Trends in animal agriculture in developing countries and implications on animal recording

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Summary

This paper makes a review of the past trends and future forecasts in animal agriculture based on a recent FAO and World Bank publication on world perspectives of agricultural development based on farming systems evolution in six developing regions of the world. Animal agriculture perspectives are analysed in five of the six regions excluding the Eastern Europe and Cental Asia Region which is covered in an other FAO paper of this Seminar. The analysis shows that in general the output and productivity of the main livestock farming systems have grown remarkably over the past 30 years particularly in the regions of Asia and Pacific and Middle East and North Africa. This has been and is predicted to continue to be driven by the demand stimulus provided by domestic urban economic growth and increasing human population. The major Latin American livestock systems evolution is driven either by strong demand for beef meat in the international market or increasing urban demand boosting intensive dairy, pig and poultry systems in urban neighbourhoods. Sub-Saharan Africa shows a rather more pessimistic picture in the past and future trends in animal agriculture. Suggestions are made for discussion on possibilities to introduce successful I&R (Identification and Recording) systems to the highly diverse livestock farming situations in the various regions and countries.

Keywords: *farming systems, trends, policies, institutions, animal recording*

Introduction

In the preparatory concept note for this seminar it was stated that the trends in livestock production which may have impact on the development and organization of animal recording can be summarised as follows:

- rapid increase of demand for animal products in developing and transition countries;

- increase in commercialization and intensification of animal production both in the rural family based systems as well as emergence of private sector industrial type of dairy, pig and poultry production in many CEE and CIS countries and peri-urban areas in the developing countries;
- withdrawal of the public sector from the production sector to limit itself to policy, legal, regulatory and other similar public functions;
- decentralization of decision making power on natural resource planning and management to local level stakeholders;
- major transitions and adjustments in the institutions involved in livestock and related skills development;
- favourable enabling environment to enhance private sector initiatives to develop decision support tools like animal recording at farm, community and national level;
- growing awareness regarding the sustainable use of animal and plant bio-diversity.

The purpose of this paper is to give the audience a broad idea of the projected future evolutions of livestock farming systems in various developing regions of the world. Particularly those livestock farming systems will be highlighted which could offer an opportunity to develop and apply animal identification and recording systems to better manage the livestock resources in developing countries. The main source of data and predictions used in this paper come from the recently (2001) published book by FAO and World Bank titled *Farming Systems and Poverty – Improving Farmers Livelihoods in a Changing World*. In the context of the overall farming systems evolution the book makes a sufficient analysis of the role and potential contributions of livestock under the external influencies listed above.

Farming systems concept

A farming system is defined as a population of individual farm systems that have broadly similar resource bases, enterprise patterns, household livelihoods and production constraints. For a farming system, similar development strategies and interventions (like animal recording) would be appropriate. Depending on the scale, a farming or livestock farming system can encompass from dozens to many millions of households. The farming systems approach is looking into the evolution of the systems both from bio-physical and socio-economic dimensions integrating multi-disciplinary analysis of production and its relationships to the key determinants of a farming system. The determinants of importance can be grouped:

- natural resource base and climate;
- science and technology; institutions, human capital and policies;
- trade liberalisation and market development;

The delineation of the major livestock farming systems provides a useful framework within which appropriate strategies and interventions can be determined. In this Seminar we focus to discuss where animal recording could be a feasible and appropriate intervention.

The classification criteria of the farming systems is usually based on:
- available natural resource base; and
- dominant pattern of farm activities and livelihoods.

Based on these criteria the FAO/WB report distinguishes eight broad categories of farming systems. For the purposes of this seminar the following seven systems (excluding coastal artisanal fishing system) in which also livestock play a major role and which could be useful for the dicussions here, namely:
- irrigated farming systems with a broad range of cash crop production integrated with livestock;
- rice-based farming systems;
- rainfed farming systems in humid areas of high resource potential with both small scale integrated crop and livestock or specialised crops and specialised livestock
- rainfed farming systems in steep and highland areas, which are usually mixed crop-livestock systems;
- rainfed farming systems in dry or cold low potential areas, with mixed crop-livestock and pastoral systems;
- dualistic (mixed large-scale commercial and small holder) farming systems, across a variety of ecologies and with diverse production patterns; and
- urban based farming systems typically focussed on livestock or horticultural production.

