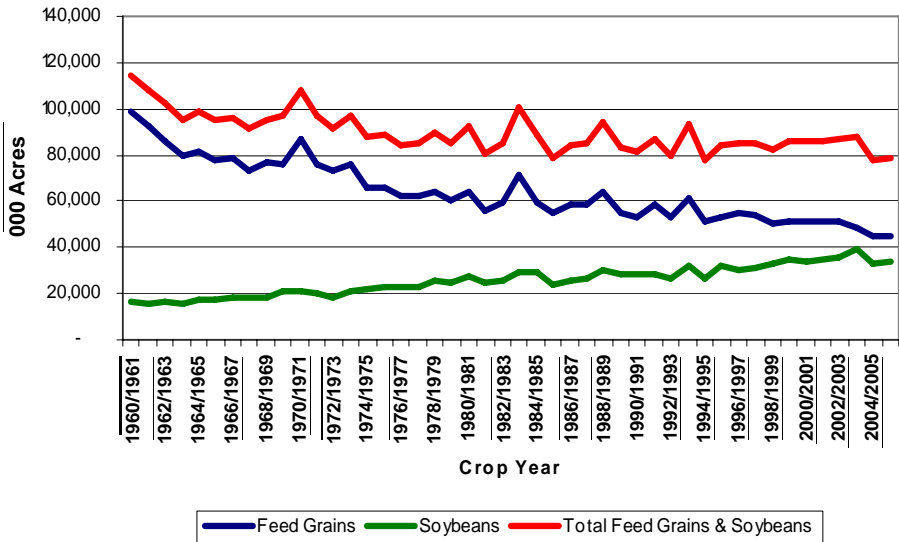
In 1961 it took 111.6 million acres of feed grains and soybeans to grow the major crops used for the U.S. feed supply. If, in 2005, that land was no more productive than it was in 1961, we produced as much per person, and our farm animals took as much feed per pound of production, we would need a least 63% increase, 70 million acres, in feed crop land use, an area the size of the entire state of Missouri.

Meat and poultry productivity increases reduce land use

The long term trend in land resources used by U.S. meat and poultry producers is more complicated than such a simple calculation, and also shows an incredible record of land conservation. In fact, despite increasing population and meat production, the crop acres needed to raise our supply of livestock products have actually **declined** over time.

It is fairly simple to calculate the acreage used for the feed grains and soybeans that are the major contributors to the U.S. livestock and poultry feed supply. Simply take the total tons of feed grains and soybean meal used for U.S. food animal feed and, using average yields, convert those tons back to acreage needed to produce the crops. The feed use estimates and yields are readily available from USDA^{iv}. Figure 1 shows the results.

Figure 1: Feed Grain (corn, sorghum, barley and oats) and Soybean Acres Used for Feed Production, 1960/61 to 2005/2006 Crop Years



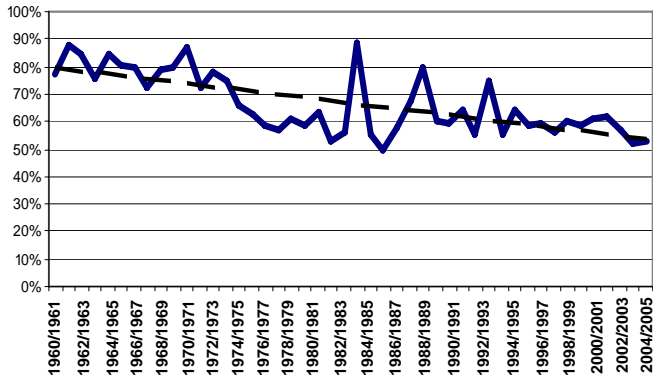
The trends show a declining acreage of feed grains, increasing acreage of soybeans, and a decline in total acreage needed for feed crop production. Since 1960/61 the total acreage of these five key crops needed to produce our livestock, dairy and poultry feed has **declined** by 32.7 million acres.

