

**LIVESTOCK AND RESOURCE
MANAGEMENT POLICY:
ISSUES AND PRIORITIES FOR RESEARCH**

**Proceedings of the
Research Planning Workshop
held at ILCA, Addis Ababa, Ethiopia
24–27 March 1992**

**INTERNATIONAL LIVESTOCK CENTRE FOR AFRICA
ADDIS ABABA, ETHIOPIA**

ISBN 92-9053-265-3

Correct citation: Ehui S and Lipner M E (eds). 1993. *Livestock and resource management policy: Issues and priorities for research*. Proceedings of the Research Planning Workshop held at ILCA, Addis Ababa, Ethiopia, 24-27 March 1992. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. 168 pp.

Table of Contents

Preface

SESSION I: Opening session

Chair: S. Ehui

General overview of ILCA and relevance to policy

J. Walsh

General overview of Training and Information activities with relevance to policy

M.E. Smalley

General objectives of the workshop

H.A. Fitzhugh

SESSION II: Trade and macro-economic policies

Chair: S. Ehui

Trade and macro-economic policy: What agenda and roles for ILCA?

K.H. Shapiro

Guidelines for structural reforms and transformation in the African livestock sector

S.C. Nana-Sinkam and Abdoulaye Niang

Trade and pricing policies in the context of sustainable livestock production
in sub-Saharan Africa

Timothy O. Williams

Development prospects in Africa through international agricultural trade

W. Oluoch-Kosura

SESSION III: Technology, policy, markets and institutions

Chair: H.A. Fitzhugh (morning session) A. Niang (afternoon session)

Priorities for research on government policies to support livestock development
in Africa

P. Pinstrup-Andersen

Priorities for livestock policy research in the context of a crop-dominated
farming system: The case of Côte d'Ivoire

J. Yao, with assistance from B. Mody

Issues in livestock research and policy

F. Dolberg

Policy issues and priorities for ILCA technology research

B. Shapiro

Interactions between technology and policy in the African livestock sector

J. McIntire

Future directions for livestock policy research in Africa

G. Perrier

Research and development of the agricultural sector: The struggle for reliable data

Dirk Perthel

Technology, policy markets and institutions for livestock development: Some general issues

M.A. Jabbar

SESSION IV: Resource management policy

Chair: M.A. Jabbar

Priorities for ILCA policy research

J. Lynam

Some sustainability and resource policy issues in ILCA's livestock research in sub-Saharan Africa

R. Rose

Environmental degradation in sub-Saharan Africa: Issues for policy analysis

S. Ehui

Environmental issues and ILCA research agenda

B. Swallow

SESSION V: Working group presentations and discussion

Closing remarks

List of Participants

Preface

Animal agriculture plays a significant role in the economies of sub-Saharan African (SSA) countries with livestock contributing between 5% (Zaire) and 88% (Botswana) of the total agricultural Gross Domestic Product (GDP). Livestock commodities account for 25% of the agricultural domestic product in the region. Livestock transform feeds with low or no alternative value into high-value livestock products. They are also living banks for farmers, providing flexible financial reserves for periods of economic stress and a buffer against crop failure. They are a source of cash income, enabling farmers to purchase inputs, foods and other needs. Livestock play a particularly critical role in the agricultural intensification process by providing draft power and manure for fuel and fertiliser. Farm-level values of power and manure raise the contribution of livestock to the total value of agriculture from 25% to about 35%.

The problem in SSA is that livestock productivity is low; between 1962 and 1987, meat and milk production grew at only 2.6% and 3.2% a year, respectively. If these trends continue, SSA is expected to face massive shortages of meat and milk by the year 2025. Currently, 10% of the milk consumed in the region is imported. Increased livestock productivity would therefore benefit economic development at both the household and the national level.

The International Livestock Centre for Africa (ILCA) was established in 1974, with a mandate to “assist national efforts which aim to effect a change in the production and marketing systems in tropical Africa so as to increase the sustained yield and output of livestock products and improve the quality of life of the people in the region”.

ILCA’s research has addressed the main constraints to livestock products in SSA, many of which have been resolved through technological interventions. However, new technologies alone are not enough to ensure that (a) enough animal products are produced to meet the increasing demand for food in sub-Saharan Africa and that (b) livestock contribute (through traction, manure, and enhanced income) to the profitable intensification of agriculture. Technological interventions will contribute to increased agricultural products only if they are adopted by farmers.

The policy environment has a direct bearing on the demand for technological change and on the extent and impact of that change. Policy factors greatly influence the efficiency of food production and distribution and consumption. In SSA, the livestock sector has, over the years, been subjected to a variety of inappropriate government policies that have hampered the development of animal agriculture. In addition, inappropriate policies have discouraged sustainable use of the natural resource base for agriculture. Currently, there is widespread concern about the degradation of natural resources in SSA and the root causes of these environmental problems are government policy and property arrangements.

Policy constraints that have adversely affected the livestock sector and have encouraged poor management of the natural resource base include:

- food pricing policies that favour consumers at the expense of the producer
- foreign exchange and trade policies that have distorted markets and stifled production
- inadequate input and credit markets and
- excessive regulation and monopolistic behaviour (e.g. marketing boards and parastatals).

Other policy factors which (combined with inappropriate government policies) may have resulted in over-exploitation, under-investment and general mismanagement of

resources include insecure tenure, multiple ownership, common property and lack of clearly defined and securely held property rights. These factors are compounded by the poor understanding of the appropriate role of institutions that govern the use of land, water, rangelands and other resources.

Clearly, increases in agricultural products and sustainable use of natural resources are unlikely without sound economic policies that support agriculture. Therefore, research that leads to improved understanding of the nature of macro-economic policies and local institutions and their impact on the smallholders, traders and consumers is important. Specifically, research is needed to (a) identify policy options and their implementation and (b) quantify the social, economic and technical effects of policy changes.

Through policy research, ILCA hopes to influence the design, production and diffusion of new livestock or livestock-related technologies in sub-Saharan Africa and research priority setting and planning. The results will also give the Centre a better sense of where its work may have an impact, thus facilitating a more efficient allocation of resources.

ILCA hopes that the results of its policy research will provide decision makers with soundly formulated policy alternatives and help to document the effects different policies have on animal agriculture. Available evidence shows that policy studies conducted within ILCA and the CGIAR system have enabled public administrators in developing countries to grapple more effectively with linkages between changes in national agricultural and economic policies and changes in agricultural production.

This workshop was convened to help ILCA develop priorities and plan for research over the five-year period, 1994–1998. Thirty policy researchers, drawn from the World Bank, the United Nations Economic Commission for Africa, National Agricultural Research Systems, International Food Policy Research Institute and Universities in north America, Europe and Australia participated in the workshop. The purpose of the workshop was to identify issues and priorities for research and training in the general areas of livestock and resource management policy, appropriate methodologies for research in these priorities, the role of ILCA in policy research and opportunities for collaboration with national and international institutes. The workshop addressed topics in the areas of trade and macro-economic policies, technology policy, markets, and institutions, and resource management policy.

The first part of this proceedings covers the opening session. The second part deals with papers presented in the session on trade and macro-economic policies. Part three comprises papers dealing with technology policy, markets and institutions while part four deals with papers presented during the resource management policy session. Part five includes a report of the working groups presentations and discussions and the closing remarks.

Simeon Ehui, ILCA, Addis Ababa, Ethiopia

SESSION I

Opening session

Chair: S. Ehui

General overview of ILCA and relevance to policy

J. Walsh

*International Livestock Centre for Africa (ILCA)
P O Box 5689
Addis Ababa, Ethiopia
[Summary of comments are presented below.]*

I would like to welcome participants to the workshop and express the hope that discussions during the week will help guide the International Livestock Centre for Africa (ILCA) in terms of developing a research agenda in the area of livestock and resource management policy for the next five years.

Appropriate policies are critical to the development of the livestock sector in Africa. At present, many policies are based on unrealistic expectations. In sub-Saharan Africa (SSA), inappropriate policies have been a major limitation to development. Policies should be developed that take into account acceptable levels of risk and available resources. Studies (e.g. the Winrock Report, 1992) have suggested that by the year 2025, sub-Saharan Africa will hold 12.5% of the world's population. Trends that are projected include: rapid urbanisation, increasing poverty, rapid resource degradation and low income. Thus, adequate and sustained policy is critical if these trends are to be curtailed or properly addressed.

Policy formation in SSA must recognise particular environmental characteristics, e.g. risk aversion, poor communication, limited resources, limited infrastructure and a lack of continuous and consistent policy.

Policy makers at the government and institutional level should develop effective tracking of appropriate comparators in the use of policy instruments, i.e. core skills, comparative advantage, use of natural resources, financial resources, infrastructure etc.

ILCA's work in the area of livestock policy has been defined through the Livestock Policy and Resource Use Thrust. The stated objective of the Thrust has been "to help increase the sustained output of livestock and crops in sub-Saharan Africa by improving policies towards the livestock sector and increasing the efficiency with which natural and other resources are used." In *ILCA's strategy and long-term plan* (1987), research topics chosen to meet this objective are:

1. ways in which government policies influence the use of inputs and the uptake of technology by producers;
2. effects of government policies on the stability and sustainability of mixed farming in marginal areas;
3. role of livestock in stabilising and sustaining farming systems in the semi-arid zone;
4. development of low-cost methods for assessing long-term productivity trends in the semi-arid and arid rangelands;
5. role of credit in technology adoption by livestock producers;
6. relationships between land tenure and other factors affecting technology adoption;
7. social and economic factors affecting the demand for livestock products;

8. financing of livestock services;
9. effects of milk and meat pricing policies on production by smallholders and pastoralists.

Thus, the major direction of ILCA's policy research has been towards a better understanding of the policy instruments that might be used in developing the livestock sectors in SSA. This work was closely interrelated with policy aspects of natural resources. The major mode of operation for the Thrust is in collaboration with colleagues in national agricultural research systems (NARS) and international institutes. The major instruments for extending the work of the Thrust has been through the African Livestock Policy Analysis Network (ALPAN) network and training.

General overview of Training and Information activities with relevance to policy

M.E. Smalley

International Livestock Centre for Africa (ILCA)

P O Box 5689

Addis Ababa, Ethiopia

The objectives of Training and Information are to strengthen animal agricultural research in national agricultural research systems (NARS) and the linkages between ILCA and NARS and to help develop a cadre of trained, educated and technically informed NARS scientists. These objectives are pursued through short- and long-term training activities and information services (e.g. computerised library data base, literature searches, dissemination of information and bibliographies).

Training and Information has been very committed to livestock policy over the years. Since 1986, a livestock policy course has been offered. To date, 120 individuals from 34 SSA countries have attended. The course has been offered in English and French and is intended to increase the effectiveness of technical advisors in policy making structures. The course identifies national livestock policy objectives and discusses the consequences of policy options. At issue during the workshop is whether the course should be continued. Could International Food Policy Research Institute (IFPRI) and International Service for National Agricultural Research (ISNAR) participate, or, possibly, take over the course? In fact, might NARS take responsibility for the course? Given that its content is not research-oriented, it is also possible that a new research-related course could be developed.

In addition to the policy course, the African Livestock Policy Analysis Network (ALPAN) generates newsletters and network papers. The papers for ALPAN are neither peer-reviewed nor research oriented. The question before us is whether or not ALPAN is cost effective. ILCA does have other outlets for communicating results and information (e.g. the journal, *African Livestock Research*). Might ALPAN be more effective as a collaborative research network?

General objectives of the workshop

H.A. Fitzhugh

International Livestock Centre for Africa (ILCA)

P O Box 5689

Addis Ababa, Ethiopia

The purposes for this workshop are to:

- identify priorities for policy research
- identify policy research opportunities where ILCA may have a comparative advantage
- identify opportunities and modalities for ILCA to collaborate with others on priority policy research.

ILCA is one of the few international centres with substantial interest in policy-oriented research. The Centre has carried out research activities on such topics as prices and trade, credit and financing, land tenure and livestock services.

The dual nature for ILCA policy research stems from two factors. First, environmental issues and resource management are important concerns in terms of livestock development. Global concerns about degradation, desertification, deforestation, global warming etc., have a technical basis that is interrelated with policy issues. Arguably, policies emanating from the United Nations Conference on Environment and Development (UNCED) in Brazil in June, 1992 and the preparatory conferences will have major ramifications for livestock production in the future. Thus, for ILCA, it is important to maintain a level of research capacity to address policies associated with environmental and resource management issues.

Second, livestock production is market-oriented in comparison to subsistence food crop production. It is frequently through the sales of livestock products that smallholders generate funds for an increasingly cash-based economy. At national levels, many African countries depend on export sales of livestock products to generate foreign exchange. Regional, national and international policies have great influence on the market value of livestock products in Africa.

The contribution of livestock products to the economies of developing regions has increased over the last 20 years as has its value to overall agricultural production. The value of livestock products in sub-Saharan Africa is about 25% of the economic value of agricultural production. This figure includes the contributions from meat, milk, eggs and hides but excludes the values placed on traction and manure. If these are included, this figure rises to 35–40% .

ILCA can bring to bear on policy research the following:

- a strong commitment to a systems approach
- a strong commitment to sustainable management of natural resources
- first hand knowledge of constraints to sustainable livestock production
- effective working linkages with national agricultural research systems (NARS) in sub-Saharan Africa
- interdisciplinary teams who can contribute to all levels of research.

We look forward to the discussions over the next few days. As we plan for the next five years, we expect that this workshop will help us set priorities and develop partnerships for the future in livestock and resource management policy research.

SESSION II

Trade and macro-economic policies

Chair: S. Ehui

Trade and macro-economic policy: What agenda and roles for ILCA?

K. H. Shapiro

*University of Wisconsin
1300 University Avenue
Madison, Wisconsin, USA 53706*

Introduction

My assignment at this workshop is to initiate discussion on the International Livestock Centre for Africa's (ILCA) agenda and roles regarding trade and macro-economic policy. A three-part process is involved: agreeing on the nature and importance of the major trade and macro-economic policy issues facing African livestock; selecting those issues on which ILCA should work (ILCA's agenda); and defining the kinds of work ILCA should do (ILCA's role).¹

This paper provides some background for the discussion. The first section offers a classification system that may be useful in setting priorities. The next section draws on previous work (Shapiro et al, 1988; Shapiro, 1991; Shapiro and Doumbia, 1992; Shapiro et al, 1992) to illustrate some of the major issues. The final section begins to define the variety of roles that ILCA might play. The paper does not attempt to select the issues that should be included in ILCA's agenda, nor to decide the best modality for ILCA's work on each issue. Those are tasks for the workshop.

Categorising the issues

Trade and macro-economic policy issues can be categorised along two dimensions—control and specificity. We can distinguish between (a) those issues over which governments can have considerable control and those over which they can have less control and (b) issues that primarily affect (or can be targeted primarily at) livestock and those which bear upon a broader set of commodities and activities (Figure 1). This categorisation may help identify issues that should be high on ILCA's agenda. Arguments are invited about the usefulness of this approach and about the placement of issues in different boxes.

It is not necessarily true that ILCA should focus most on issues in the upper left and least on those in the lower right. For example, in the “more control–more specific” group, ILCA may find it difficult to contribute to issues regarding state enterprises because of political sensitivities. At the other extreme (“less control–less specific”), ILCA may have a role to play in conducting analyses and developing positions for the current General Agreement on Tariffs and Trade (GATT) negotiations.

1 One challenge in defining the agenda is that different issues are important in different places and for different species and commodities. Specifying ILCA's roles requires a consideration of the interface between the Centre's work and that of national institutions and such international units as the World Bank, International Monetary Fund (IMF) and International Food Policy Research Institute (IFPRI).

Figure 1. *Trade and macro-economic policy issues*

	More control	Less control
More specific (Mainly affect the livestock sector)	tariffs, subsidies, counter-vailing levies, paper work, taxes, licences, price controls, public enterprises, non-tariff barriers	developed countries' policies, dumping, food aid, competition, transport, lawlessness, world supply/demand and prices for animal products
Less specific (affect much of the economy)	exchange rate, interest rates, public debt, public investment, public salaries, employment	GATT, world prices for other goods

Illustrative issues

The West African meat and animal trade

Prior to the Sahelian drought of the late 1960s and early 1970s, tsetse-infested coastal West Africa relied almost entirely on Sahelian live animal imports to supplement their own limited meat production. Meat imports from the rest of the world were insignificant. For example, before 1975, Côte d'Ivoire had not imported more than about 1500 tonnes in any one year from the rest of the world (compared to over 40 000 tonnes in 1988). Furthermore, most of this amount was high-quality meat for the "class 1" market (Ariza-Nino and Steedman, 1980: p. 4).

The drought sharply curtailed animal exports from the Sahel at the very time that beef cycles in the world's major producing regions all came into alignment in their surplus phases. This coincided with tighter import restrictions in the EC, US and Japan. As a result, exporting nations had to seek new markets (Shapiro, 1979). South American producers were especially hard hit as they were closed out of their traditional EC markets. They found West Africa.

These developments, in a sense, constituted a learning period for importers and exporters. The long-term effect is that West Africa is now part of the world meat economy. Importing countries now have experience with a variety of sources from which they can seek the cheapest supplies; non-African exporters consider coastal West Africa as a potential market; and Sahelian producers are competing with producers in the EC, North and South America and Oceania.

The world meat market is characterised by variability, part of which is predictable and part of which is not. The predictable part stems from the beef cycle. The world's major producers go through alternating periods of increasing and decreasing their herds in anticipation of higher and lower prices, respectively. When herds are increasing, slaughter and meat supply are relatively low, and vice versa.

The unpredictable (or perhaps less predictable) part of the world beef economy stems from government policy. All major exporting nations intervene significantly in their agricultural sectors. Their priorities are steady incomes for farmers and steady supplies for consumers. But policies aimed at stability at home often cause instability abroad.

During the 1980s, West Africa felt the impact of sharp changes in the world meat economy caused largely by changes in EC policy. Changes in the Sahel reinforced some of these impacts. Jossierand (1990) presents a regional overview of the effects of both sets of changes on West and Central Africa. In 1970, 11 major net meat importing countries in the

region (excluding Zaire) imported about 700 000 live head of cattle from within Africa (primarily from the Sahel) and the equivalent of 124 000 head as meat, primarily from outside of Africa. In 1980, the respective numbers were 689 000 and 370 000, after which there was a dramatic change. The totals in 1985 were 780 000 and 670 000; by 1987 those 11 countries were importing only 478 000 from within Africa and the equivalent of 740 000 from non-African sources. Thus, non-African sources increased their share of the region's import market from 15% in 1970, to 35% in 1980, to 46% in 1985 and 61% in 1987 (Josserand, 1990: p. 12).

Kulibaba and Holtzman (1990: p. 117) summarise the policy dynamic that led to this change:

The legendary mountains of butter, powdered skim milk and processed milk that characterised the EC in the first half of the 1980s led to reduced public intervention in support of dairy producers. This provided an incentive for producers to cull surplus cows [the EC dairy herd declined from 25.7 million in 1983 to 22.5 million in 1987], which expanded beef surpluses and shipments to non-EC markets. Subsidised EC exports flooded coastal West African markets during the mid to late 1980s. Urban consumers benefitted from the low prices to expand red meat consumption [most of the meat was capes, low grade sidemeat with 25% or more fat and with no market in Western Europe where it is considered industrial waste], but West African livestock producers were penalised.

The situation is now different. The Organisation for Economic Co-operation and Development (OECD) expects tighter world supplies and higher prices until at least 1992 because, not only has the EC disposed of its surplus, but EC dairy herds are expected to stay lower because of the dairy quota (OECD, 1989: p. 49). Also, the US and Canada are in the herd rebuilding (supply decreasing) phase of their beef cycles and Japan may emerge as a major beef importer.

West Africa's major importer of non-African meat is Côte d'Ivoire. In 1980, about 66% of that country's red meat supply came from live Sahelian imports, 17% from imported meat and 16% from domestic production. In 1988, only 29% came from live Sahelian imports, 52% came from meat imports and 19% from domestic production. Virtually all meat (i.e. dead meat) imported by Côte d'Ivoire comes from outside Africa. As shown in Josserand's analysis, the declining Sahelian position is not just relative but also indicates an absolute decline from 40 500 tonnes (carcass equivalent) to 22 800 tonnes. Similarly, there was an absolute increase in meat imports, from 11 200 tonnes in 1980 to 41 450 tonnes in 1988 (Kulibaba and Holtzman, 1990: p. 108).

Mali is Côte d'Ivoire's main Sahelian livestock supplier. A review of Malian exports shows the impacts of EC dumping as well as other factors that affect African livestock trade. Estimates of Mali's total cattle exports went from 220 000 head in 1972, down to 102 000 in 1977, up to 300 000 in 1983 and then down to 185 000 in 1990. Estimates of small ruminant exports (perhaps one-third of the value of cattle exports) went from 280 000 head in 1977 to 134 000 in 1978, up to 537 000 in 1982 and then stayed between 480 000 and 390 000 through 1990. During the 1960s, Ghana was the main export market for Malian livestock, but by the mid-1970s only negligible amounts were going there and more than two-thirds were going to Côte d'Ivoire. In the latter 1980s, the Ivoirien market received over 90% of Malian cattle exports.

These fluctuations had various causes:

1. the rise of inefficient state importing mechanisms and the decline of purchasing power in Ghana;
2. the long-run rise and recent decline of purchasing power in Côte d'Ivoire;
3. the Sahelian droughts of the 1970s and 1980s (resulting first in greater exports as herders destocked and then lower exports as herds were rebuilt);

4. the surplus of world beef in the mid-1970s (filling the gap left by lower Sahelian exports after the drought); and
5. the dumping of European meat in the latter 1980s (undercutting the price of Sahelian meat).

Total meat and offal imports, almost all from Europe, skyrocketed from about 12,000 tonnes in 1984 to almost 60 000 tonnes in 1988. The effect on Sahelian cattle exports is striking. Exports fell from almost 40 000 tonnes (of carcass and offal equivalent) in 1985 to less than 23 000 tonnes in 1988. Sahelian cattle imports accounted for two-thirds of Ivoirien beef in the 1970s and early 1980s, but only about one-third by the late 1980s. On a smaller scale, dumped poultry meat jumped from about 5% of all poultry supply in 1985 to 25% in 1989, mainly at the expense of domestic Ivoirien production.

Côte d'Ivoire imposed a ban on poultry imports in mid-1989 to protect its own poultry industry. In January 1991, Côte d'Ivoire imposed a countervailing levy against beef imports to protect its own cattle industry, but which also protects Sahelian exporters of live animals, i.e. Mali and Burkina Faso.

The countervailing levy (200 FCFA/kg) has fallen primarily on capa, the deboned frozen meat with 10% to 30% fat content. For capa with relatively low fat, about 10% to 15%, the levy has meant an increase of 68%—from 325 FCFA to 525 FCFA/kg. For higher (25%–30%) fat capa, the increase has been 118%, from 169 to 369 FCFA/kg (USAID/World Bank, 1991: p. 59). No levy is applied to hindquarter imports, which sell for about 600 FCFA/kg. This is considerably below Sahelian beef, which sells for about 800 FCFA/kg.

Capa imports have fallen to negligible levels as a result of the countervailing levy. This has mainly affected low income consumers who had been able to increase their animal protein consumption with cheap capa since the mid-1980s. They are shifting to fish, which sells for about 300 FCFA/kg. It is unlikely they will shift in the foreseeable future to the much higher-priced Sahelian beef.

Given price levels of West African red meat (800–1000 FCFA per kg) and poultry (800 FCFA per kg), consumption is likely restricted to middle and upper income Ivoiriens (and expatriates) who can afford higher prices for animal protein (USAID/World Bank, 1991: p. 61).