This criteria and broad grouping were then applied to six main world regions of the developing world in a pragmatic fashion with a view to draw conclusions with regard to future agricultural growth. The further analysis of the broad systems resulted in identification of 72 sub-systems. In many cases the sub-system resulted from differencies in criteria like for example from small-scale farms or commercial farms, or low altitude or high altitude areas. The names of the sub-systems were chosen to reflect the broad systems outlined above. For more in-depth analysis for prospects of growth and economic importance two to three sub-systems are chosen within each geographic region. Rapid and sustained growth in a major crop-livestock or livestock farming system could be expected to have a significant impact e.g through market linkages. Factors determining a system's apparent growth potential include:
- suitable natural resource endowments;
- favourable access to infrastructure and services, including markets; and
- feasibility of removing development constraints.

More recently, international agreements and the establishment of the World Trade Organisation (WTO) have significantly boosted trade liberalisation. As a result the reduction of impediments to international trade and investment, the process of trade liberalisation is generating changes in the structure of animal agriculture at all levels. This creates conditions which either could further marginalise traditional small holder systems but also give opportunities particularly to those systems which are (export / domestic) market driven and able to meet the challenges.

As the structural adjustment programmes have progressed, policy makers have increasingly shifted their attention to increase the efficiency of the service delivery through the restructuring of institutions. The shifts of many traditionally public sector roles to civil society and the private sector; the decentralisation of remaining government services and an increasing reduction of government investment in the provision of public services, have resulted from such adjustment. Animal recording services are among the functions now weakened by the diminishing public support and are one of the issues of our discussions in this seminar. The coping strategy involves better alignment of the non-government stakeholders who consider their participation carefully from a cost-benefit view.

In the next sections an attempt is made to identify in broad terms the potential livestock farming systems which would seem, in the authors opinion, to offer opportunities for a development of animal identification and recording systems in the various development regions.

Sub-Saharan Africa

In fifteen farming sub-systems the region has 219 million head of cattle, 194 million goats and 189 million sheep. From 1970 to the present time the cattle sheep and goat numbers grew moderately and also the productivity increases in milk and meat have been marginal (Table 1). Per capita animal food availability for human consumption hardly kept pace with the population increase.

For livestock potential the most important farming sub-systems are:

- maize mixed farming system
- highland perennial farming system
- large commercial and smallholder farming system
- urban based farming system
- pastoral farming systems

The maize mixed farming system is the most important food production system in East and Southern Africa extending across plateau and highland areas at altitudes of 800 to 1 500 metres, from Kenya, Uganda and Tanzania to Zambia, Malawi, Zimbabwe, South Africa, Swaziland and Lesotho. Cattle and small ruminants are numerous and important for household cash income. The prospects for livestock development and intensification are promising in areas of transportation and market access

Table 1. Trends in Livestock Populations and Output in Sub-Saharan Africa, 1970-2000.

Species	Million head in year 2000	Ave annual change 1970-2000 (%)
Cattle	219	1.5
Sheep	189	1.4
Goats	194	2.3
Pigs	19	3.2
Poultry	809	2.9
Product	Output 2000 (mill tons)	Ave annual change (%)
Total meat	8	2.0
Total milk	19	1.8
Total eggs	1	3.7
Cattle hides	0.5	1.7

Source: FAOSTAT.

but in more peripheral areas constrained by lack of services, infrastructure and by weakness of local authorities and communities to manage demanding services. These same observations certainly apply to livestock systems in the highland perennial farming systems and the pastoral systems.

Over the recent decade most of the countries in the Sub-Saharan Africa region have gone through Structural Adjustment Programmes which have lead to withdrawal of the public sector from many services and production, processing and marketing functions including animal production and health and milk and meat industries. The transition to private sector take-over, however, was mostly done without proper preparation and the build-up of private services has been slow. In much of the region, medium to large livestock farms (dairy, beef, mutton and poultry) have considerable scope for increasing productivity but will require more and improved financial, input supply and advisory services for which they will have to be able to meet the user charges. Animal performance recording would obviously have best chancies to be adopted in such systems.

For pastoralists and agro-pastoralists and the highland livestock keepers the main thrust will be to devise and implement disease monitoring and approved certification schemes for export of live animals and animal products. Particularly, the animal identification part of the I&R system and associated sanitary control are becoming very important for many countries of the region traditionally involved in export of live animals and meat in the international markets. Traditional preferential access of the ex-European colonies to the EU meat market is threatened under increasing competition from other regions and the live animal trade to

the Arabian peninsula countries is constrained by non-compliance with sanitary requirements. The members of the Southern Africa Development Community (SADC) have already made a commitment to plan and implement ID systems and in that context FAO has been invited to give technical assistance to Malawi to design a national framework for a phased implementation such a system.