Soybean acreage increased in part because soybean yields have increased at a lower rate than those of feed grains. Also, we have raised the protein content of feed over time, increasing animal efficiency in the process, and reducing the acreage needed for feed grains.

With the decline in total acreage of feed crops needed for our animal feeds, we have also seen a major decline in the percentage of plantings of those key crops that are used for U.S. feed production. In the 1960s it took about 80% of our harvested acres of these crops for our domestic feed production, in the last few years that percentage has been slightly over 50%, or a nearly 30 point decline (Figure 2).

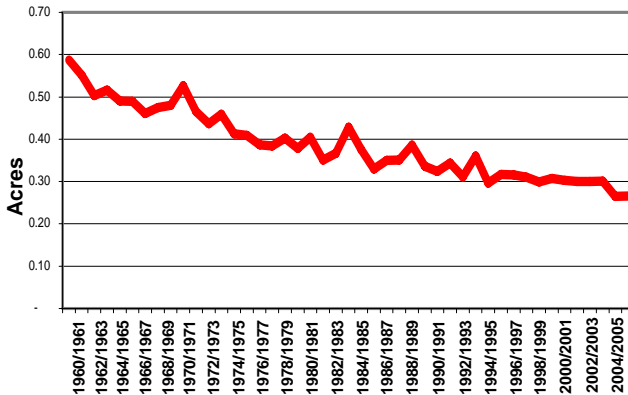
While reducing land used for feed crop production may seem like quite an achievement, it is very far from the whole story. What is missing in Figures 1 and 2 is the fact that while we were reducing land used, we also saw the increases in both the U.S. population that were mentioned above and along with even larger percentage increases in total meat and poultry product production.

Figure 2: Feed Grain and Soybean Acres Used for Feed Production as a Percent of Total Feed Grain and Soybean Acreage, 1960/61 to 2005/2006 Crop Years



It took an average of almost 0.6 acres per person to produce enough feed for our meat, dairy, and poultry production in 1961. In 2005 that statistic has dropped to about 0.27 acres. In other words, today it takes less than half as much land on a per person basis to produce our meat, dairy and poultry supply than was the case in 1960/61 (Figure 3). Again, this is not the total story.

Figure 3: U.S. Feed Grain/Soybean Acres Used Per Person for Meat and Poultry Production

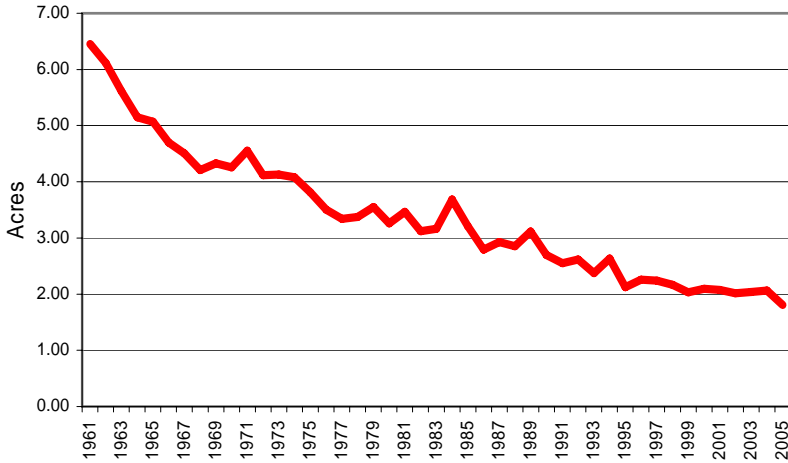


Along with increases in population our U.S. production of meat and poultry has also increased, and even faster than the population. More of that production is exported now than was the case in 1960, and it is consumed elsewhere, but it is still consumed.

Figure 4 shows an estimate of the average use of crop land to produce one ton of meat and poultry. In 2005 each ton of production took about one-third the land that was needed in the early 1960s. The decrease is a result of both increasing crop yields and

decreases in the average amount of feed needed to produce a given amount of meat and poultry.