Despite this, the USAID/World Bank Action Plan expects that,

effective implementation of the countervailing duty should have positive welfare effects on livestock producers in Côte d'Ivoire and the Sahel, especially in the long term, depending on the efficiency of internal marketing channels. ...The magnitude of welfare effects depends on cross price elasticities of demand between costly domestic and Sahelian livestock products and cheaper imported meat of non-African origin (USAID/World Bank, 1991: p. 61).

Good estimates of those cross price elasticities are not available.

The OECD (1989:p. 51) sounds a warning for small, vulnerable exporting and importing areas like Sahelian and coastal West Africa:

The international meat trade is still heavily protected and encompasses many trade distorting practices. Direct or potential limitation of market access continues to be a cornerstone of meat policies in many countries and together with the widespread use of export subsidies, national meat policies continue to affect international prices. Current agricultural support and trade policies in many countries, by insulating the domestic producers, inherently consider the world as a residual market to dispose of domestic instability. Even though the world supplies and demand for beef have temporarily moved into a position where higher prices prevail, these same policies, if not changed, will again inhibit adjustment and depress world market prices once meat supplies begin to exceed demand.

In other words, national policies continue to have the potential to exacerbate the inherent variability of the world meat economy. Small changes in the domestic markets of major producers tend to be magnified into large swings in the international market. Africa faces the task of developing mechanisms to cope with these external conditions that are likely to continue to be quite variable.

To make matters worse, several West African nations have policies that impede inter-African animal trade and many countries have or had overvalued exchange rates that encourage cheap imports of meat and milk. Sahelian livestock producing countries have imposed a variety of taxes, charges and tariffs that have raised the cost of animals exported to the coast and thereby decreased their competitiveness against non-African imports. Mali and Burkina Faso imposed income-type taxes, animal head taxes, pasture taxes, domestic market taxes, licensing charges, export taxes and customs charges (Kulibaba and Holtzman, 1990: pp. 80–82). These taxes and charges totaled between 24% and 48% of all marketing costs found in the 1989/1990 study of trade between Mali, Burkina Faso and Côte d'Ivoire, just lower than the costs of transport (Kulibaba and Holtzman, 1990: p. 100).

Stryker et al (1987: pp. 65–66) provide another insight into government discouragement of exports, in this case in Mali:

Most important, perhaps, are the complex procedures which traders must go through. In Bamako, for example, an exporter must go to at least six different physical locations to have his animals vaccinated, pay his taxes, get a bank guarantee, and obtain a licence and other papers. This may take two or three days. There are other delays at the border, both on leaving Mali and on entering the neighboring country. Corruption has increased markedly in recent years, and bribes of 500 to 1000 FCFA must be paid at each step of the export process.

In addition to dealing with the challenges of the global livestock economy and detrimental national policies, African livestock exporters must also cope with changing economic conditions in their target markets on the continent. Those conditions, in turn, are also affected by external as well as African developments. Côte d'Ivoire is again a useful illustration. From independence to the mid-1970s, the country's real GNP grew at an average rate of 7.7% per year. From 1975–1977 there was a boom in the prices of coffee and cocoa, the economy's mainstays. Following this boom, the country undertook a massive public investment programme. But then coffee and cocoa prices fell and import prices rose. The government obtained large foreign loans to maintain the investment program. By 1980, there were major problems with foreign debt and balance of payments.

In 1981, Côte d'Ivoire, with assistance from the IMF and World Bank, initiated a structural adjustment programme to deal with these problems. But by 1990, conditions had hardly improved. The government was forced to make “draconian” cuts in public expenditures and will have to continue its adjustment programme—at least for the medium term. The World Bank expects this will cause a further reduction of 30% in consumption per person between 1990 and 1994—on top of the 13% decline from 1987 to 1990. If this harsh programme succeeds, the Bank expects that the Ivoirien economy could start to grow at 4% per year in 1996 (USAID/World Bank, 1991: pp. 1–2).

Meat and offal consumption in Côte d'Ivoire increased from 10.5 kg/person in 1975 to 13.2 kg in 1988. This 1988 peak coincided with the peak of non-African meat imports, i.e. European dumping. Consumption of meat and offal then declined to 10.0 kg/person in 1990. The drop in fish consumption from 1980 to 1987 and 1988 was 20.9, 14.2 and 15.6 kg/person, respectively and then its rebound in 1989 and 1990 to 19.6 kg and 19.2 kg/person seems to support the above hypothesis about substitution between fish and capa.

Predictions of demand are important inputs for formulating a strategy of livestock research and development. Long-run projections of population and income are often used in support of optimistic, aggregate scenarios for the African livestock sector. Focusing on the nearer term and a particular market is a bit more complicated, as can be seen by

comparing recent World Bank and African Development Bank (ADB) projections of Ivoirien demand for meat.

For the year 2000, the ADB's high, medium and low scenarios project total demand for meat and offal at 190 000, 140 000 and 120 000 tonnes, respectively. This compares with a 1990 consumption figure of 117 300 tonnes. The difference among the scenarios is the assumed annual growth rate of consumption per capita—1% , -2% and -3% . Thus, the high case winds up with per capita meat consumption of 11.0 kg. The pessimism in all these scenarios is clear since the *high* case projects lower per capita consumption than was true throughout the 1980s until the sharp contraction from 13.2 kg in 1988 to 10.2 kg in 1989. The medium and low scenarios assume even lower levels, down to 8.2 kg and 7.2 kg, respectively.

The World Bank offers high (106 704 tonnes) and low (86 240 tonnes) projections to 1997. This compares with the African Development Bank's 1997 projection (by interpolation) of 164 600, 133 100, and 119 500. The Bank's two cases are driven by different income elasticities of demand applied to income projections (N= 1.2% for the low case and 0.8% for the high case—the higher the income elasticity, the sharper demand will fall as income falls). It is of course striking that the African Development Bank's *lowest* projection is 12% above the World Bank's *high* projection, and that its highest projection is 55% greater than the World Bank's high projection.

Two factors are at play here. They show how sensitive these exercises are to seemingly slight differences, i.e. differences that are probably within the margin of error of surveys on which the estimates of variables are made. First, the ADB estimates population growth at 3.9% while the World Bank uses 3.5% . Note that still a third estimate, 3.8% , appears in the World Bank's Annual Development Report for 1991. Second, the two sets of projections estimate future per capita consumption with different methods and from different initial conditions. As a result, the World Bank estimates 1997 per capita consumption at 7.3 and 5.9 kg in its two cases, while the ADB gets 10.7, 8.7 and 7.8 kg in its three scenarios.

While accurate projections of meat demand in Côte d'Ivoire may not be possible, it is clear that short-term demand will be affected by low world prices for coffee and cocoa and by consequent national economic problems and the strong measures taken to resolve them. The African Development Bank's scenarios do not show any decline in *total* meat consumption, just lower per capita consumption and slower growth. World Bank scenarios show declines to 1995 and then a recurrence of growth by 1996. The world market picture for coffee remains bleak, with prices 75% of their 1977 peak. However, cocoa futures prices, which had fallen even further and are still 75% below their 1977 peak, surged up about 50% since this summer to US \$1245 per tonne (International Herald Tribune, 1992).

Further complicating the picture is the Ivoirien political situation. In the 1970s the stable political environment helped attract foreign investment. Just the opposite has been true for some years now. If [President] Boigny retires or dies in office in the next few years, that may lead to greater instability or it may clarify and stabilise the situation. Demand projections are obviously problematic.

*Dairy trade and aid*²

The international dairy situation bears many similarities to the international meat situation and, as shown above, the two have some direct linkages to each other. Von Massow (1989: p. 1) offers this assessment for the early and mid-1980s:

Europe and the United States have significant dairy surpluses and are prepared to sell significant dairy quantities at very low prices or to give them away free. This has a two fold

2 This section is drawn from Shapiro et al (1992).

impact, as the availability of cheap or free dairy imports not only discourages domestic production, but also stimulates an increase in domestic consumption, exceptions being countries where food aid is being used to help finance dairy development projects. [These were largely unsuccessful.]

In addition, a number of African countries maintain overvalued currencies, which also cheapens the domestic price of imported milk, discourages domestic production and encourages consumption. And while some African countries have trade policies which may be designed to protect [the] domestic dairy industry,...such policies have generally been overwhelmed by the effect of overvalued currencies.

However, looking at the late 1980s and 1990, Shapiro et al (1990: p. 20) predict that, depressed world dairy prices and large dairy donations will not continue because of changes in dairy price support policies. Essentially, it has become too costly for either the EEC or the US to continue their past programmes, which have encouraged surplus milk production. Consequently, sub-Saharan Africa will have to rely increasingly on domestic production to expand consumption...

The authors point to several developments in support of this somewhat controversial prediction (Shapiro et al, 1992: p. 21–25). Following unsuccessful efforts to control supply with incentive payments (for farmers to quit dairying) and with co-responsibility levies, the EC in 1984 instituted compulsory quotas. The quotas have been very successful in alleviating excess supply. By 1989, EC-12 ending stocks of skim milk powder were down 73% from 1986 and butter stocks were down 77% .

Since 1981, US farm legislation has had provisions to cut the milk support price if government purchases of surpluses exceed specified limits. This has resulted in a cut in the support price from US\$0.29/kg in 1981 to US\$0.22/kg in 1990. This drop, along with voluntary supply control and increasing US cheese consumption, caused US dairy surpluses to fall from 12% of production in 1983 to about 5% by the end of the 1980s. Current support prices are believed to be lower than full production costs and hence supply and demand should come into balance.

New Zealand and Australia do not subsidise exports but they are low cost producers. They account for about 25% of world exports, but the potential for expansion is limited, especially in New Zealand. Eastern Europe is a major unknown. Large co-operative farms have produced in excess of consumption, especially as the easing of price controls has dampened demand. However, privatisation of production and higher incomes should bring supply and demand closer in line.

The above developments have resulted in lower surpluses and higher prices. The world's 1990 ending stocks for butter and skim milk powder were projected to be only 35% of their 1986 levels. Dairy prices increased considerably from 1986 to 1989 and while they softened in 1990, they were still 50% to 100% above 1985–1987 levels. Lower stocks and higher prices discouraged food aid donations which were estimated to have fallen by 35% between 1984 and 1988. In conclusion, any build-up in stocks will be met with more restrictive quotas or lower support prices. Consequently, the longer-term prospect is for dairy prices on world markets to remain high relative to levels experienced in the 1970s and 1980s. Smaller surpluses will also generate smaller dairy donations (Shapiro et al, 1992: p. 24).

Total sub-Saharan dairy imports (commercial and donated) declined by nearly half from their peak of almost 3.5 million tonnes (liquid milk equivalent) in 1985 to less than 1.8 million tonnes in 1988. Most of the decline was in the form of dry milk (the dominant dairy import), which experienced stronger world markets. Donated dairy products in total dropped from nearly one million tonnes (liquid milk equivalent) in 1985 to 315 000 tonnes in 1988. Imported dairy products account for a small and declining share of total milk available in Africa.

Donated dairy products have been considered a development tool, not just a form of welfare for consumers or of competition for local producers. Between 1983 and 1988, the World Food Programme (WFP) donated approximately US\$134 million worth of dairy food aid to 13 African countries: Angola, Mali, Senegal, Burundi, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Swaziland, Tanzania and Uganda (WFP, 1988). Tanzania was the largest recipient with US\$35 million and Uganda was next with US\$24 million.

Locally produced milk from the Tanzania Sisal Authority farms were to provide 3000 litres and the rest was to be made up by combining WFP powder. The plant design was enlarged from the original after Tanzania received a US\$10 million World Bank credit to expand parastatal dairying. The installed capacity finally was 40 000 litres (Netherlands Economic Institute, 1988: p. 165).

The plan for Tanga and other plants was that locally produced fresh milk would eventually replace imported powder as the domestic industry developed—helped in part by proceeds from WFP donated powder. Not only has this not materialised, but in Tanzania there was actually an increase in the share of powder in total processing between 1976 and 1983 in the four plants with reconstitution capability (Netherlands Economic Institute, 1988: p. 167).

The best known example of using dairy food aid to develop a local dairy industry is India's Operation Flood. At the start of Operation Flood, India had several advantages that Africa does not now enjoy. The relatively high level of industrial development in India allowed Operation Flood to buy locally produced dairy equipment with local currency generated through food aid sales. The foreign exchange needs of the project were thereby minimised. There was a relatively large pool of trained manpower to draw on for project implementation and research. In terms of dairy development, India had and continues to have much higher levels of per capita consumption of dairy products than African countries. When the project began, there were areas of India with thriving commercial dairy production by both smallholder and commercial operations. This situation exists in only a few African countries. Similar efforts to use WFP dairy food aid for development of African dairy industries have enjoyed much less success.

Mali provides an interesting case study. In 1969, the country received WFP aid for the development of the milk industry in Bamako. The outcome was not as hoped for, and the WFP cancelled a renewal of the Mali project in 1979. Since 1984, however, the EEC has supplied skim milk powder and butter oil, much of which is sold by the government to the Union Laitière de Bamako (ULB). The revenues from sales of dairy food aid currently go to a compensation fund for famine victims, whereas the original WFP project envisioned them going to a research station or dairy development.

ULB reconstitutes milk and sells it at subsidised rates to consumers in the capital. ULB incorporates negligible amounts of local milk in its product and its retail prices are almost half the retail price of fresh milk. According to von Massow (1989) less than 50% of ULB's pre-tax profit goes to stimulate milk production.

Mali's use of dairy food aid has provided inexpensive milk to consumers in the capital area. Yet it has not helped to promote dairy development either through research, extension or price incentives for producers. ULB's cheaper product, though inferior, decreases potential demand for local milk in the short-run. It has brought milk consumption to a greater portion of the population, stimulating domestic demand for milk without an increase in domestic production. This increases dependence on foreign sources of dairy products, whether donated or commercial. In other parts of the continent, researchers have documented the negative impact that low consumer prices have had on the domestic dairy industry (Mbogoh 1984; Rodriguez, 1987). Dairy food aid is unlikely to play a major role in the development of Africa's dairy industries.

The exchange rate

For sub-Saharan Africa as a whole, real effective exchange rates rose through the 1970s and early 1980s and then declined sharply (World Bank, 1989: p. 29). Overvalued exchange rates were a significant factor in increasing African dairy imports in the 1970s and early 1980s. Von Massow (1989: pp. 29, 31) studied the growth of dairy imports in 22 African countries from 1970–1972 to 1980–1982 and concluded that,

where imports grew faster than can be explained by changes in population, income, and domestic production, the increase was due to the effects of exchange rate overvaluation and low import prices;...national governments have significantly influenced this increase through their own policies, specifically their interference with the exchange rate.

The dominance of the exchange rate over other policy variables is seen in Nigeria. Nwoko (1986) showed that Nigerian policy was consistent with the objective of decreasing dairy imports and increasing domestic production. However, those policies were overwhelmed by the overvalued exchange rate (and low world prices) so that imports increased tremendously from 1972 to 1982 (von Massow, 1989: p. 34). Similarly for beef, ILCA (1990: p. 106) showed that when evaluated at official exchange rates, import policies resulted in a nominal protection coefficient (NPC) well above 1.0 from the mid-1970s onwards, i.e. they operated to give domestic producers considerable protection from the world market. However, when evaluated at an adjusted exchange rate (approximating a free rate) the NPC was found to be much lower and below 1.0 between 1979 and 1985, i.e. domestic producers actually were implicitly taxed and imports were favoured during those six years.

Devaluation of the FCFA is often discussed as one way to increase the competitiveness of the West African livestock sector. However, overvaluation may not be so intractable a problem as it appears and devaluation is not the only tool at hand nor is it without significant risks.³

The problem with an overvalued exchange rate is that it artificially makes exports more expensive and imports less expensive. Basically, it decreases the competitiveness of exports and of domestic goods facing import challenges. A well-known way to deal with this is through a mix of import tariffs and export subsidies that will affect competitiveness just as devaluation would. Thus, for example, since the mid-1980s, several Sahelian countries have been subsidising cotton and groundnuts, making them more competitive on the world market and they have been protecting food grains. There are limits to such a strategy. It may lead to unsustainable political and/or fiscal problems and it is prone to being undercut by smuggling.

A second alternative is to operate directly on the real exchange rate (the nominal rate adjusted for inflation). If Mali's nominal rate (e.g. 50 FCFA = 1 French franc) stays constant but the country undergoes 50% inflation, then the real rate will have appreciated by 50%. For competitiveness, what matters is the "real effective exchange rate," which takes into account not just Mali's rate of inflation but also that of its trading partners and competitors. Monetary and fiscal policy have to be brought to bear to control inflation to rates below those of competitors. In the 1980s, with the help of structural adjustment programmes, several CFA (Communauté financière africaine) countries experienced declines in their real effective exchange rates: -25% in Mali between 1976 and 1986; and -29% in Niger between 1981 and 1987.

While devaluation is often a faster and more direct way to affect competitiveness, it carries risks that may outweigh the gains. First, in countries without a real option to devalue, the fixed rate imposes monetary and fiscal discipline. For example, USAID/World Bank (1991: p. 3) have described Mali's reform programmes as, "good, almost exemplary".

3 The following discussion is based on Shapiro et al (1988).

Second, devaluation after such a long tie to the French franc would likely lead to capital flight and enhanced inflationary expectations. That would make control of the real effective exchange rate all the harder.

Third, without the devaluation tool, countries are forced to intensify the search for productivity raising reforms which are essential for increased competitiveness. Cost reductions in Sahelian cotton sectors after the decline of world prices are cited as examples of such beneficial actions. Finally, devaluation raises the issue of the survivability of the French zone. Each CFA state cannot define its own parity with the French franc without threatening the zone.

All of this is not to say that devaluation of the FCFA should never be considered. Rather, the full implications of devaluation must be taken into account, as must alternative measures to control the real effective exchange rate. It may turn out that the devaluation option is not better than its alternatives.

Transportation

Inadequate and costly transportation is a major marketing problem. Average road construction costs in Africa are said to be almost one-third more than in South Asia; road and rolling stock maintenance are more than twice as expensive (Singh, 1990: p. 35). Singh lists various causes: low rates of equipment utilisation caused by lack of spare parts make construction more costly; limited funds diminish the frequency of maintenance which means that roads and rolling stock deteriorate to levels that are costly to restore; both very wet and very dry climates speed road deterioration; and heavily staffed roads departments use most of their budget for salaries (90% in Kenya in one year).

Not only is transport costly, it may also not be available or not available in the amount and at the time needed. For example, in parts of Kenya in the wet season, roads deteriorate to the point where milk deliveries to processing plants decline by 20% to 30%. Thus, farmers cannot get their milk to market (IDF, 1986: p. 12).

High transport costs on the African continent can give an advantage to competing imports. This has particular relevance for West African meat facing competition from imports in the main urban consumption centres. Those centres are on the coast. Thus, imports landed at the docks do not suffer from inadequate transportation systems in the interior. In contrast, most meat animals are in the Sahel, far from the consuming centres and thus very much at the mercy of interior transportation systems.

In the 1970s, most Sahelian exporters could choose among three means of transporting animals to market—trek, truck and train. The University of Michigan's livestock studies found trekking to be the most common means of moving animals from the Sahel to the coast in the mid-1970s (Shapiro, 1979: pp. 18–19, 178, 402). Staatz (1979: p. 181) showed that in 1976/1977 the cost per animal of moving cattle from Tingrela at the Mali–Côte d'Ivoire border to Bouaké in south-central Côte d'Ivoire was twice as high by truck as by trek. That comparison includes the cost of weight loss, alleged to be high on treks but found to be modest by Staatz (1979: p. 181). In fact, he states that in some cases, animals gain weight from good grazing along the trek route, although this obviously depends on the season and on how fast the drover moves the animals.

The main indirect cost of trekking was time. The Tingrela–Bouaké route took 30 days by trek compared to only one day by truck. The importance of this difference depends on the opportunity cost of capital, but it generally was not enough to outweigh the great cost-saving in trekking. In some cases, however, truck or train was preferred because of herd size, the need to reach a market during a short period of high prices or other factors.

Over the last 20 years, trekking has become less feasible while truck and rail options have expanded, albeit in a costly and inefficient fashion (Kulibaba and Holtzman, 1990: pp. 39–40):

Increased population density and the expansion of residential, agricultural, and reserve lands in the coastal states have severely restricted the use of trekking to coastal markets...Government regulations have been imposed which severely restrict the passage of livestock in certain regions.

While trek options declined, the road network expanded. Unfortunately, according to Kulibaba and Holtzman (1990: p. 58) :

Road transport in West Africa is characterised by high costs and inefficiency, due principally to...(a) high import duties on vehicles, spare parts and fuel; (b) high administrative costs and fees for the registration and operation of vehicles; (c) [low] tariff rates [that limit] ...profitability and reinvestment; and (d) high transaction costs in the form of bribes, extortion and other corrupt behaviour by uniformed services responsible for controls.

The 1990 option is also problem-ridden. Kulibaba and Holtzman (1990: pp. 69–77) found that the Regie Abidjan–Niger (RAN), which operates between Ouagadougou and Abidjan, suffers from management problems, insufficient and overaged rolling stock, frequent breakdowns and limited repair capability. In addition, the shortage of rail cars, the infrequent service, and the system of charging per car rather than per head encourages overcrowding and animal mortality. Not surprisingly, RAN's inefficiency, infrequent service and insufficient rolling stock have spawned a system of bribes to gain priority access.

More generally, the World Bank (1989: p. 53) comments that, "railways, which were once the backbone of Africa's transport system, are now in a critical situation." Only two of 22 had even modest profits between 1985–1987 and many had large deficits. Ghanaian annual rail tonnage dropped from about 2.6 million in the early 1970s to 0.4 million in the mid-1980s. Nigeria's railways lost 33% of their traffic from 1979 to 1986. Lack of equipment and poor maintenance prevent the railways from taking the tonnage that would be available to them.

Lawlessness

The West African live cattle trade from the Sahel to the coast has recently come under increasing pressure from illegal charges imposed by officials who control necessary papers and access to transport. Kulibaba and Holtzman (1990: p. 101) found that bribery and extortion accounted for between 5% and 23% of marketing costs in the region, with the highest costs being in Mali and Ivory Coast.

The University of Michigan studies in the mid- and late 1970s also found these charges. At that time they do not seem to have been so important in Côte d'Ivoire and Burkina Faso as they were in Mali. Staatz (1979: p. 181) and Herman (1979: p. 406) cite these charges mainly when animals were trucked in Burkina Faso and Côte d'Ivoire. At the time of their studies, trucking was not a very important mode of transport; trekking dominated.

As trekking has declined, trucking has become more important, and this may help explain the increasing importance of illegal charges. In the companion Michigan study of Mali, Delgado (1980: p. 377) found that "non-official fees" were quite important and an expected cost of exporting. He cites the case of the most important legal trader who had to pay 6800 FM per head in illegal charges for cattle trucked from Bamako to Abidjan in 1977. This almost equals the 8730 FM per head of official fees required for exports.

The rise of illegal charges has added a further impediment to intra-African animal trade. Not only does it lower producer prices and raise consumer prices, it also gives an advantage to non- African imports, which do not face most of these illegal charges.

Possible roles for ILCA

The pervasiveness of structural adjustment programmes throughout Africa attests to the effectiveness of research and proselytising by the World Bank, International Monetary Fund, United States Agency for International Development (USAID) and others over the past decade. The importance of trade and macro-economic policies is accepted, and the general nature of their impacts is understood—at least to the point where additional general work faces diminishing marginal returns. The emphasis now must be on (1) country and sector-specific research, and (2) development of national capability to continually monitor and adjust these policies.