Middle East and North Africa

The Middle East and North Africa region comprises 14 low and middle-income countries or territories streching from Iran to Morocco. Human settlement patterns vary but populations are increasingly in cities or larger villages in the rural areas. The region contains a significant number of pastoralists who move seasonally between low and high altitudes and between wetter zones and the dry steppe. There are eight major farming sub-systems of which important for livestock growth potential are irrigated farming systems (large and small-scale), rainfed mixed, pastoral and urban based systems.

The region is very important in sheep and goat production having a population of 197 million head, accounting for one seventh of the total population in the developing countries (Table 2). They are kept in a variety of production systems, which include:

- extensive pastoral systems;
- seasonal exploitation of crop residues in arable areas, and
- feedlots in and around major urban centres.

In recent times poultry numbers (900 million in 2000) have increased very rapidly at a rate of almost 6 percent per annum, nearly double that for the rest of the developing world.

Table 2. Trends in Livestock Populations and Output in Middle East and North Africa, 1970-2000.

Species	Million head in year 2000	Ave annual change 1970-2000 (%)
Cattle	21	0.8
Sheep	143	1.6
Goats	54	1.5
Camels	1	0.3
Poultry	905	5.8
Product	**Output 2000 (mill tons)**	**Ave annual change (%)**
Total meat	6	4.5
Total milk	17	3.4
Total eggs	2	5.4

Source: FAOSTAT.

Cattle and buffalo numbers have increased at moderate rate at 0.8 percent per annum and this rate is forecasted to continue although the region is not best suited to large ruminant production. In many countries large ruminant systems are highly polarised; very few large production units dominate the industry limiting the opportunity of the small-scale producers to compete in the market. This fact also explains that the productivity improvements in meat and milk output have remained at high level.

Trade liberalisation has favoured the large producers in the region and many smaller operators have moved out from business. The traditionally important artisanal animal product processing and marketing is closely linked with the smallholder production and there are minimal examples of modernisation of the small-scle milk and meat industries.

Public policies and investments in public goods have had a strong urban bias for many decades. Many public institutions are extremely centralised and development policies have favoured cheap food for urban population. National livestock policies have tended to aggravate the overstocking in pastoral systems and investment in industral animal production, through the encouragement of importation of cheap feed grain and the lack of regulation of animal numbers. These policies have also undermined the strength of traditional institutions and the systems of range management. For the same reasons innovation and diversification in livestock systems have been stifled and the top-down extension systems have left little scope for farmer driven initiatives and partnerships. Human capital hardly is a limiting factor but the system of extension, training and market information is not easily available to rural farmers.

Animal recording programmes are (or have been) operational in some of the countries in the region (Egypt, Tunisia, Jordan, Lebanon) and our colleagues from these countries can enlighten us on the experiencies during the discussions. In FAO's view the opportunities to make use of animal recording are in principle good in the large commercial livestock farms and high-tech applications can be applied in such conditions. The biggest constraint for institutional animal recording systems has been the difficulty to see what benefit a member could expect from participation. For instance a national progeny testing system of young AI bulls is lacking and semen is imported. At times even importation of bred heifers is subsidised for herd replacements. In many cases large commercial herds apply herd management software available from the market and use it efficiently for herd production monitoring and management of reproduction, health, and feed rationing.

South Asia

South Asia is comprised of eight countries and contains a human population of 1 344 million – nearly 1 000 million of them rural. The combination of high population and limited land (514 million ha) has resulted in severe pressure on natural resources. In the region eleven farming sub-systems are identified and livestock is important in most of them. Volume-wise and for the purposes of this analysis the most important ones are the:

- rice farming system;
- rice-wheat farming system;
- rainfed mixed farming system
- highland mixed farming system, and
- urban based farming system.

The overall livestock development pattern is very similar in the four rural farming systems. For meat, milk and eggs output has grown more rapidly than livestock populations, indicating that production efficiency has improved in the recent decades (Table 3).