Figure 4: U.S. Feed Grain/Soybean Acres Used Per Ton of Meat and Poultry Production



Corrected for both population and meat production growth the land needed for our meat and poultry supply has shrunk dramatically over the past 45 years. Where did that land go? Much of it is used today for producing crops for export or ethanol. Some of it has gone back to nature. From 1990 to 2005 FAO reports that the total land in forests in the U.S. increased from 738 million to 749 million acres^v. We also now have 36 million acres currently enrolled in a Conservation Reserve Program that did not exist in 1960. Increases in agricultural productivity are what make this possible.

Resource use consequences of organic and natural production systems

If we examine the organic food industry from the point of view of cost the higher *overall* resource use of organic production is abundantly obvious. In competitive markets, and agriculture is about as price competitive as it gets, prices reflect costs, and costs directly reflect total resource use. As the Organic Trade Association admits “While the retail price of organic meat is generally greater than conventional, to many consumers, the greater peace of mind is priceless.^{vii}” How much is the value of the additional resources needed for this “priceless” system’s products worth in the niche organic market?

The added cost, price and thus resource use numbers can be quite revealing. Genesee Valley Organic Beef, of Taylorsville CA, on December 29, 2006 was advertising organic beef tenderloin at \$41.50 per pound, plus shipping and handling^{vii}. On the other end of their price scale, Genesee’s 90%-lean organic hamburger was priced at \$7.00 per pound. Local grocery store prices for these same beef cuts were \$9.99 and \$3.44 (93% lean) on the same day. In this one instance the cost, and thus total resource use, of an organic beef production system is 4.2 to 2.0 times that of beef produced with the benefits of modern technology. Laura’s Lean beef tenderloin was \$17.99 per pound at a local store on 12/29/06 and the store brand was \$9.99. Other comparisons from a local grocery store, made on 12/29/06, show the same general price, and thus resource use, advantage for modern technology farming for a wide variety of meat, dairy, egg and vegetable products (Table 1).

Table 1: Selected Cost Comparisons for Organic vs. Modern Technology Food Items, December 29, 2006

Item	Organic Cost	Modern Technology Cost	Cost Ratio
½ Gallon 2% Milk ¹	\$3.39	\$1.69	2.0:1
1 lb. Beef Tenderloin ²	\$41.50	\$9.99	4.2:1
1 lb. Beef Tenderloin ³	\$17.99 ³	\$9.99	1.8:1
1 lb. 90% Ground Beef ²	\$7.00	\$3.44	2.0:1
1 doz. Large Eggs ¹	\$3.29	\$1.44	2.3:1
1 Pound Celery Hearts ¹	\$3.49	\$1.99	1.8:1
1 Head Iceberg Lettuce ¹	\$2.99	\$1.19	2.5:1
1 Bu. Yellow Corn ⁴	\$41.44	\$3.50	11.8:1

¹ Local chain grocery store, Indianapolis area

² Sources: <http://www.geneseevalleyorganicbeef.com/>; Local chain grocery store, Indianapolis area, 12/29/06

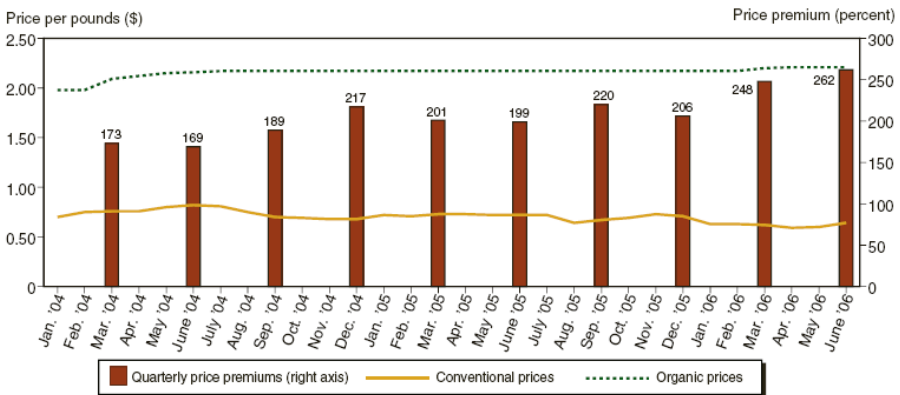
³ Laura’s Lean compared to store brand, Local chain grocery store, Indianapolis area, 12/29/06