ILCA's strategy and long-term plan (1987: pp. 75–76) proposes an ongoing research planning process and identifies the following three modes of research implementation: collaborative research; contract research; and own research. The planning process calls for biannual meetings with the “Leaders of Livestock Research, Training and Development in Africa”, the collaborative research mode focuses on National Agricultural Research Systems (NARS) and contract research is anticipated with various specialised institutes.

This orientation to national research leaders and institutions is especially appropriate for trade and macro-economic policy. However, ILCA may have to co-operate with a broader set of institutions than those indicated above. National directors of livestock research are unlikely to be the best participants in ILCA's ongoing planning process as it relates to trade and macro-economic policy. Similarly, the livestock research services are unlikely to be the best partners for research on these issues. Indeed, ministries of agriculture may not be the best starting point.

At the ministerial level, finance is, of course, a logical target. ILCA may play a useful role in sensitising decision makers in finance to the effects their policies have on the livestock sector and the need to conduct research on those effects.

At the level of research co-operators, ILCA can look to various kinds of institutions. Economic research units within some ministries may be useful. However, it is our experience that in ministries of agriculture, there may be expertise in micro-economic but not much in macro- or trade. (This, in part, reflects the training offered in most departments of agricultural economics in US universities). Thus, ILCA must look beyond its usual collaborators.

Research institutes such as Centre ivoirien de recherches économiques et sociales (CIRES) in Côte d'Ivoire, Makerere Institute of Social and Economic Research (MISER) in Uganda, and Economic Research Bureau (ERB) in Tanzania may be effective partners. Many of these are linked through networks that can also be useful. The ADB hopes to start a programme to strengthen such institutes and the World Bank's African Capacity Building Initiative may be relevant.

Compared to other economic issues, trade and macro-policy may require the most attention in the national context to foster good analysis and effective implementation. Thus, ILCA faces two related challenges—first, to collaborate with national researchers in a way that builds national capacity and second, to collaborate with the right institutions in such a way as to maximise the prospects that research will lead to policy change.

ILCA may also be able to work effectively in other modalities. It may perform a valuable service by continually monitoring and analysing the world meat and dairy markets and communicating findings to national institutions. As argued above, the livestock sectors in many African countries are strongly affected by world market conditions. However, few, if any, African countries monitor those external forces; nor do they analyse their likely impacts.

ILCA may also play a role in upgrading livestock statistics. Livestock have not been well integrated into previous efforts to improve agricultural production data, and we are

unaware of any efforts to improve livestock trade data. If trade and macro-policy analysis is important, then the data base for such analysis must be improved.

ILCA may be helpful in efforts to organise regional trade groups. Those efforts call for a good understanding of the constraints to greater regional trade and also identification of winners and losers from regional trade agreements. Outside, impartial analysis may be the most helpful.

ILCA may also have a role to play in calling attention to the deleterious effects of developed country policies on developing countries. Can ILCA serve as a voice for Africa in forums discussing US or EC policies or at GATT meetings?

Finally, can ILCA bring special expertise about the livestock sector to collaboration with International Food Policy Research Institute (IFPRI) or World Bank researchers?

References

- Ariza-Nino E J and Steedman C. 1980. Synthesis report. In: Ariza-Nino E J, Herman L, Mekinen M and Steedman C, *Livestock and meat marketing in West Africa: Volume 1. Synthesis Upper Volta, Part I*. Center for Research on Economic Development, University of Michigan, Ann Arbor, Michigan, USA. pp. 1–33.
- Delgado C L. 1980. Livestock and meat production, marketing and exports in Mali. In: Delgado C L and Staatz J, *Livestock and meat marketing in West Africa. Vol. III, Ivory Coast and Mali*. Center for Research on Economic Development, University of Michigan, Ann Arbor, Michigan, USA. pp. 211–439.
- Herman L. 1979. The livestock and meat marketing system in Upper Volta: Summary of an evaluation of economic efficiency. In: Shapiro K H (ed), *Livestock production and marketing in the entente states of West Africa: summary report*. Center for Research on Economic Development, University of Michigan, Ann Arbor, Michigan, USA. pp. 323–437.
- IDF (International Dairy Federation). 1986. Milk collection in developing countries. *International Dairy Federation Bulletin* 205. 16 pp.
- ILCA (International Livestock Centre for Africa). 1987. *ILCA's Strategy and Long-term Plan*. ILCA, Addis Ababa, Ethiopia. 99 pp.
- ILCA (International Livestock Centre for Africa). 1990. *ILCA Annual Report 1989*. ILCA, Addis Ababa, Ethiopia. 144 pp.
- International Herald Tribune*. 1992. January 25–26, 1992 issue. pp. 14.
- Josserand H. 1990. *West African systems of production and trade in livestock products: Synopsis and introduction to a regional analysis*. Working paper. Club du Sahel, Paris, France.
- Kulibaba N and Holtzman. 1990. *Livestock marketing and trade in the Mali/Burkina Faso—Côte d'Ivoire corridor*. Draft. Abt Associates, Washington, DC, USA.
- von Massow V H. 1989. *Dairy imports into sub-Saharan Africa: Problems, policies and prospects*. ILCA Research Report 17. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. 46 pp.
- Mbogoh S G. 1984. Dairy development and dairy marketing in sub-Saharan Africa: Some preliminary indicators of policy impacts. *ILCA Bulletin* 19:8–16. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia.
- Netherlands Economic Institute. 1988. *The livestock sector in Tanzania*. Rotterdam, The Netherlands.
- Nwoko S G. 1986. *The development of dairy imports in Nigeria*. LPU (Livestock Policy Unit) Working Paper 10. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. 43 pp. + 14 Appendixes.
- OECD (Organization for Economic Cooperation and Development). 1989. *Agricultural policies, markets and trade: Monitoring and outlook*. OECD, Paris, France.

- Rodriguez G Jr. 1987. The impacts of the milk pricing policy in Zimbabwe. *ILCA Bulletin* 26:2–7. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia.
- Shapiro K (ed). 1979. *Livestock production and marketing in the entente states of West Africa*. Center for Research on Economic Development, University of Michigan, Ann Arbor, Michigan, USA.
- Shapiro K. 1991. Assessment of animal agriculture in Africa: Economic issues. Study Work group Paper for *Assessment of animal agriculture in Africa*. Winrock International, Washington DC, USA.
- Shapiro K and Doumbia A. 1992. *Mali livestock markets and marketing*. Paper prepared for USAID (United States Agency for International Development).
- Shapiro K, Berg E and Kristjanson P. 1988. *The competitiveness of Sahelian agriculture*. Paper presented for the Club du Sahel, December 1988.
- Shapiro K, Jesse E and Foltz J. 1992. Dairy marketing and development in Africa. In: Brokken R F and Senait Seyoum (eds), *Dairy marketing in sub-Saharan Africa*. Proceedings of a Symposium held at ILCA, Addis Ababa, Ethiopia, 26–30 November 1990. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. pp. 45–87.
- Singh J. 1990. Analysis of project costs in sub-Saharan Africa in selected sectors. In: World Bank (Background papers), *The long-term perspective study of sub-Saharan Africa, Volume 2, Economic and sectoral policy papers*. The World Bank, Washington, DC, USA.
- Staatz J. 1979. The economics of cattle and meat marketing in Ivory Coast: A summary. In: Shapiro K (ed), *Livestock production and marketing in the Entente states of West Africa*. Center for Research on Economic Development, University of Michigan, Ann Arbor, Michigan, USA. pp. 144–227.
- Stryker J D, Dethier J, Prepah I and Breen D. 1987. *Incentive system and economic policy reform in Mali*. Associates for International Resources and Development, Sommerville, Massachusetts, USA.
- USAID/World Bank. 1991. *Liberalising regional markets for livestock products: An action plan for the Mali, Burkina and Côte d'Ivoire corridor*. USAID (United States Agency for International Development)/World Bank, Washington, DC, USA.
- WFP (World Food Programme) Committee on Food Aid Policies and Programmes. 1988. *Food aid and dairy development*. CFA (Committee on Food Aid Policies and Programmes), Twenty-fifth session, Rome, Italy, 30 May–10 June 1988. WFP, Rome, Italy.
- World Bank. 1989. *Sub-Saharan Africa—from crisis to sustainable growth: A long-term perspective study*. World Bank, Washington, DC, USA. 300 pp.

[In his presentation, Dr. Shapiro put forth a number of priority research areas to be considered for discussion as well as a matrix (Figure 1, p.7) in which to categorise the issues. The priority research areas are reproduced below.]

Priority research areas for consideration

1. Liberalisation/structural adjustment (applications to livestock, national and general)
2. Regional economic integration (impediments, winners and losers, welfare, protection)
3. Impediments to trade (regional and national)
4. Market prospects (national, export)
5. World market conditions (analysis, warnings, advocacy)
6. Coping with variability (drought, world market, export market economies)
7. Improving data (production, trade, how is livestock different)
8. Encouraging policy change (internal, external)

9. Credit (for trade, for fattening, for butchers, landlords)

Discussion

- Q: What did you mean by the statement “the drop of per capita imports is good for producers but bad for consumers?” I believe that both consumers and producers would be worse off.
- A: You are right. In Côte d’Ivoire, the result was that cheaper meat was not made available to consumers.
- C: I think that ILCA could do more about the application of subsidies.
- C: We should work with the issue of exchange rates but I hope the conclusions we reach are not the same as those of the speaker. Alternatives do not work well. At issue here is the short-term costs versus long-term benefits. ILCA should look at the available data on exchange rates.
- C: It is true that exchange rates have, for too long, been inappropriate. Unfortunately, few African countries have sufficiently developed markets. When it comes to an overvalued exchange rate, devaluation is not necessarily the solution. Perhaps a better solution would be to maintain a nominal exchange rate for SSA or to develop more appropriate fiscal policies.
- A1: I agree that changing exchange rates will not solve problems if no internal measures, such as marketing, are put in place as well. We are still not going to get far with overvalued exchange rates. We need balanced internal and external changes.
- A2: With reference to structural adjustment and the poor, we found in our study that dramatic effects were more pronounced in developed countries. We tend to be too concerned with short-term effects; short-term negative effects are not strong enough to negate devaluation.
- C: You say that in 1989, there was a large jump in per capita beef consumption because of dumping. In fact, there was only a 200 g/person increase. The real increases were in pork and fish.
- A: The argument should be for 1985–88.
- C: If we focus too much on exchange rates, we lose the point. We should be looking at structural adjustment as a package.
- Q: Your three-way matrix seemed useful. This group needs to debate about the appropriate audience for ILCA’s research. Who are our targets? We are not making policy but providing information, analysis etc. Is there a target audience where ILCA has a comparative advantage?
- A: ILCA’s audience should not just be Africans, but livestock people involved in the production cycle.
- Q: Can the speaker comment on dairy food aid—the impact of reduced dairy aid on domestic consumption/production? Do we know enough here?
- C: Regarding dairy marketing in Nigeria, imports hit different markets. Imports did not damage producers/peri-urban dairying. Is this true and are there any similarities in terms of meat? Are they competitive or separate markets?
- A: There may be more competition in terms of dairy, than meat markets. Importation of milk hurt peri-urban dairy production. Regarding imports and local production, in terms of dumping meat, clearly there was segregation in markets.

- C: There are two types of target consumers for meat in Côte d'Ivoire and Mali. In Côte d'Ivoire, meat has been subsidised for a long time. One of the responses of the government was to suppress subsidies. As a result, the price of meat went up and people tended to substitute fresh meat for frozen meat. For the second type of consumers—those using frozen meat as snacks—when the price of frozen meat became cheaper, people went to market to purchase this meat for snacks.
- S: Out of this discussion, a number of points were raised that should be addressed by the work groups. Specifically, the issue of ILCA's target audience; dairy aid/food aid as a researchable issue; the priority research areas listed by Dr. Shapiro in his presentation; and ILCA's involvement in regional economic integration.
- C: A real comparative advantage for ILCA is its expertise in livestock development. The issue of regional economic integration, proposed by Dr. Shapiro, does need more technical understanding.
- C: We should keep this list and return to it. As we talk, opportunities may open up. For instance, in terms of world market conditions, we do have many linkages outside of Africa. This list may also expand.

Guidelines for structural reforms and transformation in the African livestock sector

S.C. Nana-Sinkam and Abdoulaye Niang

*Joint ECA/FAO Agricultural Division
United Nations Economic Commission for Africa
Addis Ababa, Ethiopia*

Introduction

For almost two decades, African countries have been going through a series of economic reforms. Most of these reforms have been undertaken under the stabilisation programme of the International Monetary Fund (IMF) or the structural adjustment programmes (SAP) promoted by the World Bank. The conditions and terms of these reforms were often ill-defined and inappropriately controlled. Those, notably under the SAP, have not always achieved their stated objectives.

The need for reform cannot be questioned. However, these reforms should be directed towards growth and development. Hence, structural transformation of African economies should be the basis of any meaningful economic and social reform.

This paper deals with the guidelines for structural reforms and transformation in the African livestock sector and is in line with the African Alternative Framework to Structural Adjustment Programme (AAF-SAP). It is argued that no matter how many resources are poured into the livestock sector or the volume of results that are generated by research institutions such as the centres sponsored by the Consultative Group on International Agricultural Research (CGIAR), they will have no measurable impact with the target or ultimate beneficiaries if the policy environment is not enabling.

What follows is based on the principle that African people and governments should pursue a collective goal in animal food self-sufficiency based on self-reliance and within the framework of the major subregional economic groupings and the newly established African Economic Community (AEC).

The structural adjustment policies and programmes and the African livestock sector

Despite huge potentials in productivity and production, the performance of the African livestock sector has been disappointing. Indeed, the productivity index for cattle over the period 1980–88 was less than 12.7% with an annual average offtake rate of less than 11.7%. It takes about seven years to raise an animal for slaughter and the production of one tonne of meat requires eight head. Likewise, nearly 500 milking cows are needed to produce 1000 litres of milk. Each year, at least 100 out of every 1000 cattle die for one reason or another.

There is a need to reverse the present trend of deteriorating performance in livestock productivity. This will, however, require bold decisions for structural transformation. In particular, reforms should take advantage of the potential in both production and trade and create conditions for the control of production by producers which will motivate them to adopt and adapt packages for increased productivity and sustained production. Reforms should be aimed at self-sufficiency in livestock production based on collective self-reliance and enhanced subregional trade. For instance, subregional markets should be developed

in order to stimulate competition among producers within the subregion. This might require the temporary use of trade distortion instruments (tariff, quota). Costs of production should be minimised by controlling risks, uncertainties in the availability of inputs, services and market outlets and by valorising all by-products (blood, bones, manure, hide and skin, hair etc).

These conditions may include land reform where, for example, an individual or group of individuals will have exclusive rights of use to a piece of land, access to a wide range of quality and competitive services (veterinary, extension, marketing) and inputs provided by both the public and private sectors.

The efficient and planned supply of livestock products will require the development of information and data management systems and the use of policy analysis tools. Appropriate policy instruments should be used to stimulate the demand for livestock products. The livestock sector should contribute to the achievement of food security by generating more jobs in the sector and in allied industries.

The possible impacts of the major instruments of SAP on the African livestock sector

African governments, assisted by international financial institutions, are presently designing and implementing the structural adjustment component of the agricultural sector. Under SAP, which is based on a pure market mechanism, emphasis is on acquiring supplies from cheaper sources in order to meet the aggregate food demand. The international meat market is distorted through production subsidies and export promotion facilities by collective or individual governments as in the case of the European Economic Community (EEC) or Australia and Argentina to name but a few. Therefore, it is almost impossible for African livestock farmers, who are theoretically not allowed under SAP to obtain subsidies, to match the price offered even in their domestic meat market.

Hence, pursuing animal food security under the terms of SAP could mean a decreased share of domestic production in the aggregate supply of meat at the national level and an increased share of foreign frozen meat. In such circumstances, while the access of consumers, notably urban dwellers, to goods may increase in the short-term, purchasing power will be severely affected in the long run as domestic production would decrease leading to fewer jobs in the livestock sector, allied industries and the public sector. A consequence would be a reduction in tax revenues.

The main policy instruments used under the stabilisation and adjustment programme of the IMF and World Bank as they could affect the livestock sector are discussed below. Possible impacts of the various policy instruments are also discussed.

Reforming pricing policies

In many countries, the price of meat is often artificially set at a level that does not include sufficient margin for the butcher to adequately cover cost of production. As a result, the butcher compensates by tapering on the composition, quality and quantity of meat sold to consumers, avoiding paying taxes in the slaughterhouse or not reimbursing as scheduled, loans from commercial banks, from the farmers or the middlemen. Hence, farmers suffer from a high rate of payment defaults. They also have no incentive to produce high quality slaughter animals for domestic consumption.

Decontrolling meat prices for urban consumers would lead, *ceteris paribus*, to an increase in the margin per animal at farm gate. The expected outcome of decontrol is to induce greater livestock production as net profits should be higher. Since the supply function for livestock is often backward-bending in the areas with comparative advantage

in breeding (ACABs), it is likely that the response of producers to price increases would be a reduction in meat production in the short run.

Reforms in pricing policies also imply a reduction, if not the elimination, of input subsidies. This, in turn, would affect the profitability of livestock production as the private cost of production would increase. Because of lags in response to price changes, it is likely that the withdrawal of input subsidies will initially negatively affect the volume of production, notably in ACABs.

The removal of subsidies might lead to an increase in the price of meat at the retail level and, perhaps, to a better quality domestic meat in a transparent meat market in the producing country.

Overall, reforming pricing policies would affect producers (higher production costs versus improved physical access to inputs and increases in farm-gate price of livestock for farmers) and consumers (higher price of meat versus better quality services and products). In particular, producers in the areas with comparative advantage in cropping (ACACs) and areas with comparative advantage in intensive production of meat, milk and eggs (ACAI) could take advantage of price increases in meat, eggs or milk as adjustments are possible in a period of about three months (fattening operation, poultry operation, intensive milk production). However, these producers are heavy users of modern inputs whose prices will become higher from the removal of input subsidies.

Liberalising import

The existing world market for livestock products is distorted by export promotion measures, including production and export subsidies, applied by developed nations. Hence, world market prices are low, affecting the ability of African producers to compete in the world market.

Import liberalisation may be destructive to African production and to consumers as the contribution of livestock to the generation of employment and income would be reduced. Indeed, many producers, notably those in ACACs and ACAIs, would be forced out of business; many more in ACABs would end up retaining animals beyond their economic life.

Equally, import liberalisation might lead to the promotion of competition in the input market by dismantling the state monopsony. The availability of inputs could then be increased and sustained provided that the private sector was able to fill the void left by the state's withdrawal. Production of livestock products and by-products might further improve as a result. Increased competition could lead to a reduction in the demand for locally produced meat as less income would be available in the livestock sector and allied industries.

Promoting export

The export of livestock products should be enhanced for the producing countries under the export promotion scheme. Credit, export subsidies, relaxation of export quotas or regulation are normally advocated under this scheme.

Enhancement would take place only if trade distortions were not applied by potential consumer countries. So far, African producers have met resistance in their attempts to enter the lucrative markets of the Middle East and Europe, thanks to the application of quotas and stringent health measures. Hence, such a programme, if applied to the livestock sector, would have minimal impact on production.

Reducing public expenditures

Public expenditure is often reduced through freezes in recruitments and salary, lay-offs and closing government-owned input and output supply outfits.

These measures will, in the short run, all negatively affect the demand for livestock products, notably meat which is considered a luxury commodity. Equally, the production of livestock products and by-products could be negatively affected by cuts in public expenditure that would severely affect the number of extension workers, delivery of animal health services and development of technologies and infrastructure in favour of livestock. A reduced demand for livestock products may also result. The reduction in production activities will further affect economic access of consumers to livestock products.

Increasing tax revenues

Reforms in fiscal policies in the form of improved tax collection and increases in tax rates are often used to reduce budget deficits. Indeed, the tax collection in many countries is deficient and subject to corruption. Improving the tax collection system could lead to increases in production costs. However, an improved tax collection system would be beneficial if it meant transparency and an increase in the effectiveness and honesty of government employees. A more efficient and fair tax collection system may decrease price distortions and result in reduced costs for transactions and the distribution of livestock products/by-products.

An increase in the tax rate could result in further increases in production costs as taxes might be levied at the point of production and processing of livestock and livestock products, or, at the point of consumption. This measure would negatively affect both the supply of and demand for domestically produced livestock products.

However, improving tax revenues could mean more job opportunities in the public sector and improved delivery capacity of public institutions and services (e.g. better extension services, animal health services, research activities etc.). Productivity could be enhanced and production increased as the economic access of consumers to livestock products would be further improved.

Credit squeeze

Under SAP, it is often recommended that the access of both private and public sectors to credit be limited through credit ceilings or through higher interest rate on loans (to discourage contracting loans). In this scheme, it is recommended that credit be redirected towards exportable commodities.

Limiting access to credit may reduce production and trade activities of producers in ACABs and ACACs as they often require short term credit for their operations. Equally, productivity in ACABs could be affected as the access to inputs might be reduced due to the credit limits or simply because operators might be denied access to credit. Also, inputs might be more expensive because of the scarcity and/or the higher cost of credit.

Employment opportunities, notably in ACACs and ACAIs, might be further reduced, thus contributing to a deterioration in the purchasing power of consumers. However, the export sector (skin, leather and meat) might benefit where credit is redirected towards exportable commodities that include livestock products.

Currency devaluation

Devaluation of currency should, in principle, make imported products more expensive and exports cheaper. For instance, in a country with excess capacity in livestock production and an overvalued currency, importing livestock products would be relatively expensive while

exporting livestock products would be enhanced through currency devaluation. However, since the African livestock sector depends heavily on imported inputs (e.g. day-old chicks, vaccines, drugs, equipment etc) currency devaluation will result in an increase in the cost of imports.

Increasing export opportunities could lead to increases in intensive production of quality livestock products. However, such opportunities will depend on the import component of inputs. Furthermore, because of distortions in the world livestock market, the extent to which African exporters will realise export opportunities from devaluation is uncertain.

Privatisation of government-owned input and output supply enterprises

The privatisation of government-owned input and enterprise supply outfits is often advocated under SAP. It is meant to increase efficiency in production as well as trade through the abolition of state monopoly and monopsony and the promotion of competition. However, in many African countries, the private sector is not prepared to take over from the public sector.

In principle, the sale of these enterprises would lead to a reduction in the budget deficit. If some of the revenue generated is partially directed towards the livestock sector, the delivery of services provided by the government could be improved. This, in turn, could help improve productivity and production (extension services, research, infrastructure). Yet, if government withdrawal is not accompanied by the entry of the private sector into vital domains, the livestock sector could suffer from a lack of, or inadequacy in, the supply and distribution of inputs and outputs and/or a reduced demand for livestock products.

Government withdrawal might result in lost jobs if the private sector is not interested in government-owned enterprise or it is interested but resources are not available to acquire the parastatals. The demand for livestock products might be negatively affected, although demand could be stimulated through the generation of additional or well-paid employment in the private sector.

Implications for policy analysis

Any given policy instrument may have positive and negative impacts. Since international financial institutions advocate the application of many instruments simultaneously, it is often asserted that several of them could reinforce the negative impacts of one or a group of instruments. Hence, the need exists to study the multiple impacts of a set of policies on target and related sectors in order to better understand the potential costs and benefits of policy instruments.

Reforming the livestock sector under existing conditions (e.g. public ownership of vital resources such as water and pasture land etc) and the terms of the international financial institutions, could aggravate conditions of the livestock sector and of those deriving their living from that sector. This would not lead to a lasting solution to Africa's livestock development problems, but instead, frustrate efforts aimed at realising animal food security. Hence, there is a need to undertake deep-rooted structural transformation of the sector based on self-reliance in the framework of subregional groupings.

