

Future of Livestock Production in Latin America and Cross-Continental Developments

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ABSTRACT: The future of animal production will depend on the need for animal proteins for human consumption and health. The world's human population is projected to grow to 8 billion in 2020. The standard of living will rise too. Intensification of livestock production will occur as a response to growing demand for food of animal origin. However the requirements for food production will become broad based. These requirements are evolving from food security to food safety, a clean environment, and socially acceptable systems of production. The overall concept of animal production is moving from the techno-centric to the eco-centric, and finally, to the holo-centric paradigm. Inclusion of all stakeholders in the production process and chain becomes conditional to the farmers' license to produce. International trade will become based on the demands of the consumer. The principles of sustainability, i.e. integration of economics, ecology and social values in a given context are likely to become incorporated in the products of animal agriculture. Therefore cost will no longer be the single determining factor. Exchange of information about sustainability will be essential for development of animal agriculture at the local level and for the opportunities of trade.

Key words: Agro-ecology, Agricultural economics, Animal production, Latin America.

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Futuro de la Producción Animal en América Latina y el desarrollo intercontinental

RESUMEN: El futuro de la producción animal dependerá de la necesidad de las proteínas animales para el consumo y la salud humanas. Se proyecta que la población humana del mundo estará cercana a 8 mil millones en el 2020. El estándar de vida también se incrementará. La intensificación de la producción ganadera sucederá como respuesta a la demanda creciente por alimento de origen animal. Sin embargo, los requisitos para la producción de alimento exigirán bases más amplias. Estos requisitos se están evolucionando desde seguridad de tener alimentos hasta alimentos seguros, un ambiente limpio y sistemas socialmente aceptables de producción. En el concepto más amplio, la producción animal se está moviendo desde el paradigma tecno-céntrico al eco-céntrico y, finalmente, al holo-céntrico. La inclusión de todos los tenedores de apuestas en el proceso y la cadena de producción condiciona la licencia de los granjeros para producir. El comercio internacional se basará en las demandas del consumidor. Los principios de sustentabilidad, es decir integración de la economía, de la ecología y de los valores sociales en un contexto dado, deberán incorporarse en los productos de la agricultura animal. Por lo tanto, el costo no será el único factor determinante. El intercambio de la información sobre sustentabilidad será esencial para el desarrollo de la agricultura animal al nivel local y para las oportunidades del comercio.

Palabras clave: América Latina, Agro-ecología, Economía agrícola, Producción animal.

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Introduction

The future of animal production will depend on the need for animal proteins for human consumption, the success in preservation of the environment and the conservation of genetic resources. The challenge to feed 8 billion people in 2020 is enormous. And with an increasing standard of living the demand for animal products is rising. Equally civil society demands a clean environment, conservation of nature and recreation facilities.

Sustainable development is based on a balance of ecology, economics and norms and values. There are trade offs between these three components of sustainability, which will depend on the status of the parameters and their value for the society at large as well as for individual farmers. Therefore we have to consider differences at various levels of the scale: between farming systems, regions, nations and continents.

Globalization of trade and some aspects of the environment like climate change show the increasing interdependence between regions, countries and continents. In this paper I will focus on the Latin American continent and contrast its expectations for animal production with those of the Netherlands. Increasingly the environment, food safety and ethical considerations may effect the opportunities to utilize the free trade agreements. The expression "Think globally and act locally" is becoming more valid over time.

Development in Latin America

In the following discussion developments in Latin America up to 2020 will be explained. Most of the information is based on publications of the International Food Policy Research Institute, FAO, ILRI and the World Bank. To focus on principles of sustainability these developments are organized as aspects of agro-ecology, agricultural economics and norms and values.

Agro-ecology

The population of Latin America is expected to grow to 665 million people in 2020. People living in cities represented at least 70% of the total population in 1997 and should reach 83% in 2020. Therefore poverty is not only a problem for rural communities, but also of cities. At present, about 44.5 million people work in agriculture out of the 480 million total.

