



## A FOOD SECURITY PERSPECTIVE TO LIVESTOCK AND THE ENVIRONMENT

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### 1. Introduction

Today, 850 million people go hungry or suffer from malnutrition. In order to meet the minimum requirements of a growing population, food production will need to double over the next 30 years. Yet the natural resources required to produce this additional food - such as soil, water and bio-diversity - are finite and vulnerable to degradation.

The Plan of Action, endorsed by the Heads of State and their governments at the World Food Summit in November 1996, assigned a guiding role to FAO in addressing food security worldwide. The Rome declaration identifies poverty and environmental degradation as the main causes of food insecurity. The Heads of State and their governments also recognized the need for urgent action to combat natural resource degradation, including desertification and erosion of biological diversity. Poverty eradication and food security must be achieved without putting additional stress on natural resources. In many situation, therefore, food security and natural resource protection go together. The issue is to what extent may the resource and environmental constraints impinge on the prospects for increasing food supplies and assuring access to food for all, the very essence of food security? And further: Can the potential for further gains towards global food security be maintained for future generations, the very essence of sustainability?

Within this broad context, this paper addresses the interactions, both positive and negative, between livestock and the environment from a food security perspective, i.e. that of rural and urban poor in low-income food-deficit countries (LIFDC). Concern for the state of the environment and the degradation and dwindling of natural resources raises the questions: What is the role of livestock in enhancing or compromising food security, now and in future? What are the trade-offs between livestock production and environmental objectives?

### 2. The role of livestock in food security

Food security embraces food production, stability of supply and access to food. Livestock play a role in all three aspects: they make a significant contribution to food production through the provision of high value protein-rich animal products; they indirectly support crop production through draught power and manure; they stabilize supply; and finally, they are the most significant source of income and store of wealth for smallholders, thereby providing access to food.

#### *Livestock for food*

Over the past 20 years, meat and egg production have risen by 127 and 331 percent respectively in the developing countries (WAICENT, 1997). Yet, most people in these countries cannot afford adequate animal

protein; the per caput consumption of meat is only 17.7 kg/year, compared to 81.6 kg/year in developed countries. In the latter, about 60 percent of dietary protein comes from animal products, compared to only 22 percent in developing countries. There is, therefore, substantial room for the expansion of livestock production. This can however raise problems but it is also true that animal products offer several advantages over crops. For example:

- Meat and milk can be produced year-round, being less seasonal than cereals, fruits and vegetables;
- Animals, in particular the smaller species, can be slaughtered as the need arises, either for food or income; and
- Both milk and meat can be preserved to cover periods of food shortage.

However, the role of livestock in developing countries is not confined to the provision of food. On the contrary, their non-food functions, even if in gradual decline in LIFDCs, are still very prominent.

### ***Livestock for crop production***

The yield-stabilizing and yield-enhancing role of livestock is a main contribution to crop agriculture in LIFDCs. It also hosts the promise for future intensification of the mixed farming system. In developing countries, more than half of the arable area (52 percent) is cultivated with the help of draught animal power and more than half of the total fertilizer applied is provided in the form of manure. This proportion can be estimated to exceed 70 percent in LIFDCs. This indicates that intensification cannot take place without fully acknowledging the resource-enhancing and stabilizing role of livestock. It follows that development programmes addressing food security must explicitly take this function into account.

### ***Livestock as a buffer***

Livestock play an important role in the economy, both at the rural and national level. A very important factor is that of added security to food supply and production. For the farmer, livestock provide liquid assets, a hedge against inflation and a means of reducing the risks associated with crops when used in mixed farming systems.

A remarkable characteristic, important for global food security, is the capacity of the livestock sector to draw on many different types of feed resources, and to contract and expand with resources availability and market demand (FAO, 1996). During the two recent global food crises, in 1974/75 and 1982/83, reductions in total cereal supply were almost entirely absorbed by the livestock sector adjusting to higher prices with reduced output, higher productivity and use of alternative non-food feed items.

### ***Livestock and income***

Sales of livestock products provide purchasing power and thus, access to food. In fact, the value added through livestock production and processing is often the only outlet of smallholders in rural communities to the monetary economy. It forms an entry point for development - an entry point that has been neglected because the image of livestock has been clouded with negative environmental and social effects. These negative effects, however, are hardly relevant to farmers and livestock holders in LIFDCs and the development community continues to miss opportunities that arise from the strong market drive associated with the surge in demand for animal products. The link between this explosion in demand and agricultural development is income.