Buffalo and cattle numbers have increased by a modest average of less than one percent per annum but milk production has grown by over four percent. With increased incomes also the demand for meats (poultry in particular) and eggs is expected to continue to grow significantly. The continued intensification and diversification of the farming systems is benefitting particularly dairy development which has become an engine of growth and income generation for the rural smallholder systems in South Asia. The increasing level of mechanisation reduces the number of draft oxen and results in a shift towards more dairy. Because of the increased availability of feed grains, by-products and crop residues family

Table 3. Trends in Livestock Populations and Output in South Asia, 1970-2000.

Species	Million head in year 2000	Ave annual change 1970-2000 (%)
Buffalo	122	1.9
Cattle	277	0.6
Small ruminants	321	2.1
Poultry	742	3.8
Product	**Output 2000 (mill tons)**	**Ave annual change (%)**
Total meat	8	3.2
Total milk	105	4.2
Total wool	1	0.9
Total eggs	2	6.2

Source: FAOSTAT.

scale dairy operations are expected to grow and intensify. In the proximity of the major urban markets the systems will also expand into specialised large-scale industrial/semi-industrial dairy and poultry enterprises.

Decentralisation of governance is expected to bring decision making closer to the farmer and the importance of farmers' organisations is expected to grow in the future. Private commercial sector together with farmers' organisations will play a bigger role in experimentation, advisory and market services. The NDDP in India and Milk Vita in Bangladesh are well known and strongly institutionalised integrated dairy schemes in the region and there are others, too. Such schemes can be instrumental for introduction of milk recording as a further service in support of breeding and management improvement programmes. The shift to more commercial and knowledge intensive livestock farming systems will call for improved flow of information to farmers, support services and the processing industry built on private-public partnerships. Our colleagues from the South Asia region certainly will go into more detail to propose the conditions in which milk recording could be succesfully integrated into the prevailing patterns of livestock faming systems development.

East Asia and Pacific

More than 60 percent of the region's 1.8 billion people are directly involved with agriculture. Most people are in two countries China (1.28 billion) and Indonesia (205 million). Out of the eleven identified farming sub-systems the most important ones are:

- lowland rice farming system;
- upland intensive mixed
- temperate mixed;
- pastoral, and;
- urban based systems.

The basic features and trends are similar to those in South Asia, namely rapid urbanisation, reduced and fragmented agricultural land, increasing pressure on natural resources and smallholder based agriculture, although semi-commercial and industrial production systems will increase over the coming decades. Most of the past growth in livestock production has been driven by the rapid expansion of the livestock sector in China. Numbers of pigs and poultry in the region have increased at high annual rates over the last decades and reached over 500 and 6 000 million head respectively (Table 4)

At present more than 50 percent of pigs and 36 percent of poultry of the world are found in the region. In the same period the international breeds have nearly totally replaced the once rich indigenous pig and poultry populations in China. This also explains the high average annual growth in productivity of meat and eggs. High annual growth has occurred also in milk production resulting mainly from the Holsteinisation of the specialised and family dairy herds, particularly in China.

Table 4. Trends in Livestock Populations and Output in East Asia and Pacific, 1970-2000.

Species	Million head in year 2000	Ave annual change 1970-2000 (%)
Cattle	38	1.9
Buffalo	152	0.3
Small ruminants	338	2.8
Pigs	501	3.0
Poultry	6 073	5.6
Product	**Output 2000 (mill tons)**	**Annual change 1970-2000 (%)**
Total meat	74	6.9
Total milk	16	6.1
Total wool	0.3	2.8
Total eggs	26	7.7

Source: FAOSTAT.

Growing urban markets and higher per capita incomes will maintain the increasing demand for animal products in the years to come. Urban and peri-urban agriculture is expected to expand and intensify with increasing demand for fruits and vegetables and meat and dairy products.

Regarding the future prospects for the introduction and adoption of animal recording systems in the region it would seem that it could be best associated with intensive animal production systems driven by the strong agro-industrialisation and urban demand. Maybe some of the participants here could tell us what might be the institutional form(s) to implement such programmes successfully. Livestock is also an integral part of the major rural farming systems in the region, but it largely remains extensive and it is not likely that animal recording could be there a priority service in the near future.