⁴ Sources: <http://www.sunorganicfarm.com/>; USDA, AMS, cash price, Northern Illinois elevators, 12/29/06

The last line of Table 1 also shows an incredible cost premium for organic yellow corn. The organic price was obtained from the web site of an organic foods retailer and the modern technology price from USDA. While the difference may reflect more than just cost of production and resource use, it does show the kind of extreme prices that may be needed by organic producers to cover all their costs.

Figure 5 is taken from a recent USDA report on organic poultry, and shows roughly the same price premiums as in the table above. Again, from an economic efficiency viewpoint, as revealed by the price premiums needed for profitability, organic technology is incredibly resource intensive relative to conventional agricultural systems.

Figure 5: First receiver prices and quarterly price premiums for organic whole broilers, 2004-06^{viii}



How Large is the Organic Beef and Dairy Industry?

USDA compiles an annual summary of the number of certified beef and dairy organic operations and the number of livestock on them. Since 2000 we have seen significant growth in certified organic beef and dairy cows^{ix} (Table 2). Despite the growth of the last 6 years, organic production is still a small share of animals, and a smaller share of total production due to the lower efficiency of organic producers.

Table 2: Cows on Certified Organic Beef and Dairy Operations

Year	Organic Beef Cows	Total Beef Cows, 1/1	% Organic	Organic Dairy Cows	Total Dairy Cows, 1/1	% Organic
2000	13,829	33,569,000	0.04%	38,196	9,190,000	0.42%
2001	15,197	33,397,000	0.05%	48,677	9,183,000	0.53%
2002	23,384	33,118,000	0.07%	67,207	9,112,000	0.74%
2003	27,285	32,947,000	0.08%	74,435	9,152,000	0.81%
2004	71,058	32,861,000	0.22%	74,840	8,990,000	0.83%
2005	70,219	32,915,000	0.21%	86,032	9,005,000	0.96%

Efficiency Increases in Beef and Dairy Production Have Conserved Resources

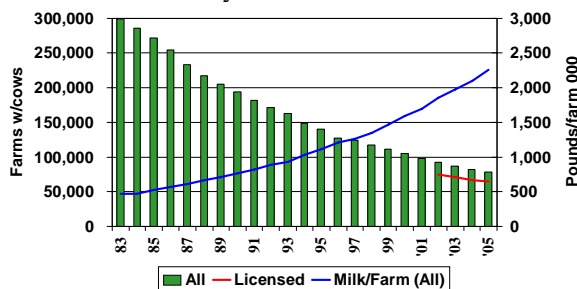
Over the last 50 years, the cattle industry has raised an increasing proportion of the beef supply in feedlots rather than on pasture and range land. A major impact of agricultural technology has been on the amount of land needed to produce the feed required for cattle feedlots. Given the large increases in the fed beef supply since the 1950's, most would assume that the amount of land needed to produce increased amounts of feedlot beef has increased, but, in fact, this is not the case.

Through a combination of yield increases for feed crops and more efficient use of feed by feedlot cattle since 1955 we have actually increased beef produced in feedlots by almost 200% while slightly reducing the acreage of corn needed to produce that larger fed beef supply. What is really remarkable is that the corn content of rations also increased significantly since 1955. Acreage needed to produce roughage also decreased markedly.

Table 3 contains estimates of the impact on the land used to produce the corn and roughage used for beef cattle feed. For purposes of this table, it was assumed that all grain used in feedlots is corn and a 50-50 hay/corn silage mixture is used for roughage.