## **3. Environment and livestock production: trade-offs and synergies**

Let us now turn to the possible trade-offs between food security, and the role of livestock to food security on the one hand, and the environment on the other. Some of these trade-offs are avoidable and the study that preceded this conference has identified a number of these *win-win* situations, where improvements only

depend on political will. Others are more difficult. The Brundtland Commission brought into prominence the dilemma of reconciling the short-term imperative of increasing food and agricultural production as well as incomes for the current generation with the need of conserving natural resources for meeting the requirements of future generations. The trade-offs between meeting short-term food security and the environmental requirements clearly have a time dimension. Quite obviously, there are trade-offs between immediate food needs and environmental objectives. Poor people will trade off immediate food production even though it may involve some resource degradation, against a less tangible but “sustainable future”. Trade-offs will be reduced once food security is achieved. In practical terms, poverty alleviation is a necessary condition for environmental protection.

The reverse, that environmental degradation brings poverty, is also true. Developing countries find it difficult to cope with the costs associated with measures to address environmental objectives. The same observations hold true when comparing the value attached to environmental objectives within a country: there is a close and clear relationship between the importance attached to environmental objectives and income. A sound environment, in some aspects at least, is a luxury good which richer societies can now afford, but which in their earlier history had been largely ignored. Still, the majority of developing countries recognizes the importance of shifting to a more environment-conscious growth path.

The world food problem is now recognized as being largely a failure of effective demand on the part of people with inadequate nutrition. In other words, it is not a problem of production but one of demand and of distribution. However, in developing countries, there is no clear separation between demand and supply of food, as inadequate growth of demand reflects that of incomes of most of the populations whose very incomes depend on the growth of agriculture itself. Given that the food security problem is concentrated in rural-based and poor countries, it is also appropriate to speak of it as being a problem of production.

#### 4. Minimizing the trade-offs

Given the high incidence of food insecurity and undernutrition precisely in countries with low per caput food supplies and high dependence on agriculture, policy responses must incorporate measures of agricultural and rural development to increase both the demand and the supply of food. What is the role of livestock in this process? And how can the trade-offs between livestock for food security and possible environmental effects be minimized?

The chances of minimizing the trade-offs grow if we consider available technologies and development pathways without prejudice. Trade-offs are being reduced by:

- growth in income which, most importantly, must alleviate poverty since degradation of natural resources is both a cause and a result of poverty; higher incomes also increase the ability to pay for environmental goods and mitigate the trade-offs between short-term production objectives and long-term resource protection;
- equitable and safe resource access, that makes livestock holders accountable for resource use and responsible for its protection;
- policy reforms to remove incentive distortions which work against optimal efficiency in the production process, taking into account the real (intrinsic) scarcities of production factors;
- wider acceptance, and further progress in environment-friendly technologies.

FAO seeks to develop a comprehensive strategy to minimize the trade-offs between food production and the environment for the purpose of long-term food security and human development. This strategy contains four elements:

1. Emphasis must be put on shifting from input-intensive technologies to **knowledge-intensive technologies** with the aim of maximizing the efficiency of scarce natural resources. For livestock

production this mainly means to optimize the use of feed, in particular feed that has alternative food use (grains). These grains and other feed concentrates have a high natural resource component as their production not only involves land but inputs such as fossil energy for fuel and fertilizer.

2. Greater importance must be given to establishing **well-defined property or user rights** for public, community and private resources. Without such changes users of open access resources such as drylands or rainforests will have little or no incentives to exploit them in a responsible fashion.
3. Another critical element is **people's participation and decentralized resource management**. In the main, it is small farmers and herders who make the key decisions about resource use. The public sector of developing countries cannot afford the cost of enforcing the requirements of responsible resource use, and it lacks the vested interest of owners and users.
4. As far as possible market signals must embody **proper valuation of environmental goods**, land, water, air and bio-diversity and their services. Where these are compromised, this must be included in the commodity prices as direct and indirect environmental costs.

These thrusts, although necessary to varying degrees, are not sufficient in themselves. They must be amplified and adapted to national circumstances and to the specific problems or different agro-ecosystems.

