Session 1: Sustainable Development of Animal Production

Animal Protein Production in a Resource Depleted World Subject to Environmental Decline and Global Warming

Ron A. Leng
Emeritus Professor, University of New England, Armidale, NSW, Australia

The world is faced with an interrelated and interactive triple crisis: climate change, Peak Oil (the end of inexpensive energy) and global resource depletion. The certainties are that there will be great changes to contend with in the future in order to produce and deliver food to maintain the present and future predicted world population, let alone a balanced diet for everyone.

If there is anything that must be understood with regard to energy it is its relationship to food. Agriculture is an energy intensive sector with row crop production particularly affected by energy price increases. Fertilizers embody the most energy among production inputs because natural gas is the primary input (70-90 percent of cost of producing nitrogen fertilizer). Inexpensive fossil fuel allowed food/feed (of which cereal grain constitutes 80%) to be produced inexpensively but this will change greatly as oil prices rise with depletion, creating the potential for major disruptions in availability of food for humans and feed for industrial livestock production. At the same time fertile land for food /feed crop production may diminish along with yields of crops for a number of compounding influences. These include: the damaging effects of climate change, decreasing water availability for agriculture, decreasing land availability/ fertility and increased use of land for feedstock for the biofuel industries. The worst impacts of peak oil will hit much sooner than the worst impacts of climate change and will be the dominant factor effecting future animal production strategies in all countries

The livestock revolution was predicated on world surplus(and therefore inexpensive) grain being exported from industrialised to developing countries to support pig, poultry and ruminant production in the same way as these industries had developed in those same exporting countries. However, grain surplus to human requirements (food and feedstock for industry) is unlikely with the present developing scenario, particularly if the human population climbs from 6.7 to 9-10 billion people. The expectation is that world cereal grain availability for livestock production will be highly restricted, with major reduction in factory farming of livestock world wide.

The animal production industries based on herbivores (mainly ruminants and rabbits) will need extensive development, exploiting a wide range of waste by-products of agriculture or biomass from land not dedicated to food or biofuel production. A primary source of biomass will be cereal straws which are treated to improve their digestibility and precision supplemented to optimize their efficient utilisation by ruminants.

Localized, diversified agriculture appears to be the best option for future food production with farms producing a variety of products close to centers of population. Integrated ruminant

animal/fish production with crops including recycling of nutrients and water must be developed. It will be essential that the inputs and products are processed locally. Low energy Mini –mills for treatment of lignified by-products and local production of protected proteins from high protein byproducts are essential for ruminant meat and milk production on such by-products.

Integrated system of crop residues fed ruminants/rabbits and herbivorous fish seems to be the most likely efficient animal protein production systems for the future and can be adapted to small-holder and large scale farm production associated with major population densities.

Grazing ruminants can be expected to expand production with the same technical inputs as for animals fed crop by-products but with developments of holistic grazing management that resolves land degradation and optimizes sequestration of carbon in soil carbon pools.

The downside of ruminant industries will be the potential increase in enteric methane production, a potent greenhouse gas. Processing of feed and supplementation of pasture and forage by-products, that promote high levels of production, minimises the production of methane per unit of product and in addition a new prospect for limiting methane production in fermentative digestion indicates that this could be reduced substantially in the future.

Ron A. Leng
Emeritus Professor, University of New England, Armidale, NSW, Australia.

Academic Degrees
1972 D Rur Sc, University of New England, Australia
1964 Ph.D., University of New England, Australia
1959 BSc, University of Nottingham, U.K.

Field of Study
Nutrition and Biochemistry