Almost 10% of the world's crops are harvested in Latin America. Small farmers produce up to a third of staples like maize and beans on less than 15% of the

cropland. The expected growth in cereal production is 2.2%, leading to a yield of 3.6 metric tons/ha in 2020. Yield improvement accounts for 75% and increase in area for 25% of the total gain in production. Some of these crops will be transgenic. For example in 1998 Argentina produced 4.3 million hectares of such crops. Cereal feed use has been projected to increase at an annual rate of 2% from 116 kg/capita in 1993 to 140 kg/capita in 2020.

Predicted annual growth rates for meat and milk production are about 2.2% for the period 1993 to 2020. For meat, production will increase to 59 kg/capita and milk to 121 kg/capita. These figures compare to those of the developed world of 87 kg for meat and 267 kg for milk. The expectations for Latin America compare very favorably with those of other developing countries. The growth rates over the period 1982 to 1994 are especially impressive for poultry where the output increased by 6.6% per year. Most of the increase in poultry production is occurring in Brazil. Cattle and milk increases were above 2%, but pigs showed no change.

Latin America accounts for 9.8% of the world's total area of harvested crops. Irrigation is used on 12.5% of the arable land. Of the total of 1,714 million hectares about 250 million are degraded. A major resource are the natural and improved grasslands, which form 75 % of the total. About 18 % of the pasture land is degraded, especially in Central America. Almost half of the world's beef, 32% of milk, and 8% of mutton and goat meat come from grazing systems in Central and South America.

Deforestation is a major contributor to environmental degradation. In South America land cleared for livestock accounts for 44% of the deforested area compared to 25% for crops and 10% due to exploitation of forest products. In the north west of the continent the mixed farming system is collapsing (Livestock-Environment study). This reduces the opportunity to utilize livestock to maintain the nutrient balance in the soil. In Latin America, with land not being a limiting factor, intensification and diversification can offset the trend to reduced soil fertility and land degradation.

Other important natural resources issues are water, energy, and pesticide use. Agriculture contributes to climate change through the emission of carbon dioxide, methane, and nitrous oxide. Cattle and sheep produce methane, but world production has been static as the feed quality has improved and relative growth is highest in pig and poultry production. Pigs and poultry are minor producers of methane. Given the requirements to use fossil fuels and fertilizers for pig and poultry feeds the emission of the other two green house gases will increase. Water is utilized most for

agricultural production. The greatest use is in producing feeds for animals. The main problems are, therefore, scarcity of water and water pollution as a result of intensified production.

Future developments will depend on environmental, farming and nature conservation policies, which may include favoring organic farming. Much will depend on the development of markets for more expensive organic products and the rigidity of enforcing environmental policies in Latin America itself and in the potential export markets.

Agricultural Economics

The per capita demand for meat products is projected to rise to 64.3 kg in 2020. Demand is very close to supply and this is also true for milk. Latin America is a net exporter of meat with a projection that exports will grow to three times the level in 1995 (0.53 metric ton). Net cereal imports will remain at the same level, implying that cereal production in Latin America will increase. Food prices will remain steady or fall slightly during the next 20 years. The new agreement on the creation of a Free Trade Area of the Americas (FTAA), if enacted, may have beneficial effects, but will largely depend on the U.S. policies to liberalize the imports of agricultural products.

Liberalization will depend not only on economic protection, but also on the disease status. The recent outbreak of foot and mouth disease in Argentina and the probable decision to start to vaccinate will hurt potential exports to the USA, but existing import quotas and subsidies make increased trade of this type virtually impossible anyway. The situation in the European Union (EU) is very similar, following the recent outbreaks of this diseases in UK, France and the Netherlands.

Norms and Values

In Latin America and the Caribbean the per capita income level is projected to increase from \$3,590 USD in 1995 to \$6,266 USD in 2020. Latin Americans have by far the best outlook compared to the rest of the developing world, but still this level is only about 20% of the income in the developed world.