The guidelines for the structural transformation of the African livestock sector

Structural transformation and adjustment programmes should enable livestock and business communities to competitively produce quality livestock products and by-products to satisfy the demand for the continent while effectively contributing to the development

of the overall economy. They should contribute to the diversification of the economic base by creating job opportunities in allied industries for inputs, services, products and by-products to improve economic access of consumers to meat and other essential goods and services.

In the following pages, a framework for the structural transformation of the livestock sector is provided. Emphasis is laid on the harmonisation of livestock development policies and strategies within the framework of subregional and regional co-operation. Reforming land tenure is considered a precondition for self-sustained and self-reliant transformation.

Harmonisation of livestock development policies

The harmonisation of livestock development policies should help further the comparative advantage of producing countries while ensuring competition among the domestic private and/or public sectors for greater efficiency in the production and trade of livestock inputs, products and by-products. It should help foster joint programming and investment ventures across national boundaries to ensure that the integration of livestock economies is based on overall mutual dependency among member states within and across subregions.

Harmonisation should help mobilise productive resources, divert to low cost production sources and lead to relative specialisation in the livestock sector. Marketing and pricing policies should be harmonised between countries to promote intra-African trade, proper identification of every animal or consignment of animals put through export channels and development of market structures. To facilitate and increase intra-African trade in slaughter animals and meat, common preferential trade areas for animal products produced within a subregion or within the continent should be developed and protected.

Mechanisms to equitably redistribute part of the financial benefit within the subregion or the continent should be devised. Preferably, redistribution should be through the financing of public activities that would reduce the cost of production and distribution while improving the quality of products and related services.

The following interventions, adjustments and reforms are recommended:

- harmonise the protocols and accords related to the promotion of trade and marketing of live animals and meat
- standardise the collection of statistics and systems for the dissemination of information on commodities, especially meat, live animals and inputs
- prepare a directory of major livestock and meat markets in the subregion and the continent
- identify two to five livestock markets per major producing country to be part of a subregional or regional network
- prepare a directory of livestock and meat marketing institutions with a view towards greater co-ordination and integration of activities
- provide incentives to encourage joint undertakings between the private and/or public enterprises, especially in the areas of transport for live animals and meat, feedlots, processing and marketing infrastructure.

Integration of the livestock economies

The integration of livestock economies should be mainly at the point of production in order to promote trade. Joint ventures involving private and/or public enterprises of a subregion or the continent to exploit animal and range resources should be encouraged. Greater integration at subregional and regional levels and more dynamism in the livestock sector through broad-based diversification and complementary programmes are essential.

Joint ventures should aim at producing goods more efficiently and competitively to satisfy the requirements of subregional or continental markets. This could be achieved by

reorganising existing production units to ensure economies of scale while avoiding monopoly and collusion in an oligopoly or monopsony.

Hence, efforts should be directed towards taking full advantage of the existing potential in production, distribution and facilities by creating the enabling environment for transforming some of these ventures into specialised multinational corporations with the full involvement of the private sector. Also, the utilisation of all relevant mechanisms, institutions, national endowments and natural and human resources in a spirit of collective self-reliance and solidarity is essential for sustained growth and development.

Above all, governments at the subregional and continental level should unite around valid economic and mutually profitable goals and protect the livestock market in the long-term interests of consumers and producers. Particular attention should be paid to providing adequate incentives towards the formation of multinational enterprises by nationals of both surplus and deficit countries for the valorisation of by-products which constitute a potential source of income.

Reforming land tenure

Pastoral land in Africa is often, by decree, public domain with open access. The cost of developing resources, such as water and range, is so high that attempts to do so are rarely made. Negative externalities to the livestock community are becoming increasingly high, particularly in terms of degradation of the resource base for livestock production. Hence, there is a need to re-examine the current approach to land tenure and the exploitation of natural resources.

The thrust of land reform should be secure access or exclusive rights to the main resources (pasture and water) by the producers. Land reform should help the livestock community be more responsive to policy and technological changes. Moreover, it should allow greater participation of pastoralists in government decisions on matters affecting their lives and help improve their access to commercial (competitive) loans.

Livestock policy research and livestock development programmes: Monitoring and evaluation

Policy research should be directed toward evaluating the impacts of policy options on the performance of the livestock sector and allied industries in meeting production and consumption objectives, environmental and other societal goals (e.g. efficiency in resource use and equity in income distribution). Results from these efforts will lead to the development of alternative livestock development programmes containing action packages and policy actions for selection by decision makers. Thereafter, indicators would be developed to monitor the progress of the adopted programme.

To this end, policy analysis units could be established at national, subregional and regional levels. These units should mainly be publicly funded and staffed on a continuing basis with individuals from branches specialising in selected policy areas. At the national level, the major policy analysis unit could be established in the Office of the President or the Prime Minister with branches in major ministries. Corresponding units could be established within the secretariat of the major subregional economic groupings and the Organization of African Unity (OAU). Above all, these units should help generate information necessary to make the best-informed decisions.

At the subregional and continental levels, these units should play a catalytic role in the design and translation of joint decisions into concrete actions and investment programmes. For instance, concrete proposals, notably in the following areas should be developed:

- measures to harmonise livestock development policies and to integrate livestock economies with a view to creating and maintaining an enabling environment
- a list of subregional project ideas for the public sectors to be implemented under the leadership of the major economic groupings
- a list of project ideas to the private sector. For instance, current reform programmes are leading to the liquidation of many industrial units in Africa as they fail to meet the criteria of economic and financial viability. Some key industrial units could be salvaged by converting them into multinational units.

The units could then be called upon to undertake activities in the following areas:

- an inventory on evaluation of the production units that could be part of a network of multinational enterprises with subregional or regional dimensions
- a cost/benefit analysis of entering into joint undertakings through the conversion of the national units into subregional ones.

To persuade a government to undertake alternative development policies and programmes, especially in the framework of collective self-reliance, it must be convinced that present livestock development policies generate little benefit compared to costs. Pay-off must be evident with an alternative plan. Thus, the need exists to develop instruments of analysis for livestock problems that are simple but powerful. These instruments should provide estimates of gains or losses for member states who are considering entering into co-operative agreements. Such instruments should help to bridge the communication gap between livestock development researchers, analysts and decision makers and promote fruitful dialogue among livestock developers and between them and others.

Modelling techniques and their use by policy analysts should help promote dialogue not only at the national, but also at the subregional level. They should also identify constraints to development; quantitatively assess policy objectives before making policy decisions, which will in turn help policy analysts assess their assumptions and limit the number of alternatives; and evaluate the multiple impacts of programmes and policies designed to modify the rates of economic development at national and subregional levels and hence to serve as a measure of the effectiveness of specific policies in force or to be implemented.

Conclusions

This paper has provided some insights on how to promote structural transformation of the livestock sector based on collective self-reliance. Reforms should be directed towards making the livestock sector the engine of its own development by putting them in full control of the development of the sector. To generate the best policies, policy research to evaluate the impact of policy choices is needed.

The International Livestock Centre for Africa (ILCA), United Nations Economic Commission for Africa (UNECA) and other development and research institutions can collaborate to assist African countries individually and collectively to develop policy laboratories in order to evaluate the impact of their policy options while maintaining and preserving the quality of their environment.

Discussion

- C: Biotechnology is one area where ILCA's knowledge in the policy area could be important.
- Q: Regarding the notion of basing prices on market price mechanisms. Should goods be bought from distorted markets or do we make our own?

- C: We tend to think we should import because prices of imported goods are lower than for local ones. But conditions for market mechanisms do not exist in Africa. We end up having a politician making the decision — a decision that is not based on popular participation. The individual politician will choose the most inexpensive option that pleases the urban population.
- C: If we do not do away with corruption, devaluation without internal measures will not help.

Trade and pricing policies in the context of sustainable livestock production in sub-Saharan Africa

Timothy O. Williams

*ILCA Semi-Arid Zone Programme
B.P. 12404
Niamey, Niger*

Introduction

This paper addresses four questions:

- What are the trade and price trends for livestock products emerging for the 1990s in sub-Saharan Africa (SSA)?
- What issues do these trends present for policy research?
- What will be the potential impact of research that addresses the identified issues?
- Does the International Livestock Centre for Africa (ILCA) have a comparative advantage in undertaking work on the identified issues and are there potential collaborators to work with?

The issues and areas identified in the following pages constitute a modest set of suggestions for future research.

Past and present situation

A number of studies conducted in the early 1980s, using mid-1970s data, pointed out the anti-agricultural incentive bias of trade and pricing policies being pursued by SSA countries (Lutz and Scandizzo, 1980; Bale and Lutz, 1981; World Bank, 1982). These policies hampered agricultural growth and weakened the contribution of agriculture to overall growth and economic development. Studies conducted in the late 1980s, using data up to the mid-1980s, showed some improvement in the price incentive structure in most countries (Byerlee and Sain, 1986; Ghai and Smith, 1987; Williams, 1990). However, the indirect macro-economic and exchange rate policies implemented at the same time negated whatever improvement was forthcoming from direct pricing policies.

The 1980s also marked a period of declining world prices for major traded agricultural commodities. For livestock products in particular, there was much instability in world markets due to surplus production of beef and milk in Europe, the USA and Oceanian countries. Some of the excess production, especially from Europe, was dumped at very low prices in African countries. While the cheap imports benefited urban consumers, they indirectly depressed domestic producer prices. Even the African beef exporting countries (e.g. Botswana and Zimbabwe) were not spared. Export markets were lost because they could not effectively compete with the subsidised exports originating from EEC countries.

Thus, considering economy wide effects, a combination of inappropriate domestic policies and declining international prices for major primary exports added to serious economic crises in most of SSA. To avert further deterioration and at the insistence of multilateral financial institutions like the International Monetary Fund (IMF) and the World Bank, a series of policy measures under structural adjustment programmes have

been instituted in a majority of SSA. These programmes emphasise three kinds of policies which are germane to the topic at hand:

- devaluation of real exchange rates
- reduction of taxes and controls in international trade
- alignment of domestic producer prices with their equivalent world prices and reduction of consumer subsidies.

These policy measures are meant to improve the balance of payments and promote economic growth and competitiveness in international markets. By the end of 1991, 26 SSA countries had fully or partially adopted structural adjustment programmes. Partial adopters are mostly countries in the CFA (Communauté financière africaine) zone where the currency has not yet been devalued.

Opportunities, constraints and issues

It is worthwhile to briefly consider what appear to be the initial effects of structural adjustment on prices, production and trade in livestock.

In those countries (e.g. Ghana, Nigeria, Kenya and Zimbabwe) where the full reform package has been adopted, domestic prices have risen sharply (Igbedioh, 1990; Weissman, 1990). The rise in domestic prices and the reduction or outright elimination of producer and consumer subsidies have different implications for producers and consumers.¹ For producers, the rise in prices presents opportunities for increased production. In addition, producers face reduced competition from imports as devaluation raises prices of imported commodities. Livestock producers in exporting countries (e.g. Zimbabwe) can expect to obtain more revenue in domestic currency terms.

On a related note, in anticipation of the inevitable devaluation of the CFA franc and the changes in economic opportunities this would bring about for the traditional trade in live animals between Sahelian and coastal countries in West Africa, some authors have argued that the time is now ripe to re-examine the case for a Sahelian dairy industry which could complement trade in live animals (Delgado, 1989; Delgado, 1990). The presumption is that the coastal countries which have always been net importers of livestock products would remain so for some time to come and that their comparative advantage lies in the production of other agricultural commodities.

Opportunities also now exist for intensification of livestock production in many African countries as previous harmful policies are being discarded. However, three related issues need to be considered:

- the comparative advantage of livestock production in specific African countries and agro-ecological zones
- prospects for regional trade and harmonisation of trade policies and regulations
- continuing instability in domestic and world markets.

To a certain extent, the second and third issues could be submerged in the first as long as one considers dynamic comparative advantage. Therefore, attention will be devoted to the first issue; only passing references will be made to the other two issues.

1 For consumers, particularly the urban and rural poor, the impact of the reform package on food prices and real wages threatens household food security (Pinstrup-Andersen, 1988). Relative to staples like millet, cassava and maize, livestock products do not, as yet, contribute significantly to average household diets, except for pastoral groups. Nonetheless, the negative impact of current reforms on the access of low income groups to animal products, at least in the short run, and the indirect effect of this on livestock production, need to be borne in mind. Issues pertaining to this aspect are not considered in this paper.

The price differential that now exists between locally produced and imported animal products is a necessary, but not sufficient, condition for sustainable growth in livestock production. Long-term sustainable growth depends on a country or location's comparative advantage in the production of a commodity. Also, if it is accepted that free trade promotes economic growth, then trade and pricing policies designed to promote livestock production cannot ignore issues of comparative advantage.

It is dynamic rather than static comparative advantage that is relevant. Dynamic comparative advantage considers the shifts over time in a production system's competitiveness as a result of changes in long-term border prices, the opportunity costs of domestic resources and production technologies in use.

Country-specific studies should be undertaken to examine the evolving comparative advantage of animal and milk production in different systems. The justification for advocating this type of studies will become clear after considering the methods normally used to measure comparative advantage.

Methods

Comparative advantage is usually measured using the Domestic Resource Cost (DRC) or Resource Cost Ratio (RCR) approach. The two are quite similar. Simply put, DRC is the ratio of the foreign exchange it costs to produce a commodity under optimal conditions to the foreign exchange received from producing it. If DRC is greater than one, foreign exchange is lost by producing the good; conversely if DRC is less than one, foreign exchange is gained.

While this summary measure is useful, it does not give much practical information that is of use in policy analysis. To draw practical implications for production decisions using this kind of measure, one needs to consider the factors that are driving changes in comparative advantage. The variables needed to compute DRC or RCR include:

- border equivalent prices of tradable outputs and inputs
- domestic prices of tradable and non-tradable outputs and inputs
- nominal and real exchange rates
- transport costs
- opportunity costs of labour, capital and land.

It is the evolution and the impact of these variables on DRC that can provide information on the binding constraints—that tend to reduce comparative advantage—and help identify which policies can be addressed to remove them. One approach to analysing the evolution of the cost components of DRC is outlined in Delgado (1990).

Conceptual difficulties in measuring some of the variables listed above, particularly the opportunity costs of domestic resources and the real exchange rate, need to be taken into consideration. Also, given the limitations of the partial equilibrium approach embodied in the DRC (or RCR), the results obtained will be more useful in assessing the relative importance of different factors and the direction of their impact rather than in determining the absolute magnitude of different effects.

The dynamic DRC approach suggested here could be used:

- to assess the relative importance of the various factors (e.g. overvalued exchange rate, inadequate transport facilities, taxes etc.) that have eroded the comparative advantage of, say, Sahelian countries in exporting live animals to the coastal states in West Africa. The approach could highlight the most important constraints and indirectly indicate the kind of policies needed to ameliorate the situation.
- as a tool for making decisions on resource allocation to support alternative production opportunities, e.g. dairy production work in humid versus subhumid zones. In this respect, the approach becomes a useful *ex ante* tool for diagnosing the ability of a

production system to remain competitive long into the future and thus justify investing resources in it.

This approach calls for a series of targeted primary data collection in specific areas, e.g. on transportation costs, farm budgets and seasonal labour costs in addition to data from secondary sources.

Potential impact

The uses listed above provide some insight into the potential impact that studies based on a dynamic approach can make. The DRC ratio can be used to make decisions on the relative emphasis given to different production activities. Studies based on this approach can point out inefficient activities and those that will ensure long-term growth. By considering the evolution (i.e. changes over time) of the various components of the DRC and the relative importance of the direction of their effects on the DRC, the method provides a framework that can permit policy makers to better understand the major factors that tend to diminish comparative advantage and what policies are appropriate to deal with them.

ILCA's role and potential collaborators

This approach makes possible opportunities to involve national agricultural research systems (NARS) scientists and policy makers in the execution of these studies. Collaboration on data collection, analysis and interpretation of results will help to strengthen the technical and analytical capacity of public officials who may also be the ones to implement whatever policies the results call for.

ILCA is well placed to work in this area and there are a number of potential collaborators. A series of targeted data collection exercises will be required. This work is best done in collaboration with NARS scientists and policy makers.

The issues of comparative advantage, regional trade and harmonisation of trade policies and regulations extend far beyond the livestock subsector. For example, in the West African Sahel, these issues cannot be sensibly addressed without looking at the staple cereals (e.g. millet and sorghum) which are wage goods and determine the opportunity cost of labour. There is room for collaborative work with ILCA, the International Food Policy Research Institute (IFPRI), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and NARS.

Conclusions

At the most general level, there is the need for a set of studies on the evolving comparative advantage of livestock production in specific SSA countries and agro-ecological locations given current economic changes in the region. If these studies are conducted in collaboration with other international or national research institutes in such a way as to include major crops grown in the study countries, a basis would be established for identifying the relative weight to give to trade, pricing and other policies needed to promote mutually beneficial regional trade and growth in livestock production.

References

Bale M D and Lutz E. 1981. Price distortions in agriculture: An international comparison. *American Journal of Agricultural Economics* 63:8–22.

- Byerlee D and Sain G. 1986. Food pricing policy in developing countries: Bias against agriculture or for urban consumers? *American Journal of Agricultural Economics* 68:961–969.
- Delgado C L. 1989. *Cereals protection within the broader regional context of agricultural trade problems affecting the Sahel*. Paper presented at the seminar on Regional Cereals Markets in West Africa, Lomé, Togo, 6–11 November 1989.
- Delgado C L. 1990. *Commodity priorities and conditions for growth of Sahelian agriculture*. Paper presented at the seminar on Future of Agriculture in Sahelian Countries, Montpellier, France, 12–14 September 1990.
- Ghai D and Smith L D. 1987. *Agricultural prices, policy and equity in sub-Saharan Africa*. Lynne Rienner, Boulder, Colorado, USA. 173 pp.
- Igbedioh S O. 1990. Macroeconomic adjustment, food availability and nutrition status in Nigeria: A look at the 1990s. *Food Policy* 15:518–524.
- Lutz E and Scandizzo P L. 1980. Price distortions in developing countries: A bias against agriculture. *European Review of Agricultural Economics* 7:5–27.
- Pinstrup-Andersen P. 1988. The impact of macroeconomic adjustment: Food security and nutrition. In: Commander S (ed), *Structural adjustment and agriculture: Theory and practice in Africa and Latin America*. Overseas Development Institute, London, UK. 250 pp.
- Weissman S R. 1990. Structural adjustment in Africa: Insights from the experiences of Ghana and Senegal. *World Development* 18:1621–1634.
- Williams T O. 1990. *Impact of livestock pricing policies on meat and milk output in selected sub-Saharan African countries*. ILCA LED (Livestock Economics Division) Working Document 13. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. 111 pp.
- World Bank. 1982. *World Development Report*. Oxford University Press, New York, USA. 172 pp.

Discussion

- C: Measuring the comparative advantage of livestock in different sub-Saharan countries, by focusing on this method, one may ignore the input sector and resource management issues that can effect the direction of DRC.
- A: The input sector is included. Natural resource issues that are outside a particular commodity market are excluded.
- C: The point is how to develop sustainable livestock production. I like the idea of basing research decisions on the long-term comparative advantage of regional sectors. Regarding integration, meat markets tend to be isolated so putting this on a regional basis is a good idea. Stratification across agro-ecozones is an important issue. The potential importance of agro-ecozones and disease pressures and how this changes with the introduction of inputs (e.g. vaccines) is important. Issues of where policy is linked to technology in the framework of dynamic comparative advantage are important.
- C: It is important that environmental factors be tied into DRC. Perhaps this is an area for research.
- C: One issue debated at UNCED [the United Nations Conference on Environment and Development] was whether there should be payment to developing countries to secure preservation of natural resources. If a country sees that its comparative advantage is to do one thing, this could lead to disaster (e.g. mining and rain forests).
- Q: In calculating domestic resource costs, would you not end up ignoring within-country differences in agro-ecological and production systems?
- A: DRC can be country-specific. Your end-product would be the relative efficiency of resources.

- C: These measures are good for cost–benefit analysis but are not very useful in terms of comparative advantage.
- C: When looking at comparative advantage, you are not looking at simple ratios. It pin-points which cost components are important — which are constraints and which promote development.
- S: Comparative advantage is important. The issue is how to use it. DRC is useful but there are some factors not taken into account in the model. This should be addressed as a topic in working group discussion.

Development prospects in Africa through international agricultural trade

W. Oluoch-Kosura

*Department of Agricultural Economics
University of Nairobi
Nairobi, Kenya*

Introduction

Agriculture is a dominant sector of most African economies, accounting for about 30% of the gross domestic product (GDP) (World Bank, 1981). Thus, the growth of the sector is central to the development of Africa. Agriculture generates foreign exchange revenue through exports.¹ As such, trade policies are important to the development process. The purpose of this paper is to assess the potential for Africa to improve its development prospects through participation in world agricultural trade. Factors which hinder progress are discussed as are possible measures which can facilitate greater development.

Development problems in Africa

Despite its dominance, the agricultural sector has been in decline for the past two decades. Almost half of the countries in Africa are suffering chronic food deficits. Financial resources are often lacking to import sufficient food supplies. It is reported that the continent will remain a net importer of food unless deliberate efforts are made to improve the region's productive capacity (FAO, 1985).

Chronic food shortages have been due to drought, epidemic crop or livestock diseases, rapid population growth rate (averaging 3% per annum) and persistent or recurring political conflict. Moreover, fundamental structural factors such as inappropriate national agricultural policies, poor infrastructure and a "hostile" international economic system contribute to food insecurity. Decline in the agricultural sector has led to industrial decline and general unemployment. This in turn, may result in political and social instability. The continent currently has a high number of refugees.

The poor performance in agriculture has also led to debt accumulation. In the 1970s, African countries borrowed heavily when they were experiencing temporary economic booms and invested in enterprises which turned out to be non-viable (World Bank, 1981). By 1987, the debt service ratio (total debt servicing as a percentage of export earnings) for over half of the African countries was above 20% (World Bank, 1989). Debt servicing competes with important agricultural and industrial inputs for the scarce foreign exchange. This high debt ratio implies that Africa's socio-economic future will be bleak unless there is a major reversal of current trends in the agricultural sector.

The basis for international agricultural trade

The classical theory of international trade is that of comparative advantage. To maximise gains from international trade, countries should concentrate on commodities that are

1 Other roles include providing domestic food, markets and raw materials for other sectors and employment.

relatively most efficiently produced, say, in terms of inputs. What this implies is that countries should specialise in what they can produce most efficiently. Developing countries (e.g. in Africa) have a comparative advantage in the production of agricultural goods. If there is free trade, a country's comparative advantage can be exploited to raise the standard of living through trade.

In this respect, trade becomes an engine of growth (World Bank, 1981; Ghatak and Ingersent, 1984).²

However, experience in Africa has shown that even where an export-led growth strategy has been "faithfully" followed, broad economic development as defined today has not been achieved.³ Backward or forward linkages resulting from the export production sector have been weak. Countries which tend to specialise in the production of agricultural commodities face a number of problems. These include:

- declining terms of trade
- low demand elasticities of agricultural commodities
- external policies and shocks faced by African producers (hostile international economic environment).

