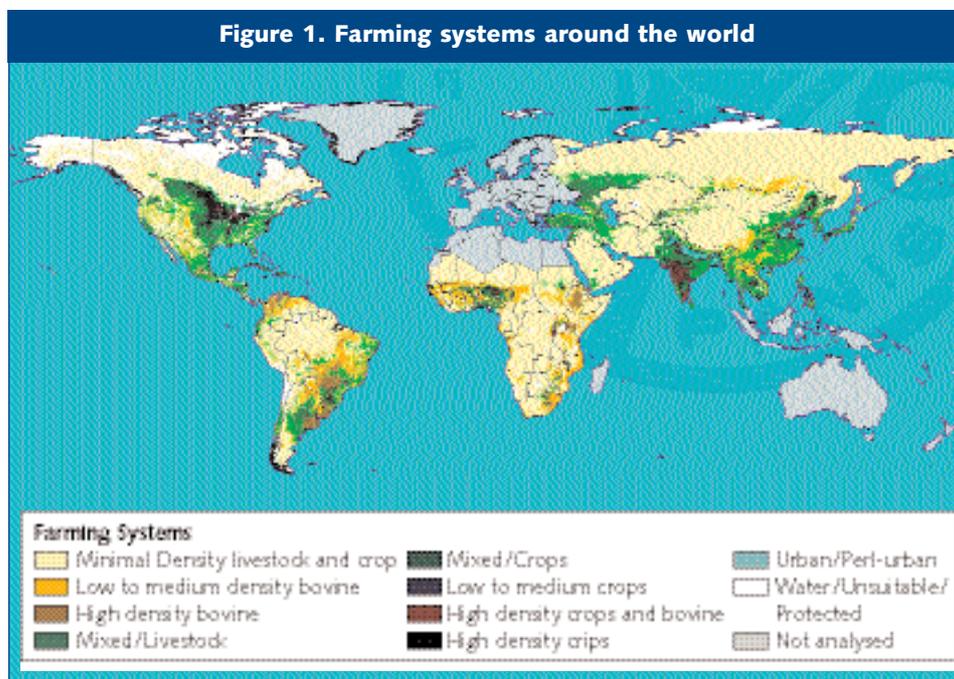


Will the Livestock Revolution succeed?

Imbalances in global livestock development must be redressed to halt the spread of animal diseases, food safety hazards and other veterinary public health risks.

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Figure 1. Farming systems around the world



Patterns of food consumption are becoming increasingly similar throughout the world, incorporating higher-quality and more expensive, safer meat and dairy products. This trend is associated with the increased international trade in foods, the global spread of fast food chains, and the exposure to North American and European dietary habits. Dietary convergence is particularly high among the high-income OECD countries. Clearly, dietary shifts have had global impacts on the demand for agricultural products and will continue to do so. Meat consumption in developing countries has risen from only 10 kilos per person per year in 1964/66 to 26 kilos in 1997/99 and is projected to rise further to 37 kilos in 2030. Milk and dairy products could rise from 45 kg now to 66 kg by 2030.

The FAO report *World Agriculture: Towards 2015/30* (FAO, Rome, December 2002) provides general statistics on trends in world food and agriculture. The assumptions made in this study are that the current world population of 6.2 billion will reach 7.2 and 8.3 billion in the years 2015 and 2030 respectively. Over half of the world population will be concentrated in

East and South Asia alone. With a projected per capita GDP growth for East and South Asia of respectively 5.3 and 3.9%, running to the year 2015, meat and milk consumption in East Asia would rise to resp. 50.0 and 14 kg/capita/year while the figure for South Asia will show the inverse of this, with 88 kg of fresh milk equivalents and only 7.6 kg meat.

The related FAO cereal balance sheets suggest that by 2015 East and South Asia jointly will require 42% of the total world demand of 2 379 million tonnes of grain. The feed required in East Asia by 2015 is estimated to amount to 218 million tonnes, or 24% of total world feed demand. It is speculated that East Asia, with this amount of feed, may realise 35% of the world meat production which totals 300 million tonnes in 2015.