In the next 20 years the intake of calories per capita will grow to 3,008 per day and in the developed countries to 3,328. The percentage of malnourished children will decrease from approximately 10 to 5%. Latin America will also make progress in decreasing the number of stunted children by about half. The causes of poor infant growth are related not only to calorie

intake, but also to hidden hunger, the deficiency of micro nutrients. Pregnant women and children suffer most from hidden hunger, 33% and 18% in the Americas, respectively. Experience in Africa has shown that child malnutrition is determined by food availability, health environment, and women's status and education. Possibly understanding these factors will also show the way to improvement in Latin America.

In the study entitled *Livestock to 2020: The next food revolution* (1999), the place of livestock ownership in family income has been reviewed for Brazil. Of 384 rural households with livestock, 32% were malnourished while 27% were not. In the Western Amazon of Brazil the lowest 20% of 154 rural households received 37% of their income from cattle and the highest 20% received 64%.

Other issues affecting public health and well-being are the safety of foods of animal origin. In the rendering of animal tissues for feed BSE is not a cause of concern in Latin America, as it is in the EU. Zoonoses like tuberculosis and *Brucella abortus* infections may become important with the increase in urban populations. *Salmonella* and *Campylobacter* are of major importance in intensive systems. Quality control programs to monitor the status of these infections and of residues like dioxins, heavy metals, and pesticides will be necessary to maintain public confidence in animal products. Similarly animal products can profit from inclusion in organic farming systems, which have a balanced nutrient management and products free of pesticides, herbicides, antibiotics, and residues. Animal welfare has also been guaranteed according to rules agreed upon in certification programmes for organic farming.

Conclusion

The Latin American continent as a whole is moving forward and in the next 20 years should achieve an improved nutritional status, less poverty, and more intensive agriculture. Soil degradation problems caused by overgrazing, deforestation and the involution of mixed farming systems can be prevented by intensification and diversification. This move to more intensive animal agriculture will require knowledge about animal production, management of the environment and food safety, and nature conservation. Access to international markets will depend on progress toward removing protection barriers and on the disease status and quality controls for safe food. Organic farming may provide an attractive alternative. Increasing investment in research, extension and education, and integrated food production and

processing and marketing chains will be necessary.

The continent, however, is very diverse in agro ecologies and socio-economic conditions. The encouraging average growth rates do not reveal extreme differences in standards of living and access to essential resources. There are opportunities for the poorest farmers to become involved in the production of animal based foods. The direction of government policies will be decisive to enable participation of the poor in the process of increased food production and achievement of higher income.

Development in the Netherlands

Obviously, a direct comparison between the Latin American continent and a small European country like the Netherlands is not possible and not useful. However, the trends of livestock production in the Netherlands open up some scenarios that are relevant for other regions. This may relate to export opportunities, to effects of intensification and to societal change. The same principles of sustainable development will be applied in this presentation.

Agro-ecology

In 1999 the total number of cattle in the Netherlands was 4.2 million of which 1.6 million cows belonged to the national dairy herd and 752,000 were for veal production. The number of pigs was 13.6 million with a total production of 23.5 million animals per year. The number of sheep and goats was 1.4 million and 153,000, respectively. Broiler chickens and layers numbered 53.2 and 30 million, respectively.

Beef consumption per capita is about 18 kg. Imports and exports of beef are balanced; more live animals (about double) are imported for slaughter than exported. Beef production is slowly decreasing. The number of dairy animals is also decreasing with an increasing level of milk production per cow. In 1999, there were 1.6 million dairy cows on 32,000 farms with 50 cows each. Since 1990 the number of farms has decreased by 10,000 and the number of cows by 300,000. The annual yield per cow increased by 1,000 kg. The effect of reduced cow numbers on the veal production system has led to the purchase of surplus calves in and outside the EU as far away as Ireland and Poland. Most of the veal produced is exported. Production offsets demand by 915%. With a domestic consumption of 43.7 kg of pork per capita the production covered 268% times the demand. Lamb is a unique product with a consumption of 1.4 kg per capita. As with beef, the demand is met by the supply. Chicken is consumed at a rate of 21.9 kg per capita per year. Supply exceeds demand by 202%. Egg

consumption is 180 eggs per capita. About 44% of the eggs produced are from free-range chickens. Supply was 342% of demand.

