by Robert Jawitz

In our companion article entitled “Meat & Dairy; A Problem for Sustainability” it was stated by LEAD, in its report “Livestock’s Long Shadow”, that “The livestock sector emerges as one of the top two or three most significant contributors to the most serious environmental problems, at every scale from local to global.” These problems include land degradation, serious contribution to global warming (damage to our atmosphere & climate), water degradation and depletion and damage to biodiversity.

All of these problems are related. Land degradation relates to the changes of land use to create pasture for livestock at the expense of arable land and forest. Damage to our atmosphere and climate relates to the fossil fuel emissions required for feed production as well as the methane and nitrous oxide emissions from fertilizers and the animals themselves. Water degradation relates to increased water use for livestock in the midst of freshwater shortages and scarcity and to the pollution of water reserves (“livestock are responsible for an estimated 55 percent of erosion and sediment, 37 percent of pesticide use, 50 percent of antibiotic use, and a third of the loads of nitrogen and phosphorus into freshwater resources”). Damage to biodiversity relates to the fact that “it is the major driver of deforestation, as well as one of the leading drivers of land degradation, pollution, climate change, overfishing, sedimentation of coastal areas and facilitation of invasions by alien species.”

However, because it is such a major player in the damage of all these sectors, it becomes an opportunity for us as we try to repair the damage. If we can reduce the 70 percent of all agricultural land and 30 percent of the land surface of the planet devoted to livestock production and restore that land for more productive and more sustainable uses, then we can have an effective way on reversing those problems.

One way to do this is to simply stop eating meat and dairy. However, even if we could do that by force of will, that approach is very painful to the ranches and dairy farms represented by the livestock industry. It would mean the gradual economic strangulation of ranches and farms with no promise that those lands can be used in a more sustainable way. A better approach would be to change the land use

of these ranches and farms, with the cooperation of ranchers and farmers, so that they can participate economically (as well as morally) in the changes necessary to address the environmental damage of the industry including global warming and to simultaneously educate the western populations on dietary alternatives. That way both producers and consumers can make the required changes with the minimum of stress.

The land use changes that would be necessary would be #1) to divert farm land from livestock feed production and #2) to restore prairies, arable land and forests from the pastures.

Currently, Maize (corn) is the top feedstock for the livestock industry in the US and more than half of total maize production is used as feed. The US has the highest share of chemical fertilizer N utilized in agriculture (51% of the total of the 11 highest users) and maize is the crop highest in N consumption. 97% of nitrogen fertilizers are synthetically produced with fossil fuels (natural gas and coal) with the resulting emissions contaminating our atmosphere. If we could free up that 50%+ of maize farmland for other uses (such as more efficient food production and bioenergy production) we can reduce our dependence on livestock as a food and replace our fossil fuels with less polluting alternatives.

We should restore prairie, arable land and forests from our pastures. This does several things for us: 1) we provide an economic substitute for producing meat and dairy for the ranchers and farmers, 2) we increase the arable land for more productive food production, 3) we increase the biomass potential of the land so that it can consume more CO2, and 4) assuming some of those restorations is the restoration of the prairies and rebuilding of forests, we can reverse damage to biodiversity.

What is an economically viable alternative for a rancher or dairy farmer to consider? Let's look at bioenergy. Bioenergy is based on the concept of the "Closed Carbon Cycle" (CCC). This concept is that most bioenergy alternatives, even though they release CO2 during combustion, absorb an equal amount of CO2 in the growing of the feedstock. What are the bioenergy alternatives: 1) Biomass is the use of wood to provide heat or power from combustion of the wood or wood by-products. The biomass approach would be to grow forests in the pasture lands (usually with the support of governments). 2) Ethanol is an alcohol made by distilling grain or cellulose into a fuel substitute for gasoline. The ethanol approach is

simply to grow distilling feedstock in lieu of grass and either selling that to distilleries or to make the ethanol oneself. 3) Biodiesel is diesel fuel made from vegetable oil that has been transesterified with the addition of an alcohol such as methanol and a catalyst such as lye to make it suitable for burning in homes and diesel engines. The biodiesel approach is to plant oil feedstocks in lieu of grass and selling that or making biodiesel oneself. and 4) Vegetable Oil Fuel is basically just the oil which new VOF engines can burn without it being tranesterified.

Why is the conversion of pastureland particularly important to reducing global warming? The “Closed Carbon Cycle” is sustainable but it doesn’t reduce net CO2 emissions from existing farmland. The IPCC is recommending a cross-the-board 80% reduction in CO2 equivalents. If we take an existing corn field, for example, and use it for biodiesel feedstock instead of livestock feedstock, we are not increasing CO2 absorption and not creating a significant gain on the CCC. Converting pastureland is different for the following reasons:

1) The plants growing on the converted pastureland would be larger (assuming the water resources were there to support them) and would absorb more CO2.

2) The animals will have been removed removing the methane production from the animals and the methane and NOx emissions from the manure. Since methane has 23 times the Global Warming Potential (GWP) and NOx has 296 times the GWP of CO2, this is significant.

3) The animal feedstocks (corn) will be converted for food (probably soybeans) or bioenergy use (probably switchgrass) and would use less fertilizer N.

4) Land degradation and the taking of forest habitat can stop (especially with the help of government policy makers). The replacement of pastureland back to prairie will not only support wild habitat but it can be an economic boom to ranchers (as switchgrass has been shown to produce 1,150 gallons of ethanol per acre and its output, considering all the energy inputs, is certainly higher than the raising of beef).

5) Fossil fuel use for animal production, transport, processing and refrigeration will be attenuated. Removing the fossil fuel use in these sectors is significant.

And then there is the question of water. According to the LEAD report, “The availability of water has always been a limiting factor to human activities, in particular agriculture, and the increasing demand for water is a growing concern. Excessive withdrawals, and poor water management, have resulted in lowered groundwater tables, damaged soils and reduced water quality worldwide”. “The agriculture sector is the largest user of freshwater resources. In 2000, agriculture accounted for 70% of water use and 93% of water depletion worldwide”. “As a direct consequence of the expected increase in demand for water,….by 2025, 64% of the world’s population will live in waterstressed basins (against 38% today)”. “Increasing water scarcity is likely to compromise food production, as water will have to be diverted from agricultural use to environmental, industrial and domestic purposes”. “Summing up the impacts of all the different segments of the production chain, the livestock sector has an enormous impact on water use, water quality, hydrology and aquatic ecosystems”.

The above projections don’t even take into account the effects of climate change projected by the IPCC. Higher temperatures will increase the likelihood of droughts with its concurrent impact on agriculture: “In some countries, yields from rain-fed agriculture could be reduced by up to 50% by 2020.” (IPCC AR4, Group2).

Because of the above, the world and the US in particular must consider more water and energy efficient food choices. According to the article from the American Journal of Clinical Nutrition (9/2003) referenced in our previous report, meat production took more land (6-17 times as much), water (4.4 to 26 times as much, and biocides (pesticides and chemicals, 6 times as much) as soy products. With that in mind, we must reduce the land, energy and water devoted to the production of meat and dairy and we should do this in a way that improves the environment and least impacts the meat and dairy industry and its consumers.

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