Predicting trends

However trend lines based on country tables do not always produce good predictions. Predictions regarding income rise and income distribution are difficult, price elasticities affecting dietary trends are considerable, and each region has animal productivity levels and

associated feed conversion rates which vary considerably within and among the different livestock sub-sectors. The only clear pattern is that in all situations the stock levels, cropping intensity and general land pressures progressively increase with human population density and/or proximity to urban centres or megacities.

Given that the country data may obscure important information, the analysis of trends in animal production also has to rely on sub-national, preferably district level data. In this regard, the recent developments in remote sensing, mainly satellite imagery, aerial photography, and the integration of Global Positioning Systems and Geographical Information System tools have greatly assisted the generation of high resolution land cover and land use data. This data has revealed important, novel insights. Historically, people settled in areas of high land quality, disease free highlands, sufficient rainfall and river basins. Agriculture became prominent in places where food production was relatively easy (*Figure 1*).

In large areas of the developing world with

basic levels of both crop and livestock production, where technology is low, inputs scarce and markets poorly developed, population pressures lead to integrated crops/livestock systems as the most efficient and sustainable means of increasing off take from a fixed land base. Invariably though, population pressure eventually drives agriculture towards progressive intensification. In urbanising environments productivity gains from crop-systems decrease, but can be further enhanced by the use of technology and inputs. Specialised farming units evolve to generate specific food commodities, including animal protein products.

Critically important in all these scenarios is the number of people against the amount of agricultural land (Figure 2). Each continent has evolved differently. Asia has an extremely high people/land ratio. Africa forms an intermediate situation, while in South America land is relatively more abundant. Countries in Europe are not shown here because its extremely high level of agricultural productivity and relatively small land mass render a spatial classification of farming systems largely futile.

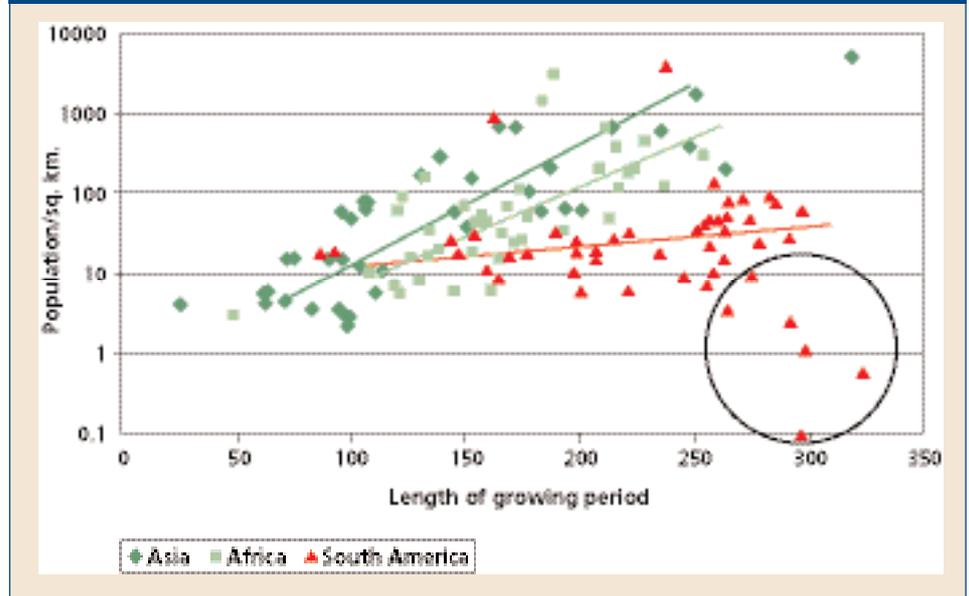
The ‘Livestock Revolution’

The most peculiar feature about animal production is that the intensification of the livestock sector has created a disconnection between the amount of available local land and feed resources, the location of the livestock production units, of the associated processing industry, and the proximity of markets. The international trade of livestock products is valued at US\$200 billion.