On the average, about half of the livestock production is exported. About 70% of pigs and poultry are produced for export. This also includes live fattened pigs and piglets besides meat and eggs. The fact that many calves for veal production originate from outside the country explains the need for disease control on the European continent and increasing protests against the welfare of live animals transported across Europe.

The large numbers of farm animals on small areas of land have associated effects on mineral emissions, which pollute soil, water, and air. Since the mid 1980's the Dutch government has designed policies to decrease pollution to acceptable levels. These levels are associated with previous emissions and with soil type. Sandy soils are very sensitive to overloading with nitrogen and phosphate, and in the sandy regions large concentrations of pigs, poultry, and dairy operations have occurred. Major problems are caused by ammonia emissions. The EU policy dictates future requirements, allowing 50 mg nitrate per liter of surface water.

So far most regulations have been based on controlling inputs in terms of manure application to arable and grass lands. The farmers can regulate fertilizer application and concentrate feed inputs and management of the soil. Adequate soil management with good quality manure should solve the mineral problem and lead to acceptable surpluses. The surplus allowed is 180 kg N per ha (140 kg on sandy soils). An improvement in efficiency of nitrogen utilization for milk and meat production in cattle can also make a large difference. The efficiency is now lower than 20%. In pigs and poultry, systems with close to zero emissions have to be adopted. These farmers have virtually no land except for the buildings. For manure disposal they have to contract with arable farmers to solve this problem. In the future this may lead to feed for manure exchanges. All livestock and arable farmers have to keep accounts of manure and fertilizer applications. Applications beyond allowed surpluses for each crop are taxed.

Society increasingly utilizes rural areas for recreation and tourism. There are many amateur farmers mixed with the professional ones and the cause of nature conservation is highly supported. The Dutch have a historic and traditional appreciation for land-based farming like dairying. Farmers have performed the role of landscape manager and keeper. The same has been true for maintenance of waterways and now, through environmental regulation, water quality and storage are included also.

In the EU and in the Netherlands the future of

livestock farming will likely depend on cross compliance or modulation systems rewarding land-based farmers for nature conservation, landscape management, employment, and a clean environment; for example, protecting ground water for human consumption. Governmental policies in Europe are guiding farmers in the direction of organic farming. In the Netherlands the goal is to farm 10% of the land organically in 2010. Only Austria is farming its land at that level now. Germany similarly wants to move up to 10% in five years and Denmark is already producing lots of organic dairy products, having doubled organic milk production during the past year. It will be a matter of time before the EU as a whole adopts these policies and bases the modulation plans on organic farming too.

Agricultural Economics

As pointed out in the previous section, production in the Netherlands is mainly for the European export markets. Many conditions favored intensive production systems in agriculture. Its central location in Europe made accessibility for both inputs and outputs attractive. Less favorable factors include extremely high land prices, high labor costs, costs of environmental regulations and welfare measures, and the relatively high risk of epidemics like swine fever and foot and mouth disease due to intensive human and animal traffic. Favorable developments are the increasing efforts for quality control in processing and on farms; the farmers' awareness of societal issues, like welfare and nature conservation; and the multifunctional land use for clean water, recreation and tourism, and landscape management. The demand for land for housing and industrial use competes with the demand for farm land and nature conservation. The future farmer will probably depend even more on income from other sources. Two thirds of the farmers already have other sources of income originating from employment outside the sector.

Dairy farmers can change to organic farming with the present high price level of organic dairy products. Organic pig and poultry farmers have to buy land to house their animals outdoors and, ideally, to grow organic feeds themselves. They also have to change housing systems completely. If no financial support is made available, it will be very difficult for these sectors to make the switch. The change to organic swine production may also be less easy because consumers cannot easily identify a different taste of organic pork as they can the tasty organic dairy products and poultry meat. Essential for the development of organic livestock farming in the Netherlands will be the continued high

pricing of these products. The organic dairy farmer requires 50% more land to produce enough feed on the farm. Essential also are monitoring systems for quality control, including food safety, environment, and welfare, to guarantee consumers products of organic origin for which they are willing to pay more.