Declining terms of trade

There is some evidence that Africa has suffered adversely from declining terms of trade (World Bank, 1984). World Bank statistics (1989) show that almost all African countries have negative balance of payments. The real price levels of agricultural exports have not matched those of imported industrial and other processed goods. Thus, as populations rise, export volumes must increase to afford even a constant level of welfare. Imports, including inputs needed for domestic production, tend to decline. Consequently, capacity utilisation of domestic industries is low or falling. If increasing output is constrained by internal policies, then Africa's share of the world market for major agricultural exports will continue to fall. Berg (in World Bank, 1981) emphasises that difficulties with foreign exchange in Africa are caused mainly by the continent's inability to expand export volumes. However, in more recent years, other factors, such as a general decline in commodity prices, have magnified foreign exchange difficulties. Moreover, these prices are characterised by sharp fluctuations. Foreign exchange earnings from year to year may continually fluctuate so that planned development programmes cannot be implemented.

Demand elasticities for agricultural commodities

Demand elasticities for agricultural commodities are generally low. This implies that world demand for agricultural commodities does not increase as price levels are lowered. In fact, demand may drop if prices increase significantly. Moreover, as incomes rise, the proportion spent on these commodities tends to decline. At the same time, artificial substitutes for agricultural products emerge. These realities may cause one to question the possibility of achieving development through an export-led growth strategy. If export volumes are increased, countries, as a group, will force commodity prices to fall with consequent low foreign exchange earnings.

It should also be recognised that some of the traditional high-volume importers of agricultural commodities from the world market (e.g. China and India) are themselves becoming self-sufficient in those commodities. This will further shrink world market demand for agricultural commodities.

² Further discussion on trade and economic growth can be found in Chenery (1979).

³ Development is defined as the achievement of improved quality of living. This implies reduction in poverty, inequality and unemployment as well as having self-esteem and being free to choose.

External policies and shocks

The structure of the international trading system does not favour African exports, be they raw or processed products. Developed countries continue to have trade barriers (including tariff and non-tariff) against import commodities which could compete with commodities produced domestically. For instance, it is reported that protectionist measures against sugar alone cost African countries approximately US\$270 million annually between 1979 and 1981, rising to more than US\$420 million in 1983. For beef exports, the cost to the continent due to trade barriers was about US\$100 million per year during this same period (World Bank, 1985). Protectionism effectively reduces the value of exports, further exacerbating the continent's balance of payments difficulties. The capacity for servicing the foreign debt is lowered and the importation of necessary goods and services for development programmes cannot be undertaken.

Apart from the protectionist measures, developed countries also have other agricultural policies meant to benefit their own farmers. This creates problems for the agricultural exports coming from Africa. Agricultural price support measures, including subsidies, lead to surpluses in agricultural commodities. As a result, commodity prices on the world market become depressed, making it difficult for African agricultural products to enter developed-country markets.

External shocks which hinder the expansion of agricultural production and exports include the occasional oil price increases (e.g. in 1973 and 1979), the "overvaluation" of the major convertible currencies like the US dollar and frequent increases in world interest rates. The adjustment to these external shocks usually takes the form of reduced imports and loss of export market shares (Belassa, 1983). Oil price increases, in particular, cause the proportion of available foreign exchange to be diverted to oil imports which lowers imports of other necessary commodities. Recession may result in the process.

What African countries can do to benefit from international agricultural trade

Given the problems noted above, several studies have recommended intra-African trade, regional integration or special trade agreements (Etherington, 1972; Gwyer, 1973; Chileshe, 1977; Weber and Hartmann, 1977; World Bank, 1989). Given technological changes, comparative advantage positions also change. Therefore, African countries may benefit by diversifying traditional exports. The World Bank (1989) emphasises that greater trade among African countries would help overcome imbalances in food supplies, thereby reducing Africa's dependence on overseas food imports. Liberalising regional trade in food would contribute to food security. Establishing buffer stocks, undertaking joint crop forecasting and livestock disease control can benefit co-operating countries. For better resource management in Africa, regional co-operation, rather than individual efforts, would bring greater benefits to the continent as a whole.

Intra-African trade

Trade within Africa can stimulate development in several ways. It permits countries to exchange complementary commodities and services. If the goods produced are similar, this increases efficiency of the producing firms within the region against alternative supply sources. Thus, the regional market becomes efficient and eventually may become competitive world-wide. Increased competition provides incentives to raise productivity and lower costs. Since internal markets are generally small, competition should be aimed at enlarging the share in the world market.

Currently, official trade among sub-Saharan African countries amounts to a modest US\$4 billion, or less than 10% of total African trade (World Bank, 1989). This has been due to macro-economic policies, including overvalued exchange rates, distorted credit allocation and self-sufficiency policies. It is estimated that intra-African trade can be more than doubled if deliberate efforts are made to formalise trade arrangements. Already, informal trade is practised extensively in the region. It keeps prices down through increased competition, supplying needed goods across various borders and providing employment opportunities.

Regional integration

Regional co-operation and integration was a central theme of the 1980 Lagos Plan of Action. However, sustaining regional integration has always been a problem due to: political differences, unequal initial resource endowments, level of economic development, inability to agree on the distribution of costs and benefits and balance of payments problems and sometimes, lack of funds to catalyse the formation of the regional bodies due to lack of interest from possible donors.

The Preferential Trade Area (PTA), involving about 20 member states, could promote intra-African trade given political goodwill. It aims at reducing existing trade barriers, particularly by giving preferential treatment to certain products. The commodities considered for preferential treatment must be both of export and import interest to member countries. The producing firms should be 51% or more locally-owned; not more than 60% of their components should originate outside the PTA.

Special trade agreements and export diversification

An important avenue open to countries to increase their gain from exports is to enter into special trade (commodity) agreements. However, as small producers of agricultural commodities, no single African country has sufficient bargaining power to influence matters in such agreements. Countries should be encouraged to act as a group so that they can benefit from trade negotiations (e.g. the Lomé Convention, where exports coming from developing countries into EEC markets are given duty free status, or the various GATT-sponsored rounds of trade talks).

Over time, technological changes have enabled some African countries to excel in producing non-traditional exportable commodities. This trend should be encouraged.

Conclusion

The agricultural sector in most African countries has undergone a period of crisis over the past two decades. Part of the problem is due to internal national policies which are biased against the agricultural sector. However, some are related to the external economic environment. For countries which can generate exportable surplus, much can be gained through intra-African trade, regional integration or co-operation, special trade agreements or export diversification. Through these avenues, available resources could be managed in the most efficient way. The International Livestock Centre for Africa (ILCA) can assist in that effort by disseminating information on available livestock technologies and identifying potential deficit and surplus livestock and livestock product areas. Moreover, the Centre can undertake studies to determine the prospects of intra-African and regional integration from trade liberalisation within the region. These efforts will enable African countries to develop appropriate livestock and livestock product trade policy strategies.

References

- Belassa B. 1983. Policy responses to external shocks in sub-Saharan African countries. *Journal of Policy Modelling* 5(1):75–105.
- Chenery H. 1979. *Structural change and development policy*. Oxford University Press, New York, USA.
- Chileshe J H. 1977. *The challenge of developing intra-African trade*. Literature Bureau, Kampala, Uganda.
- Etherington D M. 1972. *An international tea trade policy for East Africa. An exercise in oligopolistic reasoning*. FRI Studies. Food Research Institute, Stanford University, Palo Alto, California, USA.
- FAO (Food and Agriculture Organization of the United Nations). 1985. *Food situation in African countries affected by emergencies. A special report*. FAO, Rome, Italy.
- Ghatak S and Ingersent K. 1984. *Agriculture and economic development*. Wheatsheaf Books Ltd, Brighton, Sussex, UK.
- Gwyer G D. 1973. Three international commodity agreements: The experience of East Africa. *Economic Development and Cultural Change* 21:465–476.
- Weber A and Hartmann T T. 1977. A comparative study of economic integration with special reference to agricultural policy in the East African community. In: Dams and Hunt (eds), *Decision-making in agriculture*. London University Press, London, UK.
- World Bank. 1981. *Accelerated development in sub-Saharan Africa: An agenda for action*. World Bank, Washington, DC, USA. 198 pp.
- World Bank. 1984. *World development report 1984*. Oxford University Press, New York, USA. 186 pp.
- World Bank. 1985. *World development report 1985*. Oxford University Press, New York, USA. 243 pp.
- World Bank. 1989. *Sub-Saharan Africa—from crisis to sustainable growth: A long-term perspective study*. World Bank, Washington, DC, USA. 300 pp.

Discussion

- Q: How can Africa participate in world trade through regional co-operation?
- A: It can gain a better bargaining position if co-operating countries are able to command a surplus for a certain commodity.
- C: The African continent does not consume what it can produce. Therefore, regional trade is a good idea. In addition, we do not participate in price fixing.
- C: Inter-regional trade needs to be based on specialisation. I see that only in West and perhaps South Africa. I do not see much hope for it elsewhere in Africa.
- C: Trade also depends on the political whims of people; dependence on common markets can be very costly.
- C: The notion of regional markets has been examined in terms of grain, but it has not been studied for livestock. I hope your comments do not spark debates on protectionism. Putting protection around the grain market in West Africa is done; it is not done for livestock. In general, are there opportunities for ILCA research in the area of world markets? market projections? the variability of livestock economies?
- C: ILCA could do work on market projections in reference to livestock. An additional issue is the viability of Africa exporting natural, “naturally-fed” live products to European markets.

General discussion

- C: The three dimensional matrix provided earlier and ILCA's placement within this matrix should be discussed. The issue of credit should not be ignored. Livestock production systems are so sensitive to credit—in part because livestock are themselves sources of finance. The output from livestock production helps provide for capital renewal.
- C: The wealth aspect of credit is separate from land tenure issues. A study of credit markets should be looked at in other aspects of resource policy.
- C: The issue of credit has links with almost any economic analysis we undertake. Credit should be looked at in terms of micro/macro issues.
- C: Livestock are used by farmers as a bank or to sell for income. Food generated for sale will be related to the rate of interest prevailing at the time. The two need to be looked at. The attitude of farmers depends on what is happening in the capital markets.
- C: When looking at credit and livestock as stock for wealth, the issue of land reform should also be considered.
- C: Regarding the livestock policy analysis course. It may need to be revised to be tailored to country-specific needs. Perhaps it would be more effective if linked to specific livestock policy planning government institutions and geared to those who formulate policy.
- C1: The three dimensional matrix is most useful, but the list of potential researchable issues is too long. ILCA should provide information to others (e.g. World Bank) who are undertaking studies of a global nature.
- C2: I am not sure that ILCA should undertake the task of encouraging policy changes as noted on the Shapiro list. Although it is important, others can do this as well. I would like to see ILCA doing policy research that is directly related to production. Also, the Centre should be involved in strengthening its training component and building reliable data bases.
- C3: The presentation on regional trade was useful but Africa should not be excluded from trading with developed countries.
- C4: Regarding the issues discussed today, it would be useful to consult with representatives from African governments for additional input.

End of Tuesday, 24 March 1992 session.

SESSION III

Technology, policy, markets and institutions

Chair: H.A. Fitzhugh (morning session)

A. Niang (afternoon session)

Priorities for research on government policies to support livestock development in Africa

P. Pinstrup-Andersen

*International Food Policy Research Institute
Washington , DC
USA*

It is indeed a pleasure to be here at ILCA (International Livestock Centre for Africa) and to have the opportunity to discuss with this distinguished group, issues related to livestock policies for Africa. I hope that my participation in this meeting signifies the continuation and strengthening of fruitful collaboration between ILCA and the International Food Policy Research Institute (IFPRI). In this presentation, I will focus, as requested, on policy research needs in the areas of technology, markets and infrastructure.

Before we can consider policy research priorities, it is important to agree on the goals of the overall effort of livestock-related research in Africa. Two alternative goals come to mind. First, one could focus exclusively on the goal of expanding livestock production in the region; or second, the focus could be on the alleviation of poverty through improvements in the livestock sector. If these two goals are not fully compatible, it is important to decide what should be the goal and what might be a means of reaching it.

In the short run, I would argue that there are serious trade-offs between the two goals. If we pursue an exclusive production expansion goal, we might wish to focus on large-scale commercial production relying on subsidies for inputs, production and marketing, including heavy subsidies for capital. Such capital-intensive large-scale production would probably be placed close to the consumption areas. In my opinion, such an approach is unacceptable. The overall goals of the international agricultural research centres is to alleviate poverty, food insecurity and malnutrition. Therefore, enhanced production and productivity should be a means to reaching that goal rather than a goal in itself. For the rest of this presentation, I will assume that poverty alleviation rather than expanded production *per se* is the overriding goal.

The next question we need to address is whose poverty we are trying to alleviate. Most poverty in sub-Saharan Africa is found in rural areas. However, there is a small but rapidly increasing proportion of poor people in urban areas. If we are concerned with rural poverty alleviation, we must emphasise policies that will alleviate rural infrastructure bottlenecks. This would reduce transportation costs, link rural markets and in general, foster transformation of the agricultural and livestock sectors while improving marketing of inputs and outputs.

Rural infrastructure tends to be a public good. Therefore, while private investment is important in certain cases, most of the investment usually has to originate from the government. During the last 10–15 years, there have been insufficient investments in rural infrastructure partly because of lack of willingness on the part of international agencies to provide capital for such investment. This is due, in part, to the inability of the governments to show that such investments would be profitable in the long run, partly because of the low food prices and inappropriate discount rates. The problem of using inappropriate discount rates is also an important issue when we make decisions regarding investments to protect natural resources because the benefits and costs for future generations are poorly represented.

Research is urgently needed on policies that will enhance the effectiveness and efficiency of input and output markets. There is a particular need for research to identify the proper role of government in a situation of insufficient private competition, poor rural infrastructure and a lack of tradition for private-sector involvement. We need research on how to reduce or eliminate rent-seeking by public and private institutions, both during the transition phase towards privatising input and output markets and beyond. Clearly, it would be a mistake to argue that governments have no role to play in future agricultural input and output markets. The question is, therefore, how to identify the appropriate role not how to eliminate governments from these areas of activity.

Research is also needed on livestock and input price policy, but it is important to recognise the limitations of price policy in expanding livestock production and in alleviating rural poverty. Such limitations are due primarily to the non-price constraints to expanding livestock production such as poor rural infrastructure, poorly functioning markets etc. If the supply response is low, then higher prices will merely transfer income from consumers to producers. While there is ample evidence to support the argument that the total supply response in agriculture is low, there is also a great deal of evidence to show that commodity-specific supply responses may be quite high. Supply responses in the livestock sector in each of the important ecoregional zones are not well known and research is needed on this topic. Price policy is also ineffective in alleviating rural poverty if the marketed surplus is skewed to a small portion of better-off producers. This may be the case for certain livestock products in certain regions. More research is needed to better understand how the benefits from higher livestock product prices will be distributed among various income groups in rural areas.

Related to this question is the issue of who consumes livestock products. Again, if most consumers are from the more-affluent section of the population, then increasing prices may do little harm to the poor. On the other hand, if low-income people spend a large part of their income on livestock products, then higher livestock product prices may have serious negative effects on poverty, food security and nutrition. There is an urgent need for consumer surveys to determine consumption patterns among the different income groups in relation to the various livestock products. In addition to budget shares, the analysis should focus on the role of livestock products in meeting protein and energy needs in each population group. Such analyses should include studies of household behaviour and intrahousehold allocation. Income elasticities for most livestock products are likely to be high among the poor, but the budget shares are expected to be rather low. This, of course, will vary among population groups. Thus, the budget share of animal products may be very high among herdsmen and very low in certain urban areas.

Additional research may be needed on consumer subsidies for milk and capital subsidies to large commercial milk producers and peri-urban areas because of their prevalence in many African countries. It is not clear that such subsidies can be justified either on poverty or nutrition grounds. Additional analysis of consumer data will provide information on the extent to which such subsidies benefit the poor.

Research is urgently needed on how to make current market liberalisation and privatisation efforts successful. Such efforts are currently undertaken in most African countries as part of policy reforms and structural adjustment. The success of these liberalisation and privatisation efforts has not been outstanding in most of these countries and there is a need for more research to assist governments in implementing the efforts for the benefit of the poor. Such research should be undertaken with regard to inputs for the livestock sector, livestock products, and other agricultural commodities. A related topic deserving more research is the pan-seasonal and pan-territorial pricing policies being followed for livestock products and inputs in some countries.

There is a need for research at the farm level, particularly on how policies may facilitate integrated livestock crop systems. Such research should take into account labour use and

its seasonality, risks and complementarities of various kinds. Research is also needed to guide feed supply and other input policies. Research to facilitate appropriate credit programmes and programmes to alleviate excessive risks and uncertainty associated with seasonality are also needed. As part of such research, analysis is needed to explore the appropriateness of using livestock as a savings/credit mechanism relative to other mechanisms. Regarding seasonality and uncertainty, research is needed to guide market policies during droughts to reduce fluctuations in herd size.

The competition between draft animals and humans for food/feed needs additional research. In particular, research should explore the feasibility of using motorised hand cultivators instead of animal traction in order to reduce feed requirements or make feed available to other classes of animal.

Research is needed to assist in developing policies that will reduce seasonality in milk production, increase the use of small-scale processing plants and reduce the large current fluctuations in producers' incomes.

Research is also needed on a number of institutions, including those influencing land use and tenure. Research on political economy aspects of livestock production and marketing, including the importance of various public- and private-sector interest groups and associated rent-seeking, is needed. Such research should be linked to the above-mentioned research on market liberalisation and privatisation to ensure that government rent-seeking is not replaced by private-sector rent-seeking.

These are some of the issues that I believe deserve additional policy research. I look forward to the opportunity of working with ILCA on some of these research priorities.

Discussion

Q: Is it necessary for parastatals to be involved in milk purchasing? I have doubts about the effectiveness of monopoly purchasing to maintain quality control.

C: While hand tractors can be used in China, they are not an appropriate technology for Africa because spare parts are often unavailable.

C: When addressing the issue of poverty alleviation, there is evidence that the urban poor can benefit from peri-urban dairying (e.g. in Mali).

C: With structural adjustment programmes, we cannot go part way yet no one is going all the way. In Africa, it tends to be very contradictory. The market is open to dumping and the private sector cannot defend itself from external constraints. The government may stimulate domestic production but freeze equipment purchases.

C1: In terms of growth versus equity, there will always be economies of scale that will favour larger enterprises. Differences in costs and in economies of scale will work for change.

C2: I do agree that mechanised cultivation is a good alternative to animal traction.

C3: Using credit, instead of animals, as a buffer is not a good idea. During drought, for instance, credit will not bring in more feed; the result will more likely be large-scale corruption. Credit and technology adoption—there is a problem of information on the true characteristics of the borrower.

C1: Livestock production and economies of scale could be a researchable issue. I think this exists only where livestock are subsidised. Most of the research I have seen says there are limited economies of scale in the absence of subsidies.

C2: My experience with repayments of credit suggests repayment rates are high. Failures tend to be design failures.

- C1: In terms of increasing the efficiency of feed utilisation, the greatest energy efficiencies will accrue to swine and poultry, not ruminants. We need to recognise that the majority of meat consumed in Africa will be non-ruminants because of supply.
- C2: Cyclical supply of grains—course grains should be the focus, perhaps in the subhumid zone. If we are going to improve livestock production, we will need to use grain, but where will it come from? There is a major trade-off between feed and food value. This is a major strategy issue that needs to be researched.
- Q: How does one alleviate rural poverty without first dealing with production issues? Unless we improve market access for rural and urban areas, it will not work. We need market access to raise incomes, address equity concerns etc. Without production, there is no opportunity to redistribute income.
- A: I presented two scenarios. The issues were whether production should be viewed as a goal or a means to another end.
- Q: I am more concerned with the rural–urban issue. Both need to be considered otherwise you will not generate income in rural areas.
- A: That is why you need a solid infrastructure.
- C: How is infrastructure incorporated into your thinking? You cannot assume things will change. Therefore, locational issues become important in defining research areas. For instance, peri-urban dairying may, under some circumstances, be a good idea, but feed supply may be a countervailing factor. We need to look at comparative advantage. Where are processing plants, location of feed production, transportation etc optimal? Basically, the issue is that we have to integrate locational aspects in terms of where we put the research.
- C1: The comment that structures affect price/adoption of new technology is good, but price tends to be inelastic. The question is how to make price changes flatter.
- C1: Increased livestock production and the alleviation of poverty may well be complementary goals. The issue of multiplier effects from livestock production may be a locational issue as well. The issue of poultry and income for women, seasonality and price policies in severe times are all important and researchable topics.
- A: The argument with the CGIAR is that poultry technology can be easily transferred from temperate to tropical zones and that intensive poultry/swine production will soon be in place. I disagree with this position, nevertheless, this is the reason why the CGIAR gives no priority to this issue.
- A: Our rationalisation for not investing in swine/poultry production is that there is no comparative advantage for ILCA (but there is for NARS, the private sector etc); most research in this area is adaptive; production tends to be larger, rather than smaller scale; and there are few technology-generating opportunities for ILCA in this area. However, policy issues (e.g. feed supply, consumption patterns etc.) could be considered. The working groups may wish to discuss this issue further.

Priorities for livestock policy research in the context of a crop-dominated farming system: The case of Côte d'Ivoire

J. Yao, with assistance from B. Mody

*Centre ivoirien de recherches économiques et sociales (CIRES)
Abidjan, Côte d'Ivoire*

Introduction

Owing to its comparative advantage in crop-agriculture compared to Sahelian countries, Côte d'Ivoire has not favoured livestock development over the years. In the 1980s, within the general framework of structural adjustment policy reforms and more specifically in the agricultural sector reform programme, livestock production was recommended. It was also decided that the local meat supply should be developed to prepare for uncertainties in world markets. A government corporation, Société de développement des productions animales (SODEPRA), was created with the mission of conceiving livestock policy, creating a new generation of Ivoirien herders and developing an extension service directed towards the older generations of herders. With the new interest shown by Ivoirien nationals, especially the younger generation, for poultry and pork production, socio-economic studies of livestock policy in the context of a crop dominated farming system have been put on the short-term research agenda of CIRES (Centre ivoirien de recherches économiques et sociales).

In this short paper, we first focus on issues considered research priorities for CIRES and then move on to briefly discuss potential areas for collaboration with ILCA.

Research priorities

Three major areas of socio-economic research priorities are discussed below: livestock production policies; public and institutional policy reforms; and market and trade policy.

Livestock production policy

Younger generations of Ivoiriens, willing to become modern farmers, have cited a number of reasons for their unwillingness to enter into livestock production. These include the longer production cycle for livestock production as compared to food crops, the lack of readily available inexpensive inputs for feeding, treating diseases and the low prices of animal products.

The two major ruminants currently produced in Côte d'Ivoire are cattle and sheep which have received most of the policy makers' attention through extension services provided by SODEPRA. They have not, however, attracted the interest of younger farmers as have poultry and pork. Domestic supply of beef increased by 36% in the 1980s while imports from Sahelian countries decreased by nearly 45% during the same period. The deficit is filled by carcass and offal imports and processed meat which have increased by 167% and 50%, respectively. The overall beef supply has increased by 5%.

The domestic supply of small ruminant meat increased by 25% between 1980 and 1989 while imports from Sahelian countries decreased by 1% during the same period. Carcass

and offal imports increased by 4% , while the total supply of small ruminant meat increased by 4% during the period considered.

In 1990, Côte d'Ivoire was almost self sufficient in poultry. By 1975, 25% of the supply originated from Sahelian countries. Poultry meat supply during the 1980s increased by 72% . Imports from Sahelian countries have decreased by 31% .

During the period 1980–1990, total imports in pork increased by 111% and the domestic pork supply increased by 21% . The difference is met by imports of offal and carcass which have increased by more than 17 000 times and represent 50% of the country's total pork supply needs. Pork is not exported by Sahelian countries for religious reasons.