The trigger for this ‘Livestock Revolution’, which will peak around 2015, was similar to that of the Green Revolution during the sixties and seventies. Regarding the latter, regions of high demographic pressure successfully realised a rapid increase in crop productivity commensurate with the surge in demand. Improved seeds, fertiliser, pesticides, irrigation and other inputs all contributed to transform agriculture, in particular in East and South Asia.

However, the Livestock Revolution is dissimilar to the Green Revolution. While the increase in crop production in the densely populated areas of the developing world was contained by the physical limits of the available land resource, no such limit applies to

Figure 2. Farming systems of three different continents in relation to human population density and length of growing period; encircled are extensive but commercial beef ranches in remote areas



modern livestock industries. Since intensive livestock production systems are disconnected from the land, major geographical imbalances may develop.

This is best illustrated with the events in the poultry sector. Most of the demand for poultry protein stems from the emergence of a world medium income class found in megacities of transition economies and developing countries. This has triggered a global wave of peri-urban poultry industries in Latin America, the Near East, North Africa, East Asia and, to a lesser extent, South Asia. Only sub-Saharan Africa is lagging behind in this development.

An important feature of the global poultry wave is that this ‘revolution’ did not keep pace with local demand rise. As a result, countries increased their imports of feed. This applied in particular to the countries with high prevailing land pressure, such as East and South Asia. When Taiwan doubled production, from 1985 to 1995, it also doubled imports of corn from the United States from 3 million to 6 million metric tons. In China the increasing meat production is taking larger and larger shares of grain output.

While the European Union produces most of its own poultry, this production has accounted for a substantial proportion of world soybean

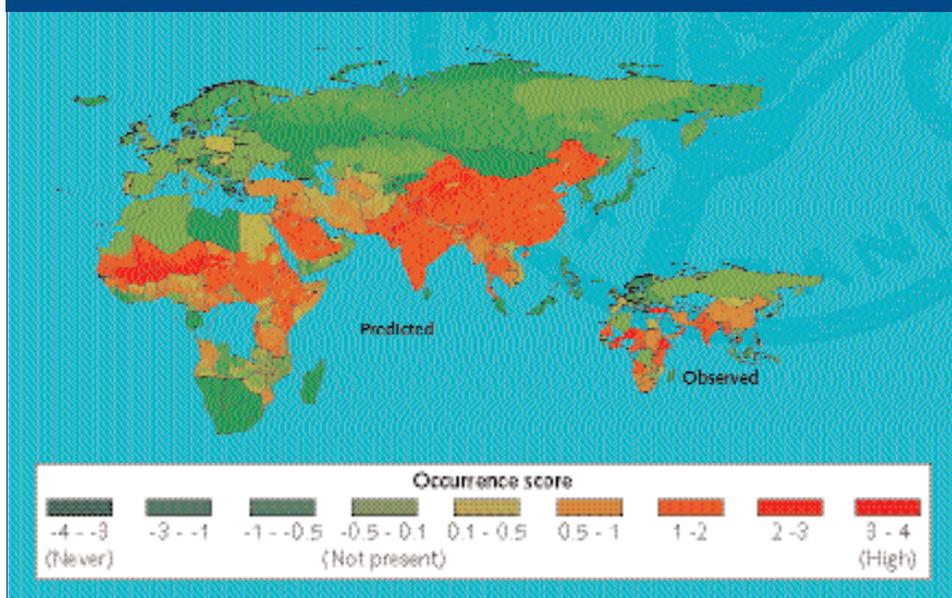
meal usage for three decades and will continue to do so for some time. Recent or prospective entrants to the European Union such as the Czech Republic, Hungary and Bulgaria have resource endowments that are favourable to broiler and egg production. Hence, production from western Europe may gradually shift to eastern Europe.