The switch to policies favoring organic farming is likely to affect traditional farming systems also. Research for organic farmers will produce solutions that other farmers will utilize too. Inversely, organic food chains will profit from the experience that has been gained in marketing free range eggs. More farmers become involved in quality control programs beyond the base level, thus, ISO 9000 and HACCP are becoming familiar concepts on the farm. Most pig farmers are participating in the Integrated Chain Control program. Furthermore, poultry farmers who had joined an ISO 9000 standard, could prove that their feeds were free of dioxin, thus, exports proceeded unhampered during the dioxin crisis.

Norms and Values

The outbreak of foot and mouth disease came at a time when discussions about the future of farming already were ongoing in the government, farmers' organizations, and many consumer and nature conservation based groups. The crisis revealed much public respect and solidarity for dairy farmers in their struggle with the eradication measures. The dilemma is how to maintain the export position, which is dependent on non-vaccination for foot and mouth disease, and export guarantees the livelihood of the Dutch farming community. For the farmers' organizations this represents a real prisoner's dilemma. The outbreak of foot and mouth disease did show that the damage is enormous because of the different agricultural sectors involved inside and outside the infected areas. All dairy, sheep, goat and pig farms in the Netherlands lost income. Pig farmers were especially hurt, because of lack of slaughter capacity for export. The on farm effects were crowded pig houses, lack of welfare and hygiene and sometimes even feed, when transport was forbidden. Tourism was estimated to loose three times as much as farmers in the affected regions, which were closed off for a substantial period of time. Recreation was not possible; public events like the Queen's Birthday celebrations were called off. Shopkeepers, retailers, veterinarians, and agricultural suppliers all lost substantial income. Nature conservation parks were closed off. Unique genetic resources were killed as part of the eradication procedure.

The above events have created intense societal

interest in the future of farming. There appears to be strong support for land-based dairy and sheep farming. But the farming systems have to become more extensive and should not rely on long distance transport of live animals. Land-based agriculture should move towards organic farming and include activities for water storage, clean water production, tourism and recreation and nature conservation, and provide for animal friendly housing. Ecological and economic issues could, therefore, be integrated in successful multifunctional enterprises provided there is an income from these new functions. Given the present intensity of Dutch farming these changes could provide some space in the export markets especially for Middle European countries soon to join the EU. The Dutch appear keen to buy products from the Netherlands itself to fully guarantee the environmental, economic, and ethical standards. This is an important issue for countries that wish to export to the EU. And finally, the non- vaccination policy of the EU will be reviewed at the end of the epidemic in terms of damage to livestock farming and all other sectors.

Future outlook for animal agriculture and conclusions

Dutch livestock farming belongs to the most intensive systems in the world. Inputs of technology, expertise and management are high. Productivity is also high because of much importation of concentrate feeds and in the past large applications of fertilizer. Environment, disease outbreaks, and animal welfare considerations require adaptation to more extensive and land-based systems. These systems also offer better opportunities for other functions like water storage, clean water production, nature conservation, recreation and tourism, and landscape management. For countries interested in exporting to the EU the conditions of food safety, environmental protection and animal welfare have to be met, even when trade liberalization has created a more level playing field. Consumers have become more critical and involved and demand transparency in the production process.

Governments in Germany, Denmark and the Netherlands have selected organic farming as a suitable paradigm system for development of multifunctional farming and extensification. The general public believes that organic products are environmentally sound, natural, healthy, and sustainable. Organic farming with scientific support, education and extension will most likely also influence traditional farming to adopt solutions derived from the organic system. The success of a major transition will, in the end, depend on the willingness of the consumer to pay more for organic

food and on the modulation standards of the EU.

