

# What If We Removed Animal Agriculture?

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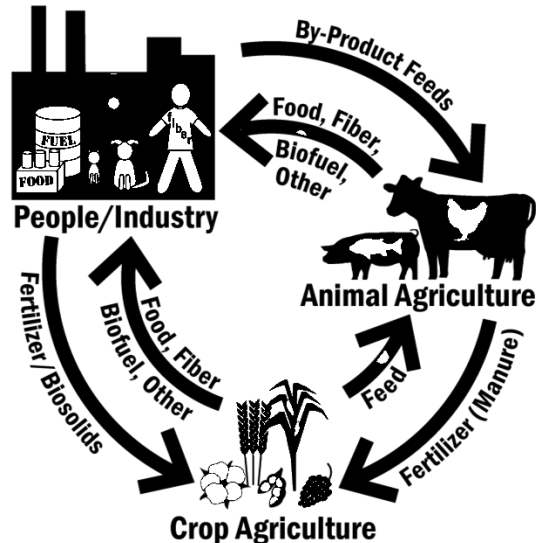
Our world is all about balance. Just enough of this, not too much of that. Keeping this balance is important for maintaining sustainability of systems, whether we're talking about the environment, or our cows' rations. As if maintaining this balance isn't challenging enough, biological systems present the additional complication that changing one part of the system results in changes elsewhere. Such related changes may be unanticipated, or can be anticipated if you have enough information, like predicting the ripples when you toss a rock into a pond. In short, when we think about managing systems, we need to see the big picture response in addition to the small piece that we're focused on.

We often think about the systems we manage -- the farm system, the rumen -- however, we rarely consider the systems we are a part of. People are a component of a food system with crop and animal agriculture. Like a food web in nature where plants grow with sunlight and water, mice eat the plants, hawks eat the mice, and their feces and carcasses fertilize the plants -- everything has to balance and supply the needs of each part, or the system won't be sustainable. In society's food web, resources, both products and "wastes" are traded among human society, crop agriculture, and animal agriculture. "Wastes" can be the resources made by one group that they can't use, but that another group can. For example, animal manure fertilizes crops, and by-products from producing food, biofuel, and fiber for human society are feed for animals. Enormous amounts of products and wastes are traded among people, plants and livestock. These exchanges make for an integrated and complex system of supplies and demands (Figure 1).

**Figure 1.** Society's food web.

People/Industry provides at least 47.6 million tons of byproduct feeds to Animal Agriculture.

Crop Agriculture provides: 189.6 million tons of food and 141.1 million tons of non-food products to People/Industry, and 123.5 million tons of crops to Animal Agriculture.



Animal Agriculture provides 132.3 million tons of food and 13.4 million tons of non-food products to People/Industry, and 4.4, 1.9, and 2.1 million tons of manure nitrogen, phosphorus, and potassium to Crop Agriculture. (White and Hall, 2017).

It has been suggested that getting rid of livestock will save the planet. Livestock make greenhouse gases that increase climate change, they can pollute water, they can compete with people for food, people deforest land for grazing, and the list goes on. In addition to environmental challenges, livestock products have been criticized as unhealthy. So, why keep farm-raised cattle, sheep, goats, poultry, and fish? Remembering natural food webs and the need for balance, if you remove livestock from society's food web, what happens?

When we evaluated what would happen if we removed livestock from U.S. agriculture (White and Hall, 2017), some key questions we had were:

- 1) What will you do with the land currently used for silage, hay, and tillable pasture?
- 2) How will the food supply change?
- 3) How well will you be able to feed people?
- 4) What happens to greenhouse gas emissions?

**#1, The Land.** If we got rid of farmed animals all 415 million acres of permanent pasture and rangeland would go out of food production. We can't be certain what will happen to the 56 million tillable acres used to grow forage, but we assumed it was largely converted to crops for people, except for 4.4 million acres that would be used to grow hay for the U.S.'s 10.2 million horses. Some have suggested that the tillable forage acreage could be let go to wildlife habitat, but we disagreed – short of a massive government program to take that land out of production, farmers would still need to earn a living from working the land. We did assume that tillable land was reallocated to grow

crops for people based on current proportions of land use for 89 crops. That added 1.8 million acres of fruits, vegetables, and nuts. Why not add more fruits and vegetables? The U.S. currently imports 51% of the fruits and 39% of the vegetables that we consume. We assumed that if it was profitable to grow these high value crops, farmers would already be doing it. Climate, weather, soil quality, water availability, labor, markets, profitability, and risk all affect what crops can be grown in different areas. More than 70% of the fruits and vegetables grown in this country are irrigated (USDA, 2012). As concerns grow as about the availability of water, do we have or would we be able to develop ways to grow more of the crops needed to feed people?

**#2, Food Supply.** With livestock gone and all crops not used for industrial products and seed available as food, the food supply tonnage would increase by 23% of what the current system with animals provides. That's over 66 million more tons of food available to feed people in the U.S. or to export. However, with only crop agriculture, the food supply would look a lot different. Grain would make up 58% of the food, up from 21%. 77% of those grains would be corn. Legumes would go from 1.4% in the present system, to 10% if animals were removed. 92% of the legumes would be soy and soy flour. The total amounts of essential nutrients available from foods generally increased with livestock gone. Some exceptions were fatty acids (long chain omega-3 fatty acids, arachidonic acid), calcium, and vitamins A, D, and B12; those nutrients are in greater supply in or are only gotten from foods from animals. With rendering products no longer available, foods would have to be diverted from use by people to provide 727 thousand tons of protein and 143 thousand tons of fat to feed our 70 million dogs, 74 million cats, and the rest of our pets.

**#3, Feeding the Population.** People don't eat nutrients, they eat foods. And a general recommendation is that it's better to get nutrients from foods than from supplements. We ran least cost diets intended to support the U.S. population based on the foods available in systems with or without animals. We assumed the U.S. food production system plus current imports needed to supply enough food to meet the population's requirement for 36 essential nutrients including protein, energy, amino acids, fatty acids, vitamins, and minerals. Without supplements, the diets from the current (with animals) food supply was deficient in vitamins D, E, K, and choline. However, without animals, diets were deficient in those nutrients as well as in calcium vitamins A and B12, and in fatty acids (long chain omega-3 fatty acids and arachidonic acids). These fatty acids are important for normal cognitive and visual development in children. Calcium and B12 are also crucial for our health. If you don't eat foods from animals, you absolutely have to take B12 supplements. If we removed animal agriculture, we would have to find a way to provide the needed supplements to everyone. People would also have to eat more food in the plants-only system because plants are not very concentrated sources of essential nutrients. And because of the sheer amount of grain available, our diets would be 85% grain.

**#4, Greenhouse Gases.** Agriculture has accounted for about 9% of total U.S. greenhouse gas emissions, with animals accounting for approximately 50% of that. Without animals, national greenhouse gas emissions drop by 2.6%, or 28% of agricultural emissions. Why 28% rather than the 50% that animals produce? Greenhouse gases produced from industrially producing fertilizer to take the place of manure is part of the answer. Incinerating inedible byproducts is part. The change in crops grown with all of the emissions now credited to people is the other major part of the picture.

So, what happens when you remove animals from U.S. agriculture? Some good things, some not so good. It's complex. More food, but more nutrient deficiencies unless we supplement everyone. Less greenhouse gases, but not a massive national decrease. Agriculture is essential for providing

people with food, products, and livelihoods. When we look at how we will feed people and make the system work in the long term, we need to look at the entire system, not just one or two aspects that we want to change.

### **References**

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