Four development stages

Extrapolating from the geographical patterns of livestock systems and guided by the above events in the world poultry sector we may discern four distinct, sequential, albeit overlapping stages in livestock development.

1. First, low input, low outcome production systems as persist today in mainly remote and harsh environments; the pastoral communities in the drylands and villages which remain out of reach of markets. There is a rich diversity of livestock well adapted to environmental stress. Husbandry systems mainly assist in sustaining livelihood in good and bad times; sales to the market are minimal.
2. Second, the transition from integrated crop-livestock farming to the development of specialized, commercial production units, generating a surplus for the market.

Figure 3. Disease occurrence worldwide



In the initial phase this process involves the creation of OIE List A disease free environments, genetic adaptation of animals towards high yields and efficient feed conversion, balanced nutrition, health care and modern husbandry practices as common nowadays to confined feeding operations. Feed resources in part arrive from elsewhere but the setting remains mostly rural; processing and marketing takes place nearer to the urban centres.

3. Third, producers find themselves in areas of high land pressure. Feed increasingly arrives from elsewhere and production units become integrated in a vertical chain. Industrial production, 'harvesting', processing and marketing thus form one continuum. The production process is driven by automation and standardisation. The commodities supply the regional market, with exportation to other countries.
4. Fourth, animal productivity approaches physiological limits and feed conversion rates converge in all the identical modern production units, irrespective of geographical setting. Production, processing and commerce is increasingly driven by multinational enterprises, and production and processing tend to shift to areas and countries where grain is relatively cheap. Mostly, these are the areas where agricultural land

is plentiful. In western Europe bulk quantities of cereals are simply shipped in from abroad. Also agricultural subsidies assist in keeping grain prices artificially low.

Imbalanced development

The main conclusion from these livestock production trends is that market forces sometimes fail, leading to imbalanced development. Geographical distortions ensue from the disconnection of feed production, protein chains and market. Animal populations keep expanding in the most populous places on earth while most of the income generated from livestock remains concentrated in the North. It comes as no surprise that the diseases are much more widespread in the South (Figure 3). The historical head-start of OECD countries in the elimination of disease, the subsequent rise in agricultural productivity, the sustained subsidies and market policies, the early shift from staple food to protein rich diets, all contributed to the current discrepancy between poor and rich countries.

International Public Goods are at stake. East Asia still will meet with major difficulties should it seek to sustain the production of half the world's poultry and pork output. The entry of China in the WTO may put over 15 million farmers out of a job. Grain prices will increase and livestock producers may lose their

competitive edge. Environmental and veterinary public health hazards are on the increase.

South Asia cannot continue to produce dairy at the current low levels of productivity. Land pressures are critical and yet the region supports over half of the world's ruminant population, a reservoir for multiple OIE List A + B diseases. Countries in the Middle East import over 10 million live ruminants each year, arriving from four different continents. Diseases are spreading from the Greater Horn of Africa to the Arabian peninsula and from there to the Mediterranean basin. India and southern Europe are connected by a 'ruminant' street within which vector transmitted and other infectious agents are freely spreading. Climate change and globalisation assist this development. Africa has already lost most of its export market as a consequence of disease spread.

Corrective action needed

Where the Green Revolution met with much success the Livestock Revolution may fail unless corrective action is taken. This may take the form of renewed private - public partnership. As a first step, there would appear a need to redress the spread of transboundary animal diseases, food safety hazards and other veterinary public health risks.

For two centuries public veterinary services were seeking an expansion of disease free territories enabling ever larger trade volumes of animals and their products. Perhaps this process has come to a standstill and time has arrived for a novel approach. The land-feed-livestock-product-consumer-environment circuitry may have to be re-designed in order to halt risk multiplication, improve quality control, labelling and introduction of a modular approach. More 'localness' and land bound systems may also assist in averting the geospatial spread of pathogens.

Local adjustment of livestock industries to directly and sustainably support economic development and agro-ecology of the region may hold the key to calling off any future hazards. ■