In the middle of an array of issues animal agriculture has to develop its future strategies. These strategies are dependent on global and local conditions. When Unilever decided to develop sustainable agriculture indicators, they formulated the following ten clusters: soil fertility, soil loss, nutrients, pest management, biodiversity, product value, energy, water, social/human capital, and local economy. For each of these a number of indicators can be used to evaluate the state of the cluster. Some clusters are locally determined, others are linked to global markets, climate, and international infrastructure. The development of sustainability indicators does not automatically imply a choice of farming system for the future. For example a selection of farming system like high input or intensive, organic, traditional or integrated will depend on the values assigned to the indicators and those values will depend on the stakeholders involved. From a farmer's perspective the choice is dependent on markets. As the director general of ISNAR recently stated, these choices can be expressed as the green ladder, which emphasizes natural resource management; the equity ladder stressing poverty eradication; the eco-label ladder for producing healthy, often organic food; and the cheap food ladder based on high yielding agriculture.

In regard to Dutch agriculture, societal views reported the results of two major trends. The first trend is space dependent moving from high tech, landless systems to multifunctional use of rural areas; the second trend is based on the dichotomy-control of versus making best use of natural phenomena. The possible combinations of these trends will lead to four different images which represent: 1) traditional animal production systems with extra quality features; 2) combinations of livestock farming with water management, tourism, landscape management, and regional products; 3) organic farming including nature conservation; 4) and experience-based animal production for medical, educational and religious functions. And the potential development of these systems will depend on markets and regulations. To test the potential feasibility of this approach a series of projects have been started which include conditional participation of stakeholders and financiers.

Given the serious effects of the livestock sector on the environment and the effects of contagious diseases on the animal sector, other organizations are advising immediate action. The National Farmers Union for Agriculture and Horticulture announced proposals for regulations to ensure the future of natural resources like soil, water and air, and to limit live animal imports and exports and close livestock markets. The goal of these proposals is to achieve more social respect and

move to higher value added production chains. The Farmers' Union prefers dynamics above tradition, a perspective for future farmers. The issues are moving from the environment only to rural planning, marketing, veterinary requirements, and social acceptability. The foundation "Nature and Environment" recently proposed that in 2030 half of Dutch agriculture should be organic. This transition would involve higher prices for the consumer, subsidies for improvement of the landscape, limitations to farming near nature conservation parks, reductions of emissions by 50%, cross compliance based on environmental, welfare and nature requirements, and reduction of energy use in horticulture. Although there may be a difference in perception of time needed for change, all proposed changes move in the same direction and appear to coincide with the future images for animal agriculture.

The dynamics of change explained in the previous paragraphs are the result of new combinations of economy, ecology, technology, and norms and values in society at large. Zachariasse (2000) uses the expression of socially responsible entrepreneurship, which should be based on the best combination of the four dimensions. The concept of socially responsible entrepreneurship links with a shift in paradigm explained by Roling (2002). This new paradigm has been created as a response to the ecological deterioration of the earth. The cause of this ecological threat to human life are humans themselves. Explaining that ecological services are deteriorating at an increasing rate is not sufficient. Active management to enhance ecological services is needed. Therefore the techno-centric paradigm should be transformed into the eco-centric paradigm. Examples are integrated pest and nutrient management. The next paradigm would be the holo-centric. Here ecological or agricultural problems are dealt with by the stakeholders. This involves a human system in the context of a defined problem. Socially responsible entrepreneurship could be a result of both the eco-centric or the holo-centric paradigm.

For livestock farmers worldwide the challenges are diverse. Some are related to world market developments and global climate change, others to their regional natural resources, infrastructure, and technology availability. The strategies to be developed are becoming more dependent on the stakeholders, which include both consumers and citizens. The challenge is, therefore, far ranging, from natural resource management of soil, water, and air to animal and human welfare, from food safety and disease control to nature conservation and landscape management, from fair priced products of organic and regional origin to a decent farmers' income. The challenge will be to combine these requirements in

livestock production chains for successful marketing at the regional and global levels. The institutions in the production chain will have to reorganize themselves to fit different economic scales and to offer transparency of the production process. And the livestock farmers will become managers of ecologically and socially acceptable production systems to earn their license to produce.

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