

Intensive animal production directly consumed 670 million tonnes of cereals and legumes (a third of the world's output, 2002 figures) and a further 350 million tonnes indirectly as protein rich concentrates (bran, oil cakes and fishmeal) (Steinfeld 06). It would be much better for the world if this were used to feed humans directly. Such use as animal food is hugely inefficient and wasteful of our resources as well as being damaging to the environment and unsustainable in the longer term.

The overall area devoted to livestock and hence its impact on the world is impressive. The livestock sector occupies directly and indirectly around 3.9 billion hectares, which represents a third of the world's land area. This breaks down into 0.5 billion for mainly intensively managed crops (representing a third of all crop lands), 1.4 billion for relatively high productivity pasture and 2.4 billion for low productivity pastures (Steinfeld 06). The impact of livestock production in all these categories is of major concern. See the section on [environmental damage](#). Despite this massive land use, livestock only contribute 1.4% of the world's gross domestic product.

The extent of intensive animal operations is very impressive. The following table shows the proportion of the world's production of various types of animal protein that comes from intensive operations.

Poultry	75%
Pork	40%
Eggs	66%

By 2001, three countries, China, Vietnam and Thailand, produced more than half the pigs and one third of chickens world wide. Brazil is likely to become the world's leading exporter of meat. Virtually all new production is of the intensive type and methods of production are largely uniform. The concentration of these operations in such countries is related to low labour costs and where environment controls are not as strict (Naylor 05).

These giant agribusinesses hide behind a series of myths and few people question their validity. There are huge advertising and political lobbying machines out there to stop any real questioning of these

operations. The following assertions have been repeated so often and extensively that most are convinced that they are true.

The myth	The truth
Industrial agriculture is necessary to feed the world.	If most people in the world were fed this way, we would require several world's of resources. These operations are good for making a profit for agribusinesses but are bad for the world.
It supplies us with safe, nutritious and cheap food.	It promotes the development of new and frightening microbes; manufactured feeds markedly reduce the nutritional quality of the food produced; the food is only cheap because the purchase price doesn't include the cost of environmental and health damage.
It is environmentally safe	It causes huge damage to the environment, both from production of feed and pollution caused by the animals themselves.
Future technologies will overcome all these problems.	While some advances have been made, most problems remain intractable.

The amount of land used to produce the typical western meat filled diet is much greater than that required for more traditional diets. For example a balanced Chinese in early 1990s containing around 20kg of meat per capita per year required about 1000 sq metres of land. The typical western diet takes four times that much. If the everyone in the world consumed a typical western diet of 80kg per capita per year of meat, global agricultural land use would have to rise by at least two thirds. To meet the rapidly expanding demand, the area of land used to cultivate soy beans in Brazil has more than doubled in the last 10 years to 21 million hectares and is expected to increase to 40 million. They supply animal feed within Brazil but also to China, India and other parts of the world. There have been very substantial intrusions into the Amazon rainforests because of this, leading to major protests in Europe against the Cargill corporation, one of the world's largest agri-businesses which has been involved in this exploitation.

The fact is that there is really not enough suitable land available to meet the increased demand for stock feed. The area of land under cultivation has risen progressively over the last 100 years to around 2.5 million sq kilometres. There is probably only about 0.2 million sq

kilometres left for further development, very much less than what would be required to feed all the additional animals. See the section on [Environmental Damage](#).

The amount of energy used to produce animal protein is much greater than that used for producing crops. An energy efficiency value for a particular food can be derived by dividing the energy available to humans from that food by the amount of energy used to produce it, and then expressed as a percentage as shown in the following table (modified from Eshel 06). The higher the value the better it is for the world. Figures above 100 indicate more energy is available for humans than was used in the production of that food.

Food Item	Energy Efficiency %
Chicken	18.1
Milk	20.6
Eggs	11.2
Grain fed beef	6.4
Lamb	1.2
Salmon farmed	5.7
Shrimp	0.9
Corn	250
Soy	415
Apples	110
Potatoes	123
The lower the figure the more inefficient the process, requiring higher energy inputs.	

As you can see most animal protein production is very inefficient way of producing food energy for humans, particularly those that involve intensive feed lot operations, where all the efficiencies are less than 7%.