A key issue in future food security will be the use of scarce land and water resources. One inevitable conclusion is that **food production will intensify further**. Historically, livestock's role in the process of agricultural intensification has been essential. Livestock have allowed for sustained intensification through nutrient balancing and the provision of energy, in buffering labour needs and supply, and in capital requirements. In that, it allowed for important productivity gains of land and it helped to spare land that otherwise would have been cultivated. In many aspects, the role of livestock in the intensification process can still be amplified and, in some cases, it has not even started. Large parts of sub-humid Africa are moving into mixed farming as important disease constraints are removed with increasing population densities. In other parts of the world, such as Asia, high cropping and land use intensities have been sustained over centuries by closed integration of crop and livestock activities. In these situations, it is still the input function of livestock that is predominant but market production is becoming ever more prominent with increasing commercialization. Where mixed farming systems can no longer be maintained as household systems because of economic pressures to specialize and up-scale activities, the same bio-physical interactions can be obtained by the integration of specialized cropping and livestock farming in a watershed context.

Grazing systems, too, are intensifying, notably in Latin America and in extensive grazing zones of Africa and the Near East. This intensification of grazing lands yields both economic benefits to producers, in particular smallholders, and environmental benefits in that it offers an alternative to expanding the agricultural frontier into the forests. Only through intensification can the land requirements to meet both a sustained livelihood for producers, supplying the demand, as well as objectives of natural resource protection be satisfied. This overall principle applies both to livestock providing inputs to crop agriculture in the process of agricultural intensification and to livestock providing animal protein more efficiently. The latter may be exemplified by intensive industrial-type production systems that cater for the demand for cheap, high quality animal feeds for which there is a surging demand. Not only in industrial production, but also in mixed and pastoral systems, is efficiency of resource conversion ever more critical, especially in the light of dwindling resources. Animal breeding, nutrition and health, together with improvements in general animal husbandry have resulted in impressive productivity gains, such as expressed in feed conversion, animal offtake and animal growth rates.

A second major issue in food security is income generation, in particular of the rural and food-insecure people. It follows that **further commercialization of food production is required for future food security**. As a general rule, the degree of commercialization in livestock products is higher than in crops. In all developing countries, livestock add value to resources that have no alternative use or to on-farm produce. In areas of extended poverty and food insecurity, such as the central highlands of Ethiopia, the sale of dung cakes is the most important source of cash income. In 1998, India will become the world's largest dairy

producer, surpassing the United States, and at the base of this success are millions of smallholders supplying a few litres of their surplus production. In almost every eco-system, poultry and small ruminants are kept with little external input but yet contributing significantly to cash income of those who have little else to offer to the market. These small-scale livestock producers are, more and more, entering the market economy, stimulated by surging urban demand. However, the inescapable trend towards rapidly increasing commercialization is not without social and environmental risks. The commercial drive may marginalize small-scale farmers where large-scale producers are favoured by urban-biased policies. The same drive may also lead to a concentration of animals and production units near urban centres, creating environmental and human health hazards.

Another key issue is **sustaining the livelihood of people** in areas where there are neither intensification nor big commercialization opportunities, and where people are threatened by vicious circles of population growth, natural resources degradation and poverty. In areas with “involution of the mixed farming system”, such as central and eastern African highlands, the Andean countries and the region of the Himalayan hills and Hindukush, the stability and sometimes the very existence of the farming systems are threatened by disappearance of livestock. The Sahel, and other arid and semi-arid grazing areas with insufficient commercial outlets, are *waiting rooms* of development of a different agro-ecological nature. In extensive pastoral systems, livestock provide the livelihood for some 250 million people from land for which there is no ready alternative use. A whole life support system comprising subsistence food needs, income and stability of life support, is provided by livestock. In such situations, technology and policies can be designed to prevent a collapse, and perhaps achieve some modest improvements, while employment and growth opportunities are being developed elsewhere. Livestock help diversify the farming systems, adding stability to precarious situations, and sustain a much larger population than would be the case in the absence of livestock. While the focus in the fragile areas under massive population pressure is on poverty alleviation and disaster prevention, livestock assist in *buying precious time*.

## 5. Operationalizing a livestock in food security strategy

But how to operationalize these elements of a food-security strategy that has livestock at its centre and that minimizes degradation of natural resources? The role of domesticated animals is drastically changing, even in remote areas of the world. It follows that livestock's role needs to be redefined in a global food security context. Two different types of situations can be distinguished by considering whether livestock production is predominantly driven by available resources or by effective market demand. In doing so, we are aware of a continuum that exists between the two poles.