Pork and poultry products have been developed by the private sector while the government subsidises beef and sheep through SODEPRA. *The research question is to determine factors that account for the adoption of a particular livestock production system.*

Many countries have abandoned the small livestock they once owned because feed has become too expensive, there is poor management of the herd, there are prevailing health problems such as trypanosomiasis and parasites and there is lack of training on appropriate technologies needed to face these problems. *The research question is to identify constraints to technology adoption which prevent the livestock owner from being competitive on national and international markets.*

Policy and institutional reforms

Sectorial analyses of structural adjustment programmes have indicated many areas of inefficiency in livestock production. The promotion of policies on livestock were constrained for various reasons and resources devoted to modernisation programmes such as sedentarisation appeared a waste.

Policy reform in the livestock sector has never shown a clear political will to go beyond self sufficiency in meat production. Livestock imports from Sahelian countries have maintained political ties. Specific government policy of tariffs and non-tariff barriers and price controls have mostly been counter-productive. *A research agenda which could involve other researchers from the subregion may try to assess the impacts of major policy decisions affecting livestock not only in Côte d'Ivoire but also in the region and the combined impact of external factors such as world prices and world supplies.*

Finally, structural adjustment and liberalisation programmes in livestock production in Côte d'Ivoire have eased price controls on meat to consumers and advocated world market liberalisation programmes as compared to limited market liberalisation conceived within the Economic Community of West African States (ECOWAS) grouping. Due to the administrative difficulties, ECOWAS structural adjustments programmes have been very difficult to implement. This has led to many delays in policy reform in Côte d'Ivoire. *A research agenda should be devoted to the study of the effect of structural adjustment policy and institutional reforms on livestock production.*

Trade and market policy

Agricultural products are either donated or subsidised by developed countries. In African production areas, they are subject to uncertainties originating from sources such as the weather or government policy. Problems are compounded by internal constraints such as transportation costs, inadequate transportation for perishable products (meat and milk) and administrative problems in the office and on the roads. Trade and market policy research is a formidable task because it sometimes lacks the prerequisites—the data. One area of possible research collaboration is to organise and clean trade data among the countries of the region.

Within the country itself, one needs to better understand the national market of live animals. There seems to exist an oligopoly type of market of meat which either excludes non-ethnic group members or has led to violent confrontation in the market place. *To what extent does the market organisation and factors affecting the supply of meat determine the floor price of meat? How are the meat markets organised in other meat importing coastal countries?* These are areas for collaborative research.

Potential areas of collaboration between ILCA and CIRES

The International Livestock Centre for Africa (ILCA) has a comparative advantage in terms of a pool of multidisciplinary scientists and its rich experience covering sub-Saharan Africa. It has access to data and research facilities that most research institutions in the region do not possess.

For the past 20 years, CIRES has conducted research in many social science areas but mostly in agricultural economics. In its recently established three-year research programme, CIRES re-affirmed the necessity of pursuing applied field research in rural areas of Côte d'Ivoire and of developing collaborative research with other institutions. With a team of 30 qualified researchers (18 doctorates) and a relatively well equipped research centre, CIRES is in a position to carry out such endeavours.

In the three broad areas of research priorities identified above, ILCA can be a potential research partner with CIRES. ILCA's experience in appropriate techniques and technologies for livestock can be useful in our search for the most cost effective animals for specialisation in livestock development in Côte d'Ivoire. The international experience of ILCA team members can facilitate a network of national researchers working on this particular topic in the same regional economic grouping. ILCA could help identify potential researchers in areas of policy reforms and bring them in contact with international experts.

A new activity to be conducted by CIRES is training in policy research of Ivoirien decision makers. CIRES trainers may benefit from ILCA experience by attending training or trainers' courses.

Discussion

- C: Given the failures of the 1960s, 1970s and 1980s, the promotion of self-sufficiency will fail as well. The livestock sector in the Sahel should be stimulated. This would increase interest in meat production in Côte d'Ivoire.
- C: This supports the notion that we need regional integration in terms of livestock trade.

Issues in livestock research and policy

F. Dolberg

University of Aarhus
Denmark

Summary

Problems in livestock development

Cassen and Associates (1986) found a high degree of failure in livestock projects in Africa. Policy problems were found in overvaluation of national currencies, export bans, taxation on exports and controls on prices intended to benefit consumers.

More recently, the Asian Development Bank (1991) evaluated nine out of 10 completed livestock projects and one livestock component of an agricultural project. Eight were found to be unsuccessful and none were 'generally successful'. Unsustainable technologies (e.g. reliance on imported animals and feed), inadequate pricing policies and excessive dependence on government for implementation were mentioned as major reasons for failure.

The UNDP (United Nations Development Programme) Human Development Report (UNDP, 1991) states:

The lack of political commitment, not of financial resources, is often the real cause of human neglect.

The problem, the report argues, is that government budgets in many countries are spent on the military, on debt servicing and on unprofitable state enterprises. An important question for policy research is whether this lack of political commitment applies to the livestock sector. Specific questions might deal with the role and relevance of state or parastatal livestock enterprises. Does their contribution to the alleviation of rural poverty and savings on imports of animal products justify the investments and recurrent costs incurred by governments? Are they environmentally friendly?

The role of communication

A problem faced by national animal agricultural institutions and ministries is that of institutional memories. Important lessons are lost with transfer of staff or termination of contract. As a result, past experience is often not incorporated into new policies, programmes and projects.

The International Livestock Centre for Africa (ILCA) should take an interest in communication inside bureaucracies because, in order for research results to reach the ultimate beneficiary—the farmer—sound policies, programmes or projects will need to be developed. Policy research in this area would provide insight into how inappropriate policies, programmes and projects are derived and the extent to which past experience is or is not incorporated into new agendas for action.

Flow of information from an international centre

In addition to policy research, there is need to examine the best ways of disseminating information from international research centres to their target audiences. Some suggestions concerning a future communication strategy can be drawn. First, for ILCA research to be

applied, participation and publishing in conferences in Africa seem to be more important than publishing in so-called prestigious journals.

Secondly, apart from providing training opportunities to African farmers, extensionists, planners and policy makers, ILCA may need to consider training activities for developed country scientists and professionals—those who have contact with Africa through supervision of students, research, consultancies, development projects etc. This form of training is critical but has thus far been overlooked. It provides greater opportunity for ensuring relevance of information in terms of developing-country conditions and needs.

For training to be successful, it has to be built on a paradigm which is appropriate for tropical/developing countries, incorporate key features such as small farmers, sustainability, use of local resources, crop–livestock and tree–livestock linkages. ILCA should, perhaps, give priority to this task over that of facilitating information exchange between African livestock farmers and national agricultural research systems (NARS) on the one side and developed country research institutes on the other.

The ultimate beneficiary of the research, the farmer or the pastoralist, must be the starting as well as the end point of animal production research. Since his/her situation is so poorly understood, it must be part of ILCA's priorities to demonstrate the importance of the farmer by identifying constraints and testing technologies. ILCA should develop a data base of results of earlier, on-going and future livestock development projects. The target group for ILCA training should be expanded to include developed country scientists, policy makers, consultants and experts involved in African livestock work. ILCA has an important facilitator role to play. Facilitation of flow of relevant information to NARS and, increasingly, non-governmental organisations, is a very important task.

References

- Asian Development Bank. 1991. *Review of bank operations in the livestock subsector*. Asian Development Bank, Post-Evaluation Office, Manila, The Philippines.
- Cassen R and Associates. 1986. *Does aid work?: Report to an intergovernmental task force*. Clarendon Press, Oxford, UK.
- UNDP (United Nations Development Programme). 1991. *Human development report 1991*. Oxford University Press, New York, USA.

Discussion

- Q: Do you really believe extension is needed? Farmers learn from one another once things go right.
- A: We need to look at where innovations come from (e.g. farmers, business, etc).
- C: We need new directions in training and education; texts need to be revised and methodologies need to be updated.
- C: Has ILCA a role to play as an institutional memory? Why do so many projects fail? This is not addressed by ILCA. We need to think about policy and the people involved—not only technological intervention. Often, people designing projects do not know or have enough information.
- C: Farmers are prepared to innovate but often are prevented from doing so by various constraints.
- C: Do we need more research on land tenure? There is enough information available now to say that secure user rights are important.
- Q: What do you mean when you say there is the need for scientific leadership?

- A: Scientific leadership needs to go out on-farm, take what is learned and go back to the laboratory. Methodology should not get in the way of asking interesting questions.
- Q: You suggest that the interests of producers are marginalised. Would you say that empowerment of producers would be a legitimate research topic?
- A: Yes, but the smallholders are weak. It will be difficult to do. ILCA could go out and see the comparative advantage of smallholders to compete.
- C: Institutional training in Africa has been poor. University graduates are not absorbed; curriculum is outdated. We need to upgrade quality.
- A: I agree. In the presentation I did not suggest that focus should move away from the university. More emphasis should be placed on-farm.
- C1: What you are asking is going on. In the 1960s and 1970s, more attention was placed on setting priorities according to the knowledge and information gained in the field or on-farm.
- C2: Regarding land tenure, we need the research because the issue is very complex (e.g. common use rights). The issue of privatising land is often taken to be too simple. In some places, privatisation has led to more landless rural labourers and, by implication, less ownership of land by the poor.

Policy issues and priorities for ILCA technology research

B. Shapiro

*International Livestock Centre for Africa (ILCA)
P O Box 5689
Addis Ababa, Ethiopia*

Introduction

Animal agriculture can add to agricultural development through income generation, intensification (animal traction, manure, crop/livestock interactions), foreign exchange earnings and non-agricultural development (employment and income generation) (Shapiro, 1991). Perhaps the primary justification for being concerned with animal agriculture in sub-Saharan Africa (SSA) at present is the need to increase farmer incomes (Winrock, 1992). Technological change is the primary means of raising farmer incomes. However, while new technology is a necessary ingredient in the process of agricultural development, it is not sufficient without conducive policy.

The justification for technology policy research

The importance of and the relation between technology and policy becomes clearer by considering theoretical constructs of the process of technological change. Relevant constructs include Boserup's hypothesis and induced innovation.

The Boserup hypothesis and extensions to it state that population growth motivates intensification and technological change over time. Induced innovation is mainly concerned with how the process of science-led technological change takes place. Induced innovation purports that developers of new technologies respond to the demand for labour using or labour saving, capital using or saving, or land using or saving technologies, as expressed through changes in relative factor prices. Technology innovators can be private individuals, businesses or public research organisations. However, the primary source of new technologies is public research (McIntire et al, 1992). The continual development of new technologies takes place as producers adopt existing ones and science advances, motivated by the demand for further new technologies.

The induced innovation model is then based on the premise that technological change is endogenous to the development process. Thus, it rests on the assumption that the demand for technologies by producers, as expressed by correct price signals, are getting to innovators and especially to researchers and development agents. The major assumptions of the model are that:

- Distorted prices resulting in biases in factor use do not exist as a result of inappropriate government policies.
- Price signals exist since markets function efficiently.
- Effective communication exists among farmers, research institutions and supply firms.
- Effective extension of new technologies is taking place.
- Institutional capacity exists to undertake research and development (R & D), i.e. research skills exist to respond to signals from farmers for new technologies.

The potential for violation of these conditions provides a motivation for policy research.

The nature of government policies in SSA

Policies are often defined as those decisions (market interventions) made by governments which alter the prices farmers face in the market and that can affect their incomes and welfare. The major features of policies followed in SSA are that they often:

- tax farmer output and subsidise farm inputs
- seek to increase agricultural output through projects without strengthening economic incentives
- introduce economic inefficiencies through price distortions and market regulations which cause non-competitive rents
- subsidise consumers.

Often, analyses of policy concentrate on price and macro-economic factors. In the context of SSA, however, institutional factors are often as important. All of the following types of policies are relevant in SSA:

- price incentives: commodity, factor and input markets
- macro-economic and trade
- sectoral: rural development, labour, land and livestock, infrastructure, investment, institutions and markets
- services: credit, research, extension.

Although there has been some improvement in price and macro-policy in SSA, there is still a need to carry out research on all aspects of policies that affect the livestock sector.

There is some evidence that commodity price and macro-policy instruments such as exchange rates are becoming less biased against livestock producers. For instance, Williams (1990) has shown that since the early 1980s, the level of price discrimination against livestock producers in Mali, the Sudan, Nigeria, Côte d'Ivoire and Zimbabwe has been reduced. Evidence from Kenya, Ethiopia, Mali and elsewhere, however, indicates that while meat price policy is being liberalised, this may not be the case for dairy products. Furthermore, the effects of and remedies for indirect sectoral and service provision policies that negatively affect technological change have not been fully investigated.

Identifying appropriate policies and their effects on alternative technologies

Identifying policies already followed in SSA that promote development is an essential element of technology policy research. Comparisons with developed countries are often of limited use because of substantial differences in resource endowments, climatic conditions and economic conditions. Relevant comparison countries do exist in SSA. Such comparison case studies can include the effects of policies on the choice of alternative production methods or technologies.

The long-term impact of government policy depends on the manner in which it affects the comparative advantage of different economic activities. A domestic resource cost (DRC) methodology such as the Policy Analysis Matrix (PAM) methodology developed by Monke and Pearson (1989) provides a systematic framework for analysing government interventions and making country comparisons. PAM sorts out the set of sometimes contradictory policies and programmes governments follow and evaluates the individual and net effects of policy on given objectives, i.e. increased privatisation, increased producer income, increased supply of dairy products etc.

Another advantage of the PAM analysis over traditional cost–benefit analyses and DRC studies is that it is focused on impacts of policy on production technologies. Traditional analyses, considering supply and demand characteristics, often produce only the overall effects of policies on the welfare of the economy. The PAM analysis is able to separate out the individual effects of deliberate micro- and macro-policies, as well as market inefficiencies and failures and other distortions. Since the analysis is focused on production, PAM evaluates the impacts of these factors not only on production incentives, but also on alternative technologies. The implications of policy for the development of production technologies become clear.

The issues that can be considered with the PAM tend to be the ones central to agricultural policy questions—long-term relative profitability and costs (as indicated by social values) and how these are affected by policy interventions (Monke and Pearson, 1989). Furthermore, PAM presents these issues in a simple and understandable manner, allowing policy makers convenient access to the most important facts to be considered in the decision making process. This ease of communication between economic analysts and policy makers also makes PAM a useful tool for training and institutional development.

Priority species and commodities for technology policy research

Species and commodities that are of importance in fulfilling ILCA's (International Livestock Centre for Africa) objectives are those that have the potential to increase production and improve the income and welfare of farmers. It may also be necessary to consider the impact of our work on the urban poor. A framework for determining the potential of specific species and commodities should include consideration of the following factors: agro-ecological environment (rainfall, soils), population density, market access, target populations (rural/urban impact) and potential for change (economies of scale and specialisation).

This work should be carried out by agro-ecological zone to identify species, commodities and technologies that have the greatest potential for impact. This can be collaborative work carried out with national agricultural research systems (NARS). To make an impact on the incomes and welfare of farmers (and the urban poor), ILCA will have to give priority to mixed crop–livestock systems undergoing intensification—those where conducive agro-ecological conditions, population pressure and market access exist. It may be useful to concentrate on the following species and commodities: dairy, especially peri-urban dairy; short-term fattening; and poultry and swine.

Technology transfer research

The technology transfer process is a priority for ILCA economists since by definition, ILCA must be concerned with making an impact. There have been a number of technologies developed by ILCA that were based on perceived needs of targeted clients. Yet, these technologies have not been adopted to the degree expected. While ILCA's mandate is not extension, the Centre still needs to be concerned with adoption and diffusion. The question is, however, in what capacity?

Technology transfer tends to be site-specific. As such, ILCA cannot become involved in actual instances of technology transfer *per se* because it has a limited resource base. However, the Centre is responsible for the effectiveness of the technology transfer process. ILCA is well placed to do strategic research on the technology transfer process and to transfer this information to NARS. In this regard, an appropriate Centre output would be a general framework for analysis that NARS could apply to specific situations.

Many factors between technology generation and technology transfer can impede the adoption and diffusion of new technologies. Technologies that show potential in on-station and on-farm trials are not always adopted by farmers. Constraints to adoption can exist on several levels: in the micro-economic behaviour of producers; in support structures and institutions; and in macro-economic linkages. Inappropriate policy, undeveloped infrastructure and ineffective service institutions can result in resource misallocations and inefficiency. Under these circumstances, the development of new technologies remains only an academic exercise.

In order to examine and identify factors that contribute to or constrain technology transfer, ILCA is currently carrying out research to:

- identify the policy constraints to adoption (individual)
- identify the policy constraints to diffusion (aggregate)
- identify the role of market imperfections in technology development and diffusion
- relate adoption and diffusion to technology development.

Ex ante evaluation of new technologies at the farm level in a whole-farm context is the first stage in this work. Whole-farm evaluation of new technologies can help determine the potential effects of the new technologies on resource use, income, other household objectives and risk. Such evaluations can include the effects of various policies, including input and output price policies, on adoption. Analysis also provides feedback to technology developers and policy makers.

The exogenous constraints that impede diffusion can arise from policy and other government interventions. The exogenous factors can include those at the institutional (related to social and political organisation) or the structural level (e.g. infrastructure, roads, transport etc). The functioning of support institutions (e.g. extension, research, credit, input supply and health facilities) can also be important.

One format for studying the policy constraints to diffusion is to do case studies comparing technologies that have been developed and diffused with those that have not. The objective of such a research effort would be to set up possible criteria for successful policies and programmes that could be presented to policy makers. Cases to be studied could draw on ILCA technologies that have been developed over the years (e.g. broadbed maker, dairy processing equipment, alley farming techniques, fodder banks).

Development of a multidisciplinary analytical framework to study diffusion would provide policy analysts and policy makers with the information needed to more effectively allocate development resources to achieve widespread diffusion of new technologies.

A multidisciplinary approach to this type of research, utilising techniques such as the PAM, is required. Livestock research in Africa has traditionally been divided into social, economic and technical/biological research. Institutional aspects of diffusion have been ignored. Economists or anthropologists have been responsible for evaluating impacts and have relied on biological scientists for an understanding of the technical/biological aspects of new technologies. This disciplinary approach has not been productive and has left important questions unstudied and cross disciplinary questions unanswered.

ILCA priorities in studying the interactions between policy and technology should include:

- providing a systematic framework for analysing technology transfer issues for international agricultural research centres (IARCs) and NARS
- determining the critical price policy factors that influence successful technology transfer
- determining the role of factor and output market imperfections and investment to improve market performance

- examining the infrastructure of co-operating NARS to establish the strength and the type of links that exist between NARS and ILCA, as well as NARS and client farmers
- recommending appropriate policies, programmes and investments to improve technology transfer.

Appropriate methodologies

The research methods developed by ILCA economists should be useful to NARS, advance the discipline of economics and involve cost effective methods of data collection to facilitate policy analysis and research.

An example of the type of strategic research in the area of technology and policy that should be pursued is the work ILCA is beginning to do with the PAM. The objectives of this research include:

- to provide a systematic framework for policy analysis
- to determine the data requirements to do effective policy analysis and devise a system of data collection that can be used by NARS
- to determine the effects of market inefficiency and the magnitude of investments that can be made to improve market performance
- to provide recommendations for appropriate policies, programmes and investments
- to train African policy analysts in the use of the PAM framework.

ALPAN and the policy analysis course

The effectiveness and impact of the African Livestock Policy Analysis Network (ALPAN) is a major concern of the ILCA Livestock Economics Division (LED) since it is a primary means through which we can affect the making of livestock policy. The objectives of ALPAN are to improve policy analysis and policy making pertaining to the livestock subsector. ALPAN provides a means of communicating policy research that is relevant to the problems faced by African livestock policy analysts. The papers published in ALPAN also provide examples of relevant methodology and thus assist in human resource development.

ALPAN should be strengthened to increase its impact on livestock policy analysis and policy making in SSA. One way that this could be accomplished would be by making the network more like the others at ILCA. ALPAN could also be tied more closely to the Livestock Policy Training Course (LPTC), thereby improving the impact potential of both.

The objective of the LPTC is to improve policy analysis and policy making by training policy analysts. A weakness of the course is the lack of training follow-up. Means should be designed to continue the involvement of LED with those who have participated in the course.

The impact of the course in terms of manpower development and the impact of ALPAN could be increased by providing seed money to course participants and others to develop research proposals and to carry out policy research. Accomplishing this would, of course, necessitate finding funds for this purpose. Donor support would be important in this regard.

Participants in the course who develop proposals for policy research could be given research support by ILCA economists. The development of such proposals could be made an integral part of the course. Participants could also be assisted in finding additional funding to support the research from agencies such as the African Development Bank. Proposals submitted by other NARS economists that are judged worthy by a research panel could also be offered this assistance.

Regional meetings could be arranged to encourage interaction among economists involved in livestock economics research in SSA. The purpose of these meetings would be to share research and policy analysis work done and to promote active participation in ALPAN. Training course participants could be invited to these meetings, as well as others who might be future course participants. Thus, these meetings would provide another means of the developing the skills of course participants.

Conclusions

It is paramount that ILCA be concerned with making an impact through the technology it generates. This is especially the case if the Centre is to have a significant effect on farmer incomes. To accomplish this, the interactions between policy and technology need to be better understood. ILCA is in a good position to gain a better understanding of macro–micro linkages, e.g. the interactions between policy and technology. It may be useful to pursue the following research priorities in the area of policy and technology:

- identify the policy constraints to adoption and policy instruments that can promote adoption
- identify the policy constraints to diffusion and policy instruments that can promote diffusion
- identify policies that have promoted technological change in SSA
- understand the effects of family issues and gender policy on technological change.

Among the methodologies that can be used to accomplish these research priorities and can provide methods useful to NARS are *ex ante* whole-farm modelling using mathematical programming, econometric adoption studies and DRC methods such as the Policy Analysis Matrix.

References

- McIntire J, Bourzat D and Pingali P. 1992. *Crop livestock interactions in sub-Saharan Africa*. Book manuscript, World Bank, Washington, DC, USA.
- Monke E A and Pearson S R. 1989. *The policy analysis matrix for agricultural development*. Cornell University Press, Ithaca, New York, USA.
- Shapiro K H. 1991. *Assessment of animal agriculture in Africa: Economic issues*. Mimeo, International Programs, University of Wisconsin, Madison, USA.
- Williams T O. 1990. *Impact of livestock pricing policies on meat and milk output in selected sub-Saharan African countries*. LED (Livestock Economics Division) Working Document 13. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. 111 pp.
- Winrock. 1992. *Assessment of animal agriculture in sub-Saharan Africa*. Winrock International, Morrilton, Arkansas, USA.

Discussion

- Q: PAM addresses the whole system, but is it a good methodology for cross-country comparisons? In some countries, the absence of data would be problematic.
- A: Your question is relevant and true. With all quantitative measures there are problems. PAM could be extended into the areas of sustainability and resource endowment.
- C: Methodology is always a concern for me. For instance, the issue of social pricing is burdensome. What it is based on may not be useful.
- C: The point is that every country has a comparative advantage in some respect; countries need to trade amongst themselves.

- Q: If a government is seeking self sufficiency, suppose there is a market failure and government intervention favours importation. Where would you go from there?
- A: PAM is a methodology, not a prescription. Neither is it necessarily a free market advocate. The constraints to PAM are similar to those of DRC discussed yesterday. The method helps set up a system for data collection, analysis and interpretation.
- Q: Unless you identify specific technologies, PAM is difficult to use. I have doubts about its efficacy in field research. How do you plan to operationalise PAM?
- A: We will do work on peri-urban dairying across sites and check the methodology. PAM has been applied before. There is experience to draw on. It is basically a budgeting technique. It means going out in the field and getting data, acknowledging that there will be data limitations.