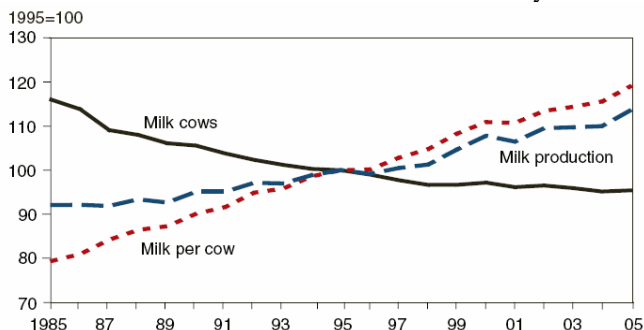
Milk producers have been down a similar path over the last 50 years. Technology has enabled producers to become significantly more productive. We are using fewer cows, fewer farms, fewer farmers, and less land, to produce a growing milk supply (Figures 6 and 7).

Figure 6: Number of Farms with Dairy Cows and Milk Produced/Farm



Note: "Licensed" data series begins in 2002

Figure 7: Overall Trends in Cow Numbers and Cow Productivity



Source: ERS using data from USDA's National Agricultural Statistics Service, *Milk Production*, various issues.

Table 3: Estimated Feedlot Beef Production and Land Used for Corn and Roughage^x

	<u>1955</u>	<u>2005</u>	<u>%Change</u>
Feed Conversion Ratio	8.0	6.2	-23%
% Corn in ration	62%	88%	42%
Bu. of corn needed/100 lb. fed beef	8.9	9.7	10%
Corn yield - bu./acre	42	147	250%
Acres corn needed/100 lb. fed beef	0.211	0.066	-69%
100 pounds of fed beef production/acre corn	4.7	15.1	218%
% Roughage (50:50 silage/hay) in ration	36	10	-72%
Pounds roughage needed/100 lb. fed beef	288.0	62.0	-78%
Roughage yield - pounds/acre	6,581	11,333	72%
Acres roughage needed/100 lb. fed beef	0.04376	0.00547	-87%
100 lbs. fed beef production/acre roughage	22.9	182.8	700%
Fed cattle marketed, 000	11,973	28,620	139%
Estimated average pounds gained in feedlot	400	500	25%
Feedlot LW pounds of beef produced, mill.	4,789	14,310	199%
Bushels corn consumed by fed cattle, mill.	424	1,394	229%
Acres of corn required for all fed cattle, mill	10.10	9.48	-6%
Price of corn per bushel	\$1.35	\$2.15	59%
Value of corn consumed by fed cattle, \$mill.	\$573	\$2,997	423%
Value of corn used (\$1982-84 mill.)	\$2,137	\$1,629	-24%
Tons of roughage consumed by fed cattle, mill.	6.90	4.44	-36%
Acres of roughage required for all fed cattle, mill.	2.10	0.78	-63%
Price of roughage per ton	\$15.82	\$53.04	235%
Value of roughage consumed by fed cattle \$ mill.	\$109	\$235	116%
Value of roughage used (\$1982-84 mill.)	\$407	\$128	-69%
Total acres used for corn and roughage	12.2	10.3	-16%
Value of corn and roughage used (\$1982-84 mill.)	\$2,544	\$1,833	-28%

Is Organic Milk Production More Profitable than Conventional?

There are so few certified organic milk producers that it is difficult to compare costs and production efficiency with conventionally produced milk. A very recent study from the University of Wisconsin compares a small number of organic Wisconsin dairy farms to statewide averages and organic farms in New England and Quebec^{xi}. The highlights include:

1. Milk yields per cow on organic farms were about 70% of conventional farms
2. Organic herds had higher costs per cwt of milk produced
3. Organic farms enjoyed significant milk price premiums of 25-40%
4. All of the higher prices were absorbed by higher costs
5. Wisconsin organic dairies were competitive on total returns to labor, but not better than, conventional farms
6. Organic dairy farms in New England were not competitive with either Wisconsin organic or conventional New England dairy farms
7. The majority of the organic systems net returns differences were due to a combination of lower milk yields and differences in feed costs.
8. Due to very high feed costs New England organic dairy farms need milk prices that are at least twice the prevailing market.