Another way of examining this is to look how many kilograms of food it takes to make a kilogram of finished product. These figures come from the Council for Agricultural Science and Technology 1999 (Modified from CAST 99):

Animal	Kg feed per kg of product
Fish	1.5 -2.0
Poultry	2.1-3.0
Pigs	4.0-5.5
Cattle	10

Greenhouse gas emission can be substantially reduced by curtailing the amount of meat in the diet. The difference between a standard US meat containing diet and a vegetarian diet in terms of green house emissions is substantial at around an extra 0.72 tonnes of CO₂ equivalent/person/year according to a study done at the University of Chicago. For comparison greenhouse gas emission from two vehicles, one a small hybrid and the other a standard sized car, was made. The distance travelled by the vehicles per year was estimated at 16,000km. (Modified from Eshel 06).

	Toyota Camry	Toyota Prius	Difference between standard meat and vegetarian diets
Green house gas emission in CO ₂ equivalents/year in tonnes (1000kg)	2.28	1.21	0.72

The difference in the vegetarian and standard meat diet approached that which would be saved by switching from a medium sized car to a highly efficient hybrid car. Remember that if two people regularly rode in the car, the savings from diet would be doubled compared with car emissions which would only be increased marginally.

A kilogram of beef is equivalent in GHG production to driving a large car for 160 kilometres or several days of electricity usage in an average household. A Japanese study (Ogino 07) has calculated that 1 kilogram of beef is associated with 36.4 kg of CO₂-e production, which is similar to a comparable Irish study of 32.1kg CO₂-e/kg of beef quoted in the same paper. Such levels would equate to driving a large car (200g CO₂/km) for around 160 kilometres or around the generation of 40KWh of electricity from a conventional coal fired power station, enough to run a standard household for about 4 to 5 days. (The generation 1KWh produces around 900 gm of CO₂ and an average household uses about 8 to 10KWh per day of electricity.)

The logic behind expanding animal-based food production to feed the poorer people of the world is flawed. Intensively produced meat cannot possibly feed the world's poor: if their meagre supply of plant-based foods is already inadequate to feed them directly, then by using such output in a striking less efficient way to produce animal-based foods is illogical. (Gold 04) Yet in many developing countries, such production is already huge, providing enormous profits for the western promoters but little for the majority of the local inhabitants, providing little in the way of employment or local business development.

As example in Brazil the number of chickens slaughtered has more than doubled to more than 3.5 billion, yet the number of people considered to be malnourished has also risen. The fate of Sri Lanka's poultry industry is a cautionary tale. In the 1990s many small operators moved into this area and initially did well. The with rising costs of feed and antibiotics, they were forced out by aggressive large multinationals unable to compete, at great cost to their local communities. The fact is that such huge animal meat export industries as in Brazil or Thailand exist not because there is well fed local population, or that there is a food excess or that such commodities cannot be produced elsewhere in the world but because there is money to be made by powerful western corporations in using cheap local labour and taking advantage of much less restrictive animal welfare and environmental regulations. (Gold 04)

It is totally illogical and probably immoral for some poorer countries to import grains to feed to animals which they then export to rich countries. Such practices are often encouraged under free trade agreements by bodies as the World Bank to bolster local GNP, where in fact they do little for the ordinary person in the street. The trickle-down effect often doesn't happen.

Is there a possibility of improving yields to overcome the shortage of land for agriculture? This seems unlikely. Genetically modified crops to date have not supplied increased yields but have had a number of adverse consequences from the use of herbicides and the exclusion of wildlife from these vast monocultures. They have also concentrated ownership of such enterprises in fewer and fewer hands.

References:

(CAST 99) Council for Agricultural Science and Technology. contribution of Animal Agriculture to Meeting Global Human Food Demand. 1999.

(Eshel 06) Gidon Eshel, Pamela Martin. Diet, Energy and Global Warming. Earth Interactions, Vol. 10, pp. 1-17, March 2006

(Gold 04) Mark Gold. The global benefits of eating less meat. Compassion in World Farming Trust. 2004. Downloadable from www.eatlessmeat.org

(Ogiono 07) Akifumi Ogino, Hideki Orito, Kazuhiro Shimada, Hiroyuki Hirooka. Evaluating environmental impacts of the Japanese beef cow–calf system by the life cycle assessment method. Animal Science Journal 2007; 78: 424–432

(Steinfeld 06) Henning Steinfeld, Pierre Gerber, Tom Wassenaar, Vincent Castel, Mauricio Rosales, Cess de Haan. Livestock's long shadow: environmental issues and options. LEAD/FAO publication 2006. Downloadable from www.virtualcentre.org/en/library/key_pub/longshad/A0701E00.pdf