General discussion

- C: In terms of subsidising livestock production activities in order to promote self-sufficiency, we need to be careful that something can be gained. Within any country or group, the only way to favour one group by subsidising is by disadvantaging another group. We should be looking at facilitating domestic industries. And in this context, facilitation needs to be kept distinct from support.
- Q: Who are our targets? Most of ILCA's work is on developing biological technologies. We have only peripherally talked about how it gets out to farmer groups. No talk has been generated about institutional structures and linkages to encourage adoption.
- A: It is an important area but we do not have a strong capacity to address the issue.
- Q1: What is the role of ALPAN? I support the notion that it move from information exchange into a collaborative research network. Some synergy would be developed across countries.
- Q2: It is still unclear who our target group is. Perhaps it is segmented?
- A1: Doing away with ALPAN is a non-issue. Since you have an information exchange network set up, you should use it. I would like to see ILCA take a small subset from ALPAN for collaborative research that would help direct future training. You could have a small research network as a follow-up to training (where training would focus on methodologies).
- A2: I wonder if you want to sharply separate economic from policy research. There is a continuum here. You may wish to see this small research network as a policy and economic research network.
- C: I discovered ALPAN in the early 1980s. For people sitting in countries with limited resources, ALPAN is most useful.
- C: If we think of developing collaborative research out of the policy analysis course, this will result in a radically different clientele; it would represent a fundamental change.
- C: With whom should ILCA be collaborating? Who are its appropriate partners? The criteria for selecting collaborators should be considered. For instance, should you build on what is already there? The Centre should pick the institution, not the person. It should strategically select the institutions that can promote policy change.
- C: For ALPAN, we need to consider the costs of production, its relative value in terms of peer reviewed journals etc.
- Q: How would you include francophone countries into these research networks? The research methods for proposals are different.

A: Yes, this is an issue, but who will train us? Somewhere this needs to be addressed if better collaboration between francophone and anglophone countries is to be developed.

Interactions between technology and policy in the African livestock sector

J. McIntire

*World Bank
Washington, DC, USA*

Background

Widespread belief exists that African policy has added to a decline over time in agricultural production. This belief is reasonably well established for annual crops, particularly cereals, and for some tree crops. There is some quantification of the notion in the livestock sector as well.

The adverse effects of policy are thought to work through, *inter alia*, disincentives to adopt new technologies. If that belief is true, then policy research is a legitimate focus of centres like the International Livestock Centre for Africa (ILCA), which seek to generate technological innovations and, by assisting national research/extension services, promote them to producers.

Policy context

African agricultural policy, at least until the beginning of many of the structural adjustment programmes of the 1980s, may be styled as follows:

- (a) There was negative effective protection of agriculture which operated through an overvalued exchange rate and heavy taxation of imported inputs. This negative effect was perhaps less severe in livestock products (which could evade public controls more easily) than in crops.
- (b) There was widespread state intervention in production and marketing. This intervention took the form of establishing state enterprises and protecting them so as to eliminate or damage putative private competitors.
- (c) Public investments in production and marketing were made without due attention to social profitability.
- (d) In addition to the market power of public firms, private investment was further discouraged by credit rationing, overvalued exchange rates and various official and extra-official administrative controls).
- (e) There was tight regulation of economic activities, including professional services (such as veterinary and extension), where barriers to entry were so high as to exclude many entrants and to discourage others from leaving the impecunious, but relatively secure, haven of government service.
- (f) Government policy often promoted technologies which were inappropriate to the production systems and factor prices prevailing in many countries.
- (g) Producers' organisations, which in other countries have served to mobilise private savings, attract public investments or contract private services, were discouraged for political reasons or were made the dull instrument of a coercive and inefficient state bureaucracy.

(h) Little or no value was assigned to environmental costs.

What were the effects of these policies?

The possible effects of African policies can be summarised in terms of their effects on sectoral output, technological change, income distribution and factor markets.

Sectoral output. First, agricultural production began to fall when the rate of area expansion started to decline in the late 1960s; in some countries, this decline accelerated as the agricultural/non-agricultural terms of trade became very distorted. Second—and only partly as a result of the first—the sectoral composition of output changed. It became more oriented to government and private services than at comparable income levels experienced during economic growth elsewhere. This was because the state could not control the non-traded sectors as well as it could the traded. Hence, the balance of incentives shifted toward non-tradable services. Third, and as a consequence of the first two, many African nations lost international market shares in agricultural commodities.

Technological changes. The rate of technological change (as measured by crop yields, the use of improved seeds and agrochemicals, for example) in African agriculture was much lower in the 1960s, 1970s and 1980s than in Asia and Latin America. This was true even after adjusting for such differences as population density, rainfall, soils and length of growing season. Asia and Latin America are the relevant comparisons because they began from the most similar bases of income level and agroclimate. This lower rate of technical change translated into a slower rate of output growth than would have been otherwise achieved.

Income distribution. The effects on income distribution are the most well-understood. Policy transferred income from producers to consumers of agricultural commodities. Within the class of agricultural producers, policy typically transferred income from (i) producers of tradables to producers of non-tradables via the over-valued exchange rate; (ii) sellers of marketing board commodities to sellers of open market commodities via the explicit or implicit taxes levied on the former group; (iii) purchasers of open market inputs to purchasers of rationed, state enterprise, inputs via the subsidies allotted to the latter.

Factor market effects. The systematic under-valuation of agricultural production had several impacts. First, it suppressed the value of land and discouraged the genesis of land saving innovations, where the latter is defined to include both technological changes such as fertiliser use and contractual innovations such as land markets and credit arrangements in which land is used as collateral. In many areas, this would not have made much difference because they were so sparsely populated, land-saving innovations would not have been profitable. In others, it had a significant direct effect on the incentives to use profit maximising levels of inputs. Fertiliser is the best example.

An important indirect effect—and one which is more serious in the long run—was on the development of transparent land markets. The latter take many years to develop because they incur costs in adjustment from customary rules of land allocation to market ones,¹ notably: the development of new legal rules; the adjudication of conflicting claims under the old and new rules; the compensation of losers after the transition; and the development of new income sources for those who may have been compensated for the loss in the value of their land assets but who are still unemployed. Hence to the extent that policy discrimination against agriculture hindered the rise of modern land markets, it had a more profound and persistent effect on allocative efficiency than did the more easily reversed effects of negative effective protection on such variable inputs as agricultural

¹ This is not purely an African phenomenon.

chemicals and such professional services as private veterinary agents. Several countries have had very rapid growth in fertiliser and machinery use subsequent to reforms, but the passage to an efficient land market promises to be much more arduous.

Yet another indirect effect was on the labour market. The shift of incentives to services and non-agricultural tradables because of the lack of agricultural competitiveness induced both permanent and seasonal migration. The short-term consequence of this was to make labour intensive techniques less remunerative because of the fall in the physical availability of labour, principally male labour. The long-term consequence was to stop the construction of labour intensive agricultural works such as dams, terraces and flood control structures, or where such structures existed, to degrade their upkeep.

Recent reforms

Many countries have seen the need to reform some of the aforementioned policies. Reforms have included, among others:

- the establishment of more realistic exchange rates
- a reduction in the direct role of the state in production and marketing
- a reduction in negative effective protection afflicting agriculture
- a cut in regulation
- more liberal rules affecting factor markets, including the end of limits on transactions in land, the end of credit rationing, the institution of positive interest rates and the abandonment of attempts to restrict hiring labour.

Though at least one attempt has been made to evaluate these reforms, the best one can honestly say now is that, while they are necessary in the long run, their course and effect are presently unclear.

Successful technological innovations

Before addressing the interactions between policies and technological changes as foci of economic research, let me define some categories of technical change as a way of showing which have been productive and/or are likely to be so and which ones are likely to be efficiently generated and/or promoted by a centre like ILCA. Here I distinguish among four types of innovations: those induced by Boserupian intensification (e.g. manuring crops); introductions (e.g. the introduction of cocoa production from outside the continent); innovations in production methods; and innovations in markets and contracts. Table 1 illustrates this scheme.

Table 1. *Type of innovations in production methods, markets and contracts.*

Class of innovation	Production methods	Markets and contracts
Boserupian intensification (the process of gradually using more labour per unit of output, complemented by local resources and getting higher yields per unit of land)	Manuring crops; harvesting crop residues; using animal traction; managing irrigation; harvesting weeds for feed	manuring contracts between farmers and herders; land pledging and sharecropping; cattle entrustment; water users' associations; fodder markets; land sales
Introduced technical change (the advent of novel inputs, which do not derive from a local innovation and which may or may not yield more per unit of land)	chemical fertiliser; tractors; improved seeds; artificial insemination; mechanised transport and processing	formal banking; contract farming with processors; future markets crop insurance; breeding stock insurance

Innovations in production methods

Throughout Africa, there have been many successful technical innovations of both the intensifying and the introduced type. The intensifying type include irrigating by hand from wells and small diversion dams of local construction; manuring, mulching and shading crops; managing crop residue; shaping land (e.g. levelling and terracing) and shifting from zero-livestock systems to ruminant production (with and without trypanotolerant stock) in areas freed from tsetse. There are obviously many other examples.

The introduced type include veterinary drugs; irrigation with pumps; dairy production with crossbred animals; sown forages and concentrate feeds; some investments in housing and water supply; animal traction and tractor mechanisation; cash crops; chemical fertilisers; and (occasionally) improved seeds.

There have been few technological changes induced by truly indigenous scientific research. One example is vaccines and antibiotics for livestock diseases. Nearly everything else was introduced or is a response to the evolution of factor prices (distorted or not). There are few plant cultivars bred under African conditions in wide use. There are even fewer novel animal breeds which have out-competed those introduced many years ago. Practically the only tradition of mechanical research is adaptive.

Innovations in markets and contracts

Perhaps less frequently considered as technical change—but just as important from the economist's point of view, which is cost per unit of output—are innovations in markets and contracts.

Intensifying technical changes affect systems of land tenure. As farming systems change under population pressure and market access, land becomes a market commodity, subject to pledges, rentals, sharecropping, non-cash exchanges and, ultimately, sales among unrelated individuals. In commerce, traders' networks flourish over long distances, typically linked via kinship to cut information and other transaction costs while expanding the volume of trade. Other innovations have comprised livestock entrustment, animal borrowing and crop residue grazing/manure exchanges.

Examples of introduced market and contract innovations include the fall in transport costs associated with mechanised transport; electrification and refrigeration; mechanised processing (e.g. oil presses and grain mills); and, to a limited extent, modern banking and insurance. The latter two are rare and usually linked to export crops like cotton and cocoa.

Failed innovations

There are many innovations whose failure provide rich material for reflection in the context of technology generation. Sadly, many of the failed innovations are those which have most strongly boosted agricultural productivity in other countries, both temperate and tropical.

Lessons of those innovations

The successful technical changes through progressive intensification and through introductions have some elements in common. Population growth encourages more labour intensive methods of crop and livestock husbandry. Those produce an apparently more sophisticated agriculture, with higher yields per unit of land, slightly lower yields per unit of labour, and, in some instances, market and contractual innovations to relieve seasonal labour bottlenecks and to raise the rate of capacity utilisation of mechanical and animal capital.

Table 2. *Failed innovations in production methods, markets and contacts.*

Class of innovation	Production methods	Markets and contracts
Boserupian intensification	rice transplanting; seeding in rows; crop residue and manure incorporation; water harvesting; harvesting weeds for feed; green manuring	land pledging and sharecropping; water users' associations
Introduced technical change	most introduced livestock breeds; public tractor hire schemes; large irrigation projects; animal traction in the humid tropics; sown forages	marketing co-operatives; crop insurance; public agricultural banking; crop auctions; contract farming with processors; futures markets; crop insurance; breeding stock insurance; state marketing boards; public grain reserves; joint stock companies; debt financing

The unsuccessful instances are mainly those in which the cost of labour is too high (e.g. transplanting rice or incorporating manures into the soil) relative to the benefits. Others involved resource use conflicts. An example of the latter is that African farmers often do not restore crop residue to the soil because they need it for feed, whereas such restoration is common in the United States on grain producing farms which, because they employ tractors and not horses for power, do not need the residue for animal feed. Unsuccessful market and contract innovations—such as rural deposit banking to replace money-lending, or public grain reserves—typically failed because they could not resolve information cost problems.

Despite the greater sophistication of intensified agriculture, the main lesson of intensification is that it does not promote economic growth without the complement of results from scientific research. This is not necessarily a conclusion which can be easily seen in Africa, both because intensification is spottier there and because the use of modern scientific agriculture is so much rarer, but is very easily perceived in Asia. In both the wet and dry tropics of Asia, there are many farming systems with what is, by African standards, high quality farming as indicated by the long-standing presence of intensive practices: planting in rows, transplanting, land shaping, harvest and storage of crop residue. Yet the income levels of those farming systems—in the absence of modern crop cultivars, machines and agrochemicals—are no better and are sometimes even worse than those of African production systems in which such intensive practices have been promoted by outsiders and have failed. In essence, intensification allows a shift along a production possibility frontier and not an outward shift of the frontier; while it leads to greater economic efficiency at the margin in response to differing land/labour ratios, it does not provide much higher utility to the farmer.

No policy inducement was required in most cases of successful innovation, whether of the Boserupian or of the introduced types. The great successes of export-led growth in agriculture—cocoa in Ghana and the Côte d'Ivoire, groundnut and cotton in several countries, tea in Kenya, oil palm in Nigeria—benefited from a favourable production environment and an existing technology which could be borrowed from outside. In some cases, there was a good extension service. In others, local adaptive research was useful.

The evolution of demands on research systems

Future technologies in the developed countries are likely to continue the secular downward trend in international primary commodity prices. Hence, technical change in African agriculture will be necessary not only to maintain present market shares of tradable commodities, but to prevent further erosion. In the short run, this will occur against a background of stagnant technology in the traditional sector.

What has been the effect in the past of this conjuncture of rapid technical change in modern agriculture and stagnation in the traditional sector? Good examples come from Latin America, whose varied mix of environments, farm size, foreign trade orientation and producer characteristics have produced dualism—the modern sector supplies goods to urban and export markets while the traditional sector supplies goods to itself and labour to the modern sector. Naturally this is a recipe for disaster in Africa, just as it has been in Latin America, because of the deep disparities in income distribution which ensue. One main challenge for the research system, therefore, will be to generate productive technologies for the traditional sector which will allow it to compete with the modern sector, both domestically and abroad.

An additional source of external change is the demand for lowered costs in traditional African agriculture. Two such costs are the externalities caused by treating the environment as a free good and the opportunity cost of output foregone caused by discrimination against women in the generation and the transfer of technology.

Characteristics of successful public agricultural research

Given the characteristics of the various innovations and the evolution of demand for research outputs, what will a public agricultural research system look like? The characteristics of a successful public agricultural system—which includes national, regional, and international programmes like ILCA—are at the very least:

- dedication to research and not to technology transfer, which is the role of national extension services
- non-duplication of private sector research. This means that there should be little or nothing on developing mechanisation or processing techniques since most of their benefits are appropriable by private agents
- not working on intensifying management practices which have, via fairly simple diagnostic farming systems research, been shown to have been tried by farmers and found unprofitable
- an opportunistic and adaptive nature, in that a primary source of technical change will be innovations first generated abroad and then adapted to local circumstances.

What will be the technical outputs of that research system?

- crop cultivars, including the embodied characteristics of stress resistance, input response, gustatory qualities and storage traits, among others
- agronomic and livestock management practices
- animal breeds and their embodied characteristics
- environment goods
- goods which can be used by victims of market failures
- other goods which are at least partly public, such as trained scientists and other staff.

Do some characteristics of livestock production and products justify special research efforts, either in amount or in kind, given the expected technical outputs of the system?

Perishability. Though many livestock commodities are perishable, this creates no special demands on the public research system because many other commodities are perishable. Moreover, reducing losses to perishability is not a research problem in most cases and, even

where it is, it may not be a public research problem, as private research and technology transfer can treat it if intellectual property rights are protected. This should create no special needs for ILCA research.

Transferability. The major livestock products are produced in many countries, under a variety of conditions, so that some research results will always be available as imports. Even the minor products—manure and power—have substitutes so special programmes are not required to improve them. The availability of technical alternatives has to be a continuing preoccupation of ILCA's research in order to avoid the temptation of inventing uncompetitive local alternatives which could be introduced more cheaply from outside.

Temporal characteristics. The assertion is often made that livestock research is special because it takes longer to generate results. This would not necessarily be true of the primary production part of the livestock research process, which is similar enough to crop production research. With respect to policy research—the study of technical change, prices, markets and institutions—most of the work can be done with cost-benefit models or with historical simulations. In those respects livestock research is not different at all.

Risk characteristics. The relative and absolute variability of African livestock production will always be high simply because its comparative advantage is in zones of low and extremely variable rainfall. It is plausible to think that the resulting risks—complete herd loss and lowered productivity of the remainder—are legitimate objects of public policy because they cannot be adjusted for completely by the actions of producers. There may be the further justification that one risk adjustment of the producers—holding supra-optimal herds—creates a negative externality in the form of overgrazing. These are legitimate issues for research, but it will be very tricky to come to any definitive conclusions.

Income generation characteristics. It is occasionally held that livestock have the specially worthy characteristic of generating a marketable surplus (i.e. cash) where other alternatives do not. That cash surplus is then held to be available for investment in crop production and hence to justify livestock development as a motor of growth. I do not believe that this is a real phenomenon, unlike the risk issue, which is. The 'cash generation' hypothesis essentially results from the misperception of the economic features of low-population density areas. Those features include (usually) low primary production, high transport costs, the absence of a land market and the absence of profitable technical improvements for crop production. In such conditions, wealth is not held as land, but as livestock and cash surpluses which are most likely to be reinvested in animals, not in crops. It is simplest to admit this, rather than to adduce a tenuous externality resulting from a cash generation hypothesis.

There is sometimes the tendency to think that the poorest agricultural regions—having sparse and variable rainfall, infertile and shallow soils, strong pest and disease pressure, isolation from markets and dissimilarities from other agricultures from which they could borrow production techniques—require the simplest research techniques. To over-simplify, this is like saying that because poor farmers characterise such regions and because they supposedly require simple techniques, simple research methods are what is needed. In fact, it is precisely because such regions present the most difficult challenge that they require the most sophisticated research techniques. This is a recurrent fallacy, which, when it occurs, has been very damaging.

What policy research will be relevant?

A programme of relevant policy research can only be defined with respect to the expected policy context. This will include:

- Continuing economic and political liberalisation and a concomitant decline in the role of the state. Many state enterprises will disappear and regulation will, it is hoped, be less bothersome.
- The real prices of non-tradables will continue falling relative to those of tradables. The short run analytic impact of this will be complicated. Many tradable inputs have been rationed so that their scarcity values on local markets exceed their c.i.f. (cost, insurance, freight) prices. Hence, the immediate effect of a real devaluation plus domestic trade liberalisation will have two components; devaluation causes the relative prices of non-tradables to fall, while eliminating rationing of tradables causes their relative prices to fall. The net effect of the two components cannot be easily predicted. The long-term evolution is easier to predict; as long as African productivity growth lags behind world productivity growth, then there will be a continuing real devaluation, i.e. a rise in the quantity of domestic goods needed to buy a unit of foreign goods.
- Changes in intellectual property regimes will continue and will improve the prospects for technology transfer.
- There will be a rising real price of land brought on by population density and by the transition from traditional systems of land rights to market systems. Associated with this trend will be increasing restrictions on common property use, including but not limited to land use.
- A falling nominal price of labour relative to that of land, possibly falling real wages.
- Greater direct foreign private investment with associated technology transfer.
- Higher market valuation of environmental costs.

ILCA's comparative advantage

ILCA's comparative advantage in economic and policy research will be in access to biological and environmental data, in collaboration with ILCA and other scientists, and in comparative studies of market and institutions in Africa facilitated by close contact with national research and extension programmes in African countries.

Major issues for ILCA's programme

The principal issues for an ILCA research programme will be:

- Technology studies of the cost-benefit and adoption type ought to be the most important. ILCA has a strong comparative advantage in them because of its access to technical data and to the wisdom of biological scientists. Such studies are not only the basis for the evaluation of production and marketing policies, but are requisite for any review of a research programme itself. I would insist—though ILCA has never done this—on detailed studies of rates of return to animal disease control as a means of providing better advice to national livestock disease control programmes, which are often completely in the dark about priorities. Relevant types of technology studies should be mainly of introduced methods using experimental data. Traditional technologies should be controls, but not the main object of study. Why? Because the traditional technologies have, in many cases, either passed or failed the market test; and because they are typically factor substitution methods, not ones which lead to net productivity gains.
- Several important issues are related to technology studies. Such things as risk, uncertainty, optimal scale and environmental questions, appear fruitful areas for study, but have to be very strictly linked to technology studies. Emphasis has to be placed on identifying constraints to market mechanisms for risk adjustment and reducing environmental costs, because those mechanisms are not well understood in Africa, either for intensifying or introduced technologies. With respect to policy barriers for market solutions, I take the point that some of the apparent cost advantage of larger

producers is policy-induced—directed credit, regulation of private veterinary and extension services, restrictions on imported inputs—but we do not know exactly how far that extends.

- Factor market studies are crucial given their importance for the technologies demanded by producers and for the fate of those generated by the research and extension systems. This area includes land, labour and credit markets. I would place very great importance on mining secondary data from existing surveys of production and consumption, in collaboration with the International Food Policy Research Institute (IFPRI) and with national programmes. It is also essential to create consistently formatted and publicly accessible data bases from whatever studies are done.
- Input and product markets studies would concentrate on traditional market efficiency analyses of the structure–conduct–performance kind. I see no role for studies of international market conditions or for projections, which are better done elsewhere by institutions with greater resources. It would be much better to exploit ILCA’s comparative advantage in working with national institutions in understanding such markets and how they are hobbled, if indeed they are, by national policies.
- Institutional studies would concentrate on: the appropriate division of labour in technology generation and transfer between the public and private sectors; the efficiency of national research and extension systems; the functioning of public and private veterinary services; the efficiency of technology transfer mechanisms, including direct investment, contract farming and bank lending. While in theory it is nice to confine the role of the public sector to the provision of public goods, including the relief of poverty and the management of exceptional risks, it has to be recognised as a practical matter that the capacity of the private sector to provide many goods and services with some research/technology characteristics is positively correlated with national income; this perspective has to be part of any analysis in this domain.

Discussion

- C: I agree regarding research on risk. For the most successful cases of growth, your point on policy inducements is too strong. They can contribute to intensification.
- A: Studies generally show that people are risk-averse. There is variability in production outcomes. Regarding policy inducements, I stand by my statement. They have either not been successful, failed to work or made no difference.
- C: I also believe your statement on policy is too strong. For instance, the introduction of cocoa and palm oil in Côte d’Ivoire was supported by systematic government policies. We need to understand how policy is implemented, adopted etc.
- A: The comment could be turned around. The successes you end up finding may be the result of getting rid of impediments caused by bad policies.
- Q: What types of animal technologies would move us forward in terms of introduced technologies?
- A: Animal productivity goes up with primary productivity.
- C: You seem to suggest that ILCA should primarily focus on the market, micro-level issues.
- A: You cannot do policy research without knowing the basic parameters such as the rates of return to different technologies, e.g. the impact of technology on animal nutrition, productivity etc. The work that ILCA does on rates of return (e.g. veterinary returns) are good.
- Q: How do you best deploy limited resources to get at this information?

A: Use your collaborators, the body of available data to analyse etc. This will give you a multiplier effect.

Future directions for livestock policy research in Africa

G. Perrier

*International Programs
College of Natural Resources
Utah State University
Logan, Utah, USA*

Introduction

This paper discusses priority research needs for livestock and natural resource policy, appropriate methods for research in these priorities and potential collaborators for the International Livestock Centre for Africa (ILCA).