The price premiums for organic milk reflect both lower yields and higher costs of grains and roughages. Organic corn, in bulk, costs about twice the price of conventional corn. This higher feed cost leads organic milk producers to use more pasture and less purchased feed per cow than conventional milk production systems.

Organic production systems and global agricultural land availability

If organic production systems were to ever become a major part of our meat and poultry production the increase in resources, including land, needed to produce our food supply would be staggering. Feed grain and soybean yields for organic grains are roughly half that of modern technology^{xii}. In addition, animals that do not have the benefit of modern production inputs convert feed less efficiently. As a result every acre needed for an organic meat production system produces at about same level of land resource use as was the case in 1960. In addition, labor requirements also increase due to the lack of use of modern weed and pest control on organic operations. It should therefore come as no surprise that total resource use, costs, and thus prices, are much higher for organic foods when compared to food produced using modern technology.

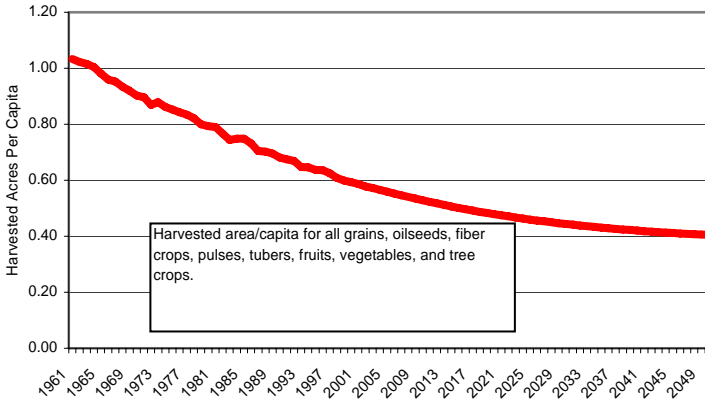
If only 10% of our U.S. livestock, dairy and poultry production were to be converted to organic systems we would need to use about 16 million acres of feed grain and soybean land for that production rather than the 8 million it takes today (a net increase of another Ohio's harvested corn and soybean acreage). In addition, we would also need more pasture and land for free range housing systems.

What is true for the U.S. is also true globally. In 1961 each person on the planet had, on average, 1.03 acres of food crops harvested for their food supply^{xiii}. In 2006 we each had about 0.55 acres. By 2050 the average will be only about 0.4 acres per person, and that assumes that we can, in the face of urbanization, actually keep total acreage at current levels for the next 43 years (Figure 8).

It's very simple: Unless productivity increases offset fewer acres per person, food production per person is going to decline. If productivity does not keep pace with

(or perhaps due to increased demand even increase faster than) global population, the pressure will be to increase global food production acreage. The problem is that there no reserve of highly productive land that is available to be brought into production. Land that can be brought into agriculture is mostly in environmentally sensitive areas, and would be costly to farm.

Figure 8: Global Food Production Acreage Available Per Person, 1961-2050



On a global basis we also must continue to increase the productivity of the animals we raise for the food supply. As stated by the FAO Animal Production and Health Division, “FAO and other institutions suggest that global production of animal products will rise impressively over the next 20 years. The growth in demand for livestock products suggests that there will be a consequent rise in demand for animal feed, not only of cereals but of other feeds and particularly proteins.^{xiv}” “Improving productivity is the key to increasing livestock production in the developing world. This requires proper animal husbandry: feeding, housing, health and breeding practices^{xv}.”

Simply put – in the U.S. and globally – without increasing production per acre AND improved animal efficiency we will need more acres in farms. Where would that land come from? Forests? Swamplands? Meadows? The Conservation Reserve Program? Unfarmed hillsides? Deserts? Biofuel production? Our parks and recreation areas?