**Resource-driven** livestock production is mainly based on roughages (natural pasture, crop residues) but also household and other wastes. It provides the exclusive livelihood of 250 million pastoral people and it enhances the livelihood of some 2 billion people in smallholder mixed farming systems around the world. Because of its resource-driven nature, it has difficulties in responding quickly to changing market demands and to changing technology, and as a result the consumer benefits little. Often, mixed farming systems are closed cycles of nutrients, energy, and farm labour. Because resource-driven livestock production does not usually revert to the market for additional inputs, the main environmental problems consist of **resource overuse, mainly as a result of poverty and change in rights of access** to the same resources. To avoid overuse of immediate natural resources, mixed farmers and pastoral people alike need to substitute them with external inputs. At the same time, property rights need to be defined to grant site access to key resources. Infrastructure and market development to provide commercial outlets are important prerequisites.

Although sustaining many people, resource-driven livestock production will see only modest growth in the next decades. Resources and their productivity have limited growth potential. Some scope exists, particularly in peri-urban livestock production, because of growing volumes of waste from households, mass kitchens and agro-food processing. In these systems, animal health and food hygiene become primary concerns for food security.

**Demand-driven** livestock production resorts for its resources to products such as grains, and therefore many important environmental effects are upstream. Production benefits are uneven where animal production units are large and in the hands of few. Consumers, however, benefit from cheap and high-value

animal products. Because of its market orientation, the main environmental problems **consist of concentration of animal production and processing in limited areas**. This concentration burdens the environment with excessive waste loads while it limits the social benefits in terms of employment and rural income generation.

The trend of further intensification and specialization of demand-driven production is inescapable. Attempts to change the direction are doomed to fail. Rather it should be attempted to accelerate this development and to divert to regions which offer the concomitant set of conditions for such development. Efficient resource use must be encouraged, and related policy distortions, such as subsidies on feed or on animal products, should be abolished for the benefit of both food security and the environment.

## 6. Lessons learnt and follow-up actions required

- National food security programmes cannot afford to leave out the demand-driven sector, even though, prima facie, there may be competition between food and feed uses of some commodities.
- If national food security is to be achieved, we cannot afford the common nostalgic desire to maintain or revive mixed farming systems with closed nutrient and energy cycles. Mixed farming can be substantially improved by creating outlets to the overall economy.
- More than in food production, livestock's most important role in food security is to be seen in income generation, starting from the producer down the chain to marketing and processing.
- There are two distinctly different roles that the livestock sector has to perform if the double objectives of minimal food requirements and protection of natural resources are to be met: The resource-driven sector needs to perform its resource management role effectively within a fair institutional and policy framework. The demand-driven sector needs to be pushed to optimal efficiencies and back to areas where livestock is not a nuisance but a benefit.

In order to tap the potential fully that livestock offer for achieving the dual objectives of food security and protection of natural resources, international organizations and all stakeholders are called upon to change the approach of discrimination against livestock. We have seen that livestock production bears a number of social and environmental risks. But we are confident that we have identified the right set of policies and technologies to deal with these hazards and to use livestock to maximize benefits to society. For that, we are suggesting broader partnerships.

Clearly, FAO's action alone cannot have the impact sought. To complement national resources and FAO's own inputs, the organization must obtain the cooperation of all its existing and potential partners, i.e.:

- The UN system, in particular UNDP and UNEP, WFP and IFAD;
- The financing institutions for development: the IMF, the World Bank and the regional, sub-regional and national development banks;
- Bilateral partners, not only the developed countries but also those developing countries and countries in transition willing to make their resources and skills available;
- Academic and research organizations;
- The private sector; and
- Non-governmental organizations.

Trade-offs between livestock and the environment, the principles of Sustainable Agriculture and Rural

Development and the objectives embodied in Agenda 21 will only be realized if technology and policy are accompanied by participation, equity and dialogue, enabling mechanisms, empowerment and incentives. These will be the pathways towards environmentally sound livestock production and food security. Without them, the important technology and policy tools available will not have lasting effects.

Towards this end, the livestock-environment initiative, sponsored by 12 different agencies until now, has taken the first step. Many more must follow. Livestock production, not only the number-one land use worldwide, but in the next decade is likely to be the number-one subsector in economic importance. The issue is too important to allow our efforts to stop here. Let us work jointly towards food security and the safeguarding of the world's natural resources, and in that, assist livestock to find its right place.

## **References**

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