Latin America and Caribbean

In contrast with the previously commented regions, Latin America has low human population density of 0.25 persons per ha, combined with an urbanisation rate of 75 percent. It is also endowed with a wide range of favourable ecologies for agriculture and livestock. Pressure on natural resources by agriculture is generally moderate. Out of the sixteen farming sub-systems livestock is important in:

- intensive mixed farming systems;
- extensive mixed (Cerrados & Llanos) farming systems;
- cereal-livestock (Campos) farming systems;
- intensive highland mixed farming systems;
- temperate mixed (Pampas farming systems);
- urban based farming.

The 356 million cattle within the region constitute 26 percent of the developing world total and have increased by 1.6 percent per annum in the last three decade (Table 5).

Table 5. Trends in Livestock Populations and Output in Latin America and Caribbean, 1970-2000.

Species	Million head in year 2000	Ave annual change 1970-2000 (%)
Cattle	356	1.6
Small ruminants	119	-0.8
Pigs	75	0.6
Poultry	2 396	4.9
Product	Output 2000 (mill tons)	Ave annual change (%)
Total meat	31	3.5
Total milk	60	2.9
Total wool	0.2	-2.0
Total eggs	5.0	4.3

Source: FAOSTAT.

In contrast, the growth rate in other species except chicken has been slower or even negative. The cattle population is forecast to grow at 0.9 percent per annum. The increase in livestock productivity is also modest compared to many other regions most likely because the abundance in land and feed resources is not forcing intensification of production systems.

Latin America is, however, the only developing region with net positive livestock trade (874 000 tons per annum) and livestock (meat) exports are expected to triple by 2030, in contrast to other developing regions. Current net imports of 6.3 million tons of dairy products are expected to grow in line with the future growth of human population. Another major past trend in the region has been the political decentralisation closely linked with the process of structural adjustment. This has been used to shed fiscal responsibilities to local and regional levels of government. This has not always been a smooth process as the central level has resisted to relinquish power.

Being an important meat exporting region, it seems that the animal identification part of the I&R system and associated sanitary control will be very important for those livestock farming systems of the region traditionally involved in export of meat in the international markets. Increasingly demanding international trade requirements will concern Argentina, Uruguay, Brazil and Chile which are the major meat exporters. Eventually national ID programmes would offer the opportunity for future

extension into more comprehensive meat performance recording systems. Several countries of the region have recently approached FAO to help design ID systems through FAO's Technical Cooperation Programme. Chile will be the first country where such assistance will be provided. In peri-urban areas highly specialised industrial systems of dairy, pigs and poultry will dominate, providing ideal conditions for making use of animal recording for several objectives. It remains to be determined whether the conditions are given for sharing the objectives and costs fairly between the private and public sector. Maybe our Latin-American colleagues can offer useful guidance.

Conclusions

From the region-wide review the following conclusions could be drawn for further discussion:

1. *In the Near East and North Africa, South Asia and East Asia regions* the rapid increase in the domestic urban demand for animal products is particularly prominent which has lead to rapid intensification, commercialisation and improved animal productivity. The geographical distribution of these developments is, however, uneven also at country level which would suggest that rather localised than nationwide animal recording systems could be feasible. The real challenge is to reach institutional agreements between the private stakeholders (farmers, their societies, and milk or meat industry) and the public sector (government, research, extension) to share the objectives and costs of recording schemes. Otherwise individual herd management recording systems might become dominating over collective recording systems in industrialised large-size farms.
2. *In the Sub-Saharan Africa region* the growth and output of the animal industry, in general terms, is barely keeping pace with the human population growth. Real productivity improvements are not evident at the regional level and the urban demand remains too weak to provide a sufficient incentive to livestock farmers. Locations for introduction of animal / milk recording programmes need therefore to be selected carefully so as to focus on situations which are an exception from the overall regional pattern, in areas like milksheds of the major cities. In some countries there are, however, pastoralist and agro-pastoralist systems which traditionally supply animals for meat or live animal export. For those countries and systems the animal identification part of the I&R system associated with sanitary control is becoming very important (ref SADC) .
3. *In Latin America and the Caribbean region* a highly polarised situation can be predicted to continue; the major rural and peripheral livestock systems producing and fattening animals for the export oriented meat industry (beef / mutton) and the intensive peri-urban systems supplying milk, eggs and pork for domestic urban consumers. It could be expected that the new WTO certification requirements for the origin and health of the internationally traded animal products will accelerate the adoption of animal ID systems in many countries of the region. A

more challenging task will be the introduction and adoption of performance recording systems to complement the export oriented animal production systems or to support the commercial peri-urban intensive dairy production systems.

References

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