Admittedly, if consumers are willing to pay twice as much for organic food, and use twice the total resources in the process, they have the right to do so. However, we need to question the advisability of going down this path given increasing population pressures on our land base and environment.

Conclusion

As long as population and food demand are growing, and they will for at least the next 50 years, farmers and scientists will have to continue to look for ways to grow more food on each increasingly precious acre. Included in that efficiency calculation is the conversion of feed to animal-based products. We need to make sure that our farmers here in the U.S. and around the world have the tools, the incentives, and the freedoms to farm as productively as possible.

Modern agriculture and its supporting organizations need to think seriously about the response to those who, in the name of conservation, insist that we need to abandon the technology that has enabled us to affordably feed the world's increasing population. Consumers of organic foods who think they are helping make a choice for more responsible use of agricultural resources need to be fully informed of the negative consequences of their purchases for resource use. Arguably, the consumption of organic food is of questionable benefit, and produced at a fraction of the land's potential yield, it is a socially irresponsible decision. Organic production can be likened to driving a "fuel guzzling SUV" when a more efficient vehicle would do the same job.

Unless agriculture is willing to proactively make its case for the use of high yield technology to feed the world those who favor resource conservation and efficiency run the risk of losing the battle for the hearts and minds of a large portion of the consuming public. To do so would result in less global food production per person, higher food costs, and a lower standard of living.

Endnotes:

ⁱ USDA. Agricultural Census. 2002.

ⁱⁱ FAO. FAOSTAT Database. Accessed December 29, 2006

ⁱⁱⁱ U.S. Department of Commerce. Bureau of the Census

^{iv} USDA, FAS. PS&D Database. Accessed December 29, 2006

^v FAO Forestry Database. Found at <http://www.fao.org/forestry/index.jsp>. Accessed December 29, 2005

^{vi} Found at <http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/01-05-2004/0002083314>. Accessed December 29, 2005.

^{vii} Found at <http://www.geneseevalleyorganicbeef.com/>. Accessed December 29, 2006

^{viii} Lydia Oberholtzer, Catherine Greene, and Enrique Lopez. Organic Poultry and Eggs Capture High Price Premiums and Growing Share of Specialty Markets. USDA. ERS. LDP-M-150-01. December, 2006.

^{ix} USDA. ERS. <http://www.ers.usda.gov/data/organic/index.htm#tables>. Accessed January 10, 2007

^x Thomas Elam and Rodney Preston. Fifty Years of Pharmaceutical Technology and Its Impact on the Beef We Provide to Consumers. July, 2004

^{xi} Tom Kriegl. Summary of Economic Studies of Organic Dairy Farming in Wisconsin, New England, and Quebec. University of Wisconsin. March 20, 2006. Found at <http://cdp.wisc.edu/pdf/Organic%20Econ%20in%20N%20E,%20Q,%20&%20W1.pdf>

^{xii} It is no accident that organic corn and soybean prices are roughly double that of high yield systems. In any given year corn and soybean yields in organic systems can approach those of modern technology. However, to achieve those yields organic systems use crop rotations in which corn and soybeans are only grown every second or third year, with the rotation crops being grown to mainly supply crop nutrients in place of chemical fertilizers. (This system may sound familiar – it is very similar to those used by farmers prior to the advent of modern fertilizers and crop protection products.) Thus, over the entire rotation cycle yields per acre of corn and soybeans are only a fraction of current levels on farms using modern technology. See: Kuepper, George. "Organic Soybean Production", Appropriate Technology Transfer for Rural Areas. Fayetteville, AR. March, 2003.

^{xiii} FAO Agricultural Database. U.N. Medium Population Projections. 2006

^{xiv} FAO. http://www.fao.org/ag/aga/AGAAN_en.asp. Accessed December 29, 2006

^{xv} FAO. <http://www.fao.org/ag/againfo/subjects/en/production.html>. Accessed December 29, 2006