Priority research needs for livestock and natural resource policy in Africa

Public policy is defined here as the strategy to meet the goals of a government programme or initiative. Successful development of the livestock sector requires sound policy formulation. Governments must identify problems, determine goals which will alleviate these problems and develop strategies that will lead to the realisation of these goals. In Africa, governments and donors have a poor record of developing appropriate policy for the livestock sector.

Research (Perrier, 1991) suggests that this poor record has mainly been caused by the failure of governments to incorporate production goals and strategies of livestock owners into policy development. As a result, policy project goals often diverge from producer goals. Reasons for this divergence are threefold. First, there is frequently a general ignorance of the production goals and strategies of traditional producers. For example, public initiatives to assist producers have often been directed towards improved cattle production for beef offtake while farmer or pastoralist interests are in cattle production for milk, traction and capital accumulation. Second, government policies tend to reflect the goals of governments and the commodity demands of their major trading partners, which commonly differ from the goals of producers. Third, the range and livestock management disciplines brought into Africa tend to follow a Western model of development and, therefore, do not have a conceptual framework that incorporates characteristics (e.g. common property resources, herded livestock, dairy production on rangeland, capital accumulation role of livestock etc) frequently found in traditional African livestock production systems (Perrier, 1990). As a result, Western production goals have been imposed on African systems with the implication that the traditional goals are inferior and therefore less important. When the goals of traditional producers are considered, they are often seen as static and homogeneous across households. There is abundant evidence to suggest that they are neither (Lawry, 1987; Solomon Bekure et al, 1991).

Range and livestock professionals in government and in donor agencies must see the goals and strategies of producers as the foundation upon which successful programmes are built. Livestock policy needs to be aimed at helping producers better meet their goals, rather than at addressing the interests of external or urban groups.

The following discussion examines some major issues in livestock policy in Africa and identifies related research questions important to sound policy development.

Environmental policy

There are three important policy areas concerning livestock and the environment: management of common property resources; control of livestock stocking rates; and the conservation of grazing land biodiversity.

Common property. Many of the resources on which the livestock sector in Africa is dependent are held as common property. Of particular importance are communal grazing resources. In general, grazing lands belong to the state and thus essentially, belong to nobody. If these important communal resources are to be conserved, policies must be developed that link producer interests to sound resource management.

If producer households are to effectively work together to manage common grazing lands, benefits to the household from management must be greater than costs. Micro-economic analysis of the management of common grazing resources is called for. Research questions should include the following. How can costs be reduced or benefits increased? Are modifications, such as different institutional mechanisms or a focus on only the most productive or critical resources potential answers? How does inter-household diversity in herd structure and size and in production resources, goals and strategies affect household economics and control over communal resources? These questions must be addressed before sound common property resource management policies can be developed.

Control of stocking rate. Governments or donors have frequently calculated a carrying capacity (or desired stocking rate) and attempted to get producers to voluntarily limit livestock numbers. Such efforts have repeatedly met with failure. Why? There is evidence that in some contexts it is inappropriate to try to limit livestock numbers. In many livestock production environments in Africa, a decline in total system productivity can occur due to stocking rate effect. How can governments determine in which context livestock can actually degrade the system? In those systems where livestock can cause declines in system productivity, what policy and institutional frameworks can promote control of stocking rate? How does the role of livestock in terms of capital accumulation affect stocking rate control? If deemed necessary, how can investment opportunities with higher returns than livestock be created to move capital out of livestock? How does the expanding human population in the livestock sector affect stocking rate control? Rather than through drought, what policy incentive can induce people to reduce the stocking rate?. Finally, how does inter-household diversity in terms of herd structure and size and in production resources, goals and strategies affect stocking rate control? Answers to these questions are necessary for the development of sound policies.

Conservation of biodiversity. Within a general grazing area, there are frequently many different types of vegetation communities, the result of local variations in soils, topography, texture and history of use. Range and livestock specialists in governments and donor agencies are just now becoming aware of the nature and importance of this diversity within grazing lands. Pastoral producers have developed intricate grazing strategies based on this biodiversity. Researchable issues include the following. What is the nature of site diversity? How have daily, seasonal and annual grazing strategies evolved to take advantage of this diversity? What types of sites are critical to livestock production and how can they be conserved? How does the expansion of cropping into grazing lands and development interventions affect this diversity? Policy makers need answers to these questions in order to develop sound policy on resource use.

Pricing and marketing policy

The effect of price on supply of livestock and livestock products and the marketing strategy of producers is an important issue for livestock policy research. There is abundant evidence to support the existence of the backward bending supply curve. As price goes up, fewer animals are sold. Many pastoral households engage in target sales—selling just those animals required to meet household cash demands.

Those disputing the existence of this curve have focused research on the relationship between price and total volume in the formal markets (Swallow and Brokken, 1987; Jarvis, 1980). This approach is inappropriate in systems where a significant number of animals passes through informal markets. An increase in the formal market price can divert animals from informal markets to the formal market without affecting total volume. Also, both backward bending supply and commercial livestock systems show an initial decline in market volume with increased price. Therefore, studies of volume–price relationships are not very helpful for answering this question.

Research on producers' selling strategies (e.g. Coppock, 1992) shows that large livestock are used for capital accumulation and milk production. They are sold only to meet major cash demands or to purchase more productive animals. Small stock are sold to meet smaller cash demands or to buy large stock. There is a need for more micro-level studies in different livestock systems to see the effects of wealth, herd composition and production goals and strategies on household marketing strategies. This information is vital for understanding how government price policy or natural market forces will affect offtake, stocking rates and household production strategies. Inadequate understanding of this issue has been a major cause of the failure of many African livestock initiatives.

Technology policy

The major policy issue concerning livestock technology is sustainability. There are numerous cases of technology introductions that are deemed beneficial by producers (e.g. livestock dips), but have not been sustainable. The sustainability of technology often depends on donor funding or government services that lack long-term operating funds and trained staff. Introduced technologies frequently have high recurrent costs, due to lack of cost/benefit considerations or because they are too advanced. In other cases, technology development has focused only on specific constraints or system components, failing to identify the negative effects of proposed technologies on other components of the system.

Research must address the effects of policy choices on the costs/benefits of technology and sustainability. Can decentralisation and local control over services and procurement reduce costs? Can producers realistically fund recurrent costs? Is there an important role for co-operatives, non-governmental organisations (NGOs), or the private sector to play in providing technology? Is the technology appropriate for existing production goals and strategies? What is the role of credit in technology provision and how does the use of credit affect household risk? These are the types of questions that must be answered before sound technology policies can be developed.

Role of institutions

In addition to providing answers to the research questions raised above, basic research is needed to describe existing livestock production systems, identify causal associations among the elements of these systems and, through inter-system comparisons, develop and test theories on how pastoral systems function. This information provides the level of understanding of pastoral systems required to develop sound livestock policies. Livestock research also needs to identify opportunities for or constraints to livestock production, develop cost effective responses to these constraints and determine outreach processes by which research results can be utilised by producers or other decision makers in the livestock sector.

ILCA must provide guidance and act as a facilitator for both basic and applied ruminant livestock research in Africa. The Centre may be in a unique position to act as liaison among various donor-funded and national agricultural research systems (NARS) livestock, range and forage research activities. ILCA can do this through its agro-ecozone programmes. The programmes can assist NARS within their regions to establish sound interdisciplinary basic research programmes and to identify appropriate applied research questions. ILCA has an obvious role in inter-system synthesis and in facilitating a dialogue within regions between researchers, producers and other decision makers in the livestock sector. This last role is especially important because livestock production systems in Africa frequently cross over national boundaries.

Appropriate methods for research in these priorities

There are numerous methods available to research livestock policy related questions. The most appropriate method will depend on the nature of the question being researched. ILCA has identified intercountry comparisons using secondary data, collection and analysis of primary data and modelling.

It is the approach to research, rather than specific methods, that is most important. Livestock research in Africa has traditionally been divided into social, economic and technical/biological research done by social, economic and technical/biological scientists, respectively. This approach, results in multidisciplinary, rather than interdisciplinary research.

The multidisciplinary approach has left important questions unstudied and cross-disciplinary questions unanswered. For example, the way that producers actually manage their livestock and natural resources and their indigenous technical knowledge has not been adequately studied. Such studies require a sound technical/biological background and skill in social science methods. Social scientists, who are often asked to conduct such studies, lack the technical training to fully appreciate what they are observing, while technical scientists have been reluctant to conduct qualitative research with producers. The few observations that have been made in this area indicate the existence of a set of very sophisticated and subtle management systems (Perrier, 1988). If it is agreed that sound policy be built on the goals and management strategies of producers, there must be a good understanding of existing management strategies and indigenous technical knowledge before appropriate policy development can occur.

Potential collaborators for ILCA

Although ILCA's research can provide guidance on methods and procedures, it cannot provide answers specific to the numerous contexts found in Africa. Therefore, it is imperative that ILCA collaborate and network with NARS in Africa to stimulate livestock policy related research at these institutions. The Centre should also maintain communication with NGOs and livestock producer groups to help further identify important policy issues.

ILCA must also collaborate and network with institutions and universities outside of Africa with research programmes concerning livestock policy in Africa.¹ Collaboration could have a large synergistic effect on livestock policy research in Africa.

1 Such institutions include the Land Tenure Center at the University of Wisconsin, the United Nations (UN) Research Institute for Social Development in Geneva, the Overseas Development Institute and the International Institute for Environment and Development in London, and the Department of Range Science at Utah State University.

The results of policy research need to reach decision makers in government. ILCA must remain in communication with such people throughout Africa and in donor institutions and provide information that assists in the application of results from policy research. Researchers must keep the end use of policy research in mind and not simply provide the results of the research. Suggestions on the process by which these results can be incorporated into actual government policy should be offered. This process itself is a legitimate area for policy research in Africa.

Conclusion

The preceding sections provide some guidelines for enhancing future policy research and initiatives aimed at assisting the livestock sector in Africa. Implementation of these guidelines requires a new way of thinking about the policy development process. What is needed is a policy development process that is founded on strong interaction among administrators, technical specialists and livestock producers; that starts with existing pastoral production goals and strategies; and that works within a conceptual framework appropriate for African livestock production systems. ILCA should take a leadership role in moving livestock policy development in Africa in this direction.

References

- Coppock D. 1992. Observations of the traditional logic of pastoral livestock marketing in Southern Ethiopia. In: *Proceedings of the 1992 International Rangeland Development Symposium, Spokane, Washington, 11–12 February 1992*. Department of Range Science, Utah State University, Logan, Utah, USA.
- Jarvis L S. 1980. Cattle as a store of wealth in Swaziland. *American Journal of Agricultural Economics* 62(3):606–613.
- Lawry S W. 1987. *Communal grazing and range management: The case of grazing associations in Lesotho*. ALPAN (African Livestock Policy Analysis Network) Network Paper 13. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. 9 pp.
- Perrier G K. 1988. Range management practices and strategies of agropastoral Fulani near Zaria, Nigeria. In: Gay C W, Perrier G K and Tiedeman J (eds), *Proceedings of the 1988 International Rangeland Development Symposium held in Corpus Christi, Texas, USA, 25 February 1988*. Department of Range Science, Utah State University, Logan, Utah, USA. 169 pp.
- Perrier G K. 1990. *The contextual nature of range management*. ODI Pastoral Development Network, Paper 30c. Overseas Development Institute, London, UK. 8 pp.
- Perrier G K. 1991. *The effects of policy development and organizational structure on the performance of range livestock development projects in Africa*. PhD Dissertation, Department of Range Science, Utah State University, Logan, Utah, USA.
- Solomon Bekure, de Leeuw P N, Grandin B E and Neate P J H (eds). 1991. *Maasai herding: An analysis of the livestock production system of Maasai pastoralists in eastern Kajiado District, Kenya*. ILCA Systems Study 4. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. 154 pp.
- Swallow B M and Brokken R F. 1987. *Cattle marketing policy in Lesotho*. ALPAN (African Livestock Policy Analysis Network) Network Paper 14. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. 19 pp. + 5 Figures.

Discussion

Q: If you looked at producer goals as is suggested in the paper, what would you change? How would development policy look or be different?

- A1: If you are going to have livestock policy, you should know what the goals and strategies of producers are. It would help to make policy changes that are based on a proper understanding of production system strategies and goals.
- A2: If we are going to have livestock policy, let us base this policy on sound knowledge so that we do not impose Western standards.
- C: Perhaps an area for ILCA involvement is to make future projections. If we expect rangelands to provide a source of beef/dairy production, something needs to be done to improve offtake. Projections could be appropriate here.
- C: Our conclusions are that unless something can be done to greatly increase offtake in arid areas, we should not become involved. Offtake in drier areas may be improved through stratified production systems (i.e. finishing cattle in more humid areas where there are markets). If this is not possible, the areas should be left alone. Such projections might be something ILCA can provide.
- A: I do not think that these stratified systems would work because pastoralists sell animals to get more productive animals. They are placing capital into livestock; they are not in a cow-calf operation.
- C: There is evidence in West Africa toward ownership of cattle by urban-based dwellers for investment purposes.
- C: That is what you need—alternative investment opportunities.
- C: Stratified production systems have been abandoned in some areas because they simply do not work. The best way to increase offtake is through land reform.
- C1: Whose goals should governments follow when generating policy? While governments should understand the goals of producers, it does not follow that the goals of both should be the same. The main rationale for having policies is to deal with externalities that producers do not deal with. In addition, there is no reason to expect that governments should implement producer goals all the time.
- C2: You build a good case for explaining why animal scientists should be familiar with the social sciences and vice versa. But then you suggest that animal scientists do the work of social scientists. I am worried about the idea of one group using the methodologies of the other.
- A: You are looking at management issues. There is a need for animal scientists to know how to deal with people oriented questions and to promote interdisciplinary work.
- C1: I support the idea that governments need not adopt producer goals.
- C2: Regarding communal ownership, let's accept this and try to do something given this type of ownership pattern.
- A1: There are many interest groups involved in policy planning. I am arguing that producer goals should be included in the policy planning process. By and large, producers have been ignored in the policy process.
- A2: My point on communal ownership is that it exists and prevails. We can do more than ignore the issue; not all land needs to be privatised—there are alternatives.
- C: Regarding stocking rate, it is more pronounced in rangeland systems. The objectives of stocking rates should be looked at. In the Ethiopian highlands, stocking rate is high in part because livestock are a major source of income and a buffer against risk. The goals of farmers need to be known before developing stocking rate regulations.
- A: I agree with what you are saying. Optimal stocking rate depends on your goals. It is a complex question.

C: You raised the issue that pastoralists are not responsive to price signals. However, there is evidence that they are interested in income. They do sell young animals at earlier ages and are indeed price responsive.

A: There is a great deal of debate on this issue.

Research and development of the agricultural sector: The struggle for reliable data

Dirk Perthel

*Winrock International
BP 1603
Abidjan, Côte d'Ivoire*

Abstract

The benefits expected from the generation of new technology have been disappointing. In part, this is a function of the quality of information that is generated from the research process. In order to maximise the quality of information, it is important to have a set of reliable data.

The reasons for wide differences in the quality of agricultural data in Africa include the quality of existing facilities, personnel and available resources.

Theoretically, central statistical offices bring together data on seasonal production, marketing, prices, consumption patterns etc. This information is then used by researchers for analysis and to further specify objectives for additional research and primary data collection. However, this rarely occurs as research often begins with field work. Consequently, quantitative data is mixed with qualitative data. Data gathering subsumes the intended research.

The quality of agricultural data—particularly primary data—is important for any sound analysis. Several donors and institutions are involved in primary data collection. Mostly however, this is done on an ad hoc basis. Some are directly involved in capacity building of national agricultural statistical offices, which may guarantee the continuation of data gathering. While national or international agricultural research centres need not set up statistical offices for data gathering, they could convince donors of the need for primary data collection on a continuous basis.

Discussion

- C: In farming systems research, you need to consider policy factors (endogenous and exogenous) that are related to livestock production.
- C: I agree that better data is needed but I am not sure that the modality you are recommending is appropriate. International agricultural research centres (IARCs) may not have a major role to play in improving national statistics. Putting together a descriptive data bank is good, but to analyse the data of others is problematic.
- C: In terms of using the data of others, is there a modality to get more systematic information? We may need to use existing resources to get information.
- C: It might be useful for ILCA to put together information for data sets. Since data are not centralised, they are hard to access.
- C: The dynamics of African agriculture are not well understood. That is why existing surveys are important and why they need to be put in a usable form.

- C: Documentation of data (e.g. in terms of how certain variables are defined) is also important. ILCA has developed a data base system, the Livestock Information Management System (LIMS), which provides a means for storing and archiving information.
- C: With social data, variables are not uniform. I am glad to see ILCA doing something in this regard. Relying on secondary data may not be reliable.
- C: You cannot always wait for reliable data in order to move forward.

Technology, policy markets and institutions for livestock development: Some general issues

M.A. Jabbar

*International Livestock Centre for Africa (ILCA)
Ibadan, Nigeria*

Summary

It is generally agreed that technology has played and will continue to play a vital role in the development of human societies. An important issue currently occupying a central position in theories of technical change and growth is the role of policy. It is argued that scientific progress is the most important precondition for technological progress but such progress also depends on appropriate policies, particularly in developing country environments. Some major flaws in the theories and discussions linking technology, policy and growth, particularly for the livestock sector, are discussed in the paper.

In recent years, policy has become central to theories and discussions on technology and development. However, empirical evidence on the contribution of policy in shaping technical change and growth is inconclusive (Alston and Pardey, 1991). Research and technology generation–diffusion and promotion activities have always been interrelated with political, economic and institutional events. Many livestock development projects in Africa and elsewhere have failed and lack of appropriate policy environments have often been blamed for these failures. While such conclusions may be true, it is also likely that these other environments (individually or in combination) may be primary causal agents of failure. Thus, policy formulation and outcomes need to be analysed with full cognizance of these multidimensional factors.

The relationships among technology, markets and institutions are neither unidirectional nor linear. Therefore, the outcome of a particular policy will depend on the direction and the extent of change it can generate in other areas. To be effective, policies need to be compatible at the national and international levels.

Any ecoregion usually cuts across political boundaries. Thus, it is exposed to different sets of markets, institutions and policy environments. While biological and physical uniformity of an ecoregion may make technology generation easier, socio-economic differences within the zone may make the diffusion and adoption process difficult. Moreover, the forces that influence the diffusion and adoption of technologies are only partly national in character. Hence, analysis needs to be done in a transnational setting. Further justification for such an analysis is the potential for spillover effects. This suggests that policy analysis should move from a partial/sectoral realm to a macro-economic framework that includes the national and international levels. International agricultural research centres (IARCs) are well placed to analyse some of these issues.

Reference

Alston J M and Pardey P G. 1991. *Technological change, constraints and incentives: The damaging consequences of getting policies wrong*. Paper presented at the Conference on agricultural technology: Current policy issues for the international community, Airlie House, Virginia 21–23 October 1991. Agriculture and Rural Development Department, World Bank, Washington, DC, USA.

Discussion

- Q: What are the dominant research questions ILCA (International Livestock Centre for Africa) should be addressing? I would like to move toward a greater level of specificity.
- A: Former ILCA work was static descriptions of pastoral systems. Now we need to look at land tenure, pressure on stocking rates etc. Political boundaries cannot be ignored.
- C: It is important to look at macro-economic linkages when planning livestock development. ILCA could play a role in this.

General discussion

- C: We could identify specific issues for the working groups to look at in more detail tomorrow.
- C: As a general comment, I support the idea that ILCA continue its work with livestock policy and resource use. This should be done with other institutions. In some cases, ILCA partnerships should be expanded (e.g. to include the United Nations Economic Commission for Africa (UNECA), Organization of African Unity (OAU) etc).
- C: I would like to see the issue put on the table for the working groups.
- C: There are three different approaches for ILCA to take in terms of policy issues: a macro-level look at technological policy; a micro-level analysis; the long-term dynamics of livestock production (e.g. continued importance of pastoralism and the development of a corresponding policy).
- C: A micro-level understanding (particularly on the production side) is critical. I think ILCA should build up from here. I hesitate making a sharp distinction between micro-level and policy research. Most policy analysis is economic analysis. That does not mean macro-level analysis should not be done. This work should be done by political scientists and economists together. I am just not sure if ILCA is the one to do it.
- C: Working group two should look at the issue of variability. We need a clear idea of the purpose and end product of this kind of research.
- C1: Consider carefully micro-economic analysis and how it links to micro-economic policy research. Would more care not need to be taken to develop micro-economic analysis so that it addresses policy?
- C2: We have not spoken much about institutions—the role of institutions and the resources they have. We may need to say something about this. What role should ILCA play in any collaboration?
- C: Land tenure, factor/output market studies came out as important issues. Is there a role for ILCA to play in terms of examining infrastructure? Market demand and structure of consumption—I am not sure that ILCA has a comparative advantage in this area.
- Q: Was the comment made earlier that infrastructure should be taken as a given?

- A: No, I was saying that it should be analysed. My question is, does ILCA have a comparative advantage? When establishing research direction, the issue is, do we take lack of infrastructure as a given? I say yes.
- C: ILCA has five peri-urban dairy consumption studies. It might be interesting to examine the costs/benefits of alternative dairying strategies.
- Q: How do we get the issue of equity into the decision making process?
- Q: Should ILCA be involved in primary data collection?
- C: I do not believe that static studies (e.g. dairying) are very useful; it is better to develop tools. ILCA should be involved in this.

End of Wednesday, 25 March 1992 session.

SESSION IV

Resource management policy

Chair: M.A. Jabbar

Priorities for ILCA policy research

J. Lynam

Rockefeller Foundation

P.O. Box 47543

Nairobi, Kenya

Introduction

International agricultural research centres (IARCs) have long recognised that adverse policies can restrict the adoption of improved technologies and, therefore, impact on productivity and welfare. This recognition has led, among other things, to the creation of the International Food Policy Research Institute (IFPRI), the incorporation of economists into IARC programmes and the creation of explicit policy research programmes in some of the centres. However, policy research has not been subjected to as much of the scrutiny on priorities and impact as has biological research. The International Livestock Centre for Africa's (ILCA) effort to set priorities in its policy research programme is a commendable step in that direction.

A priority framework for policy research

How does an institution like ILCA begin to set priorities in policy research? One approach is that the research agenda should evolve through the published literature. ILCA, however, has to be more strategic in its selection of research areas and research agendas for applied research in areas such as livestock policy in Africa are not really well developed within the literature. The objective of this section is to suggest factors that might go into the development of a formal framework for policy research.

Policy is a generic term and this has led to a great deal of confusion about what comes under the policy rubric. Macro-economists would be rather narrow in their definition; agricultural planners, rather wide-ranging. If one starts with a dictionary definition that policy is "a definite course selected from among alternatives and in light of given conditions to guide and determine present and future decisions", then defining policy starts with a specification of a policy area or objective of the institution forming policy and the policy instrument. Understanding how to manipulate the policy instrument to meet the objectives requires an ability to undertake policy analysis. Such analysis can lead to the design of new policies or the need for policy reform, so that the application of policy instruments better achieves policy objectives. Achieving impact in the policy arena requires linking policy analysis to effective implementation in priority areas.

Policy dimensions

Policy research within the agricultural sector has at least three possible dimensions. First is economic policy which essentially tries to influence the structure of price incentives in which economic decisions are made. Thus, there is macro-economic policy, price policy—which is defined in terms of commodity, factor or input markets—and trade policy. Second is sectoral planning policy, such as for rural development, agriculture, labour, land, fertiliser or livestock. This may include economic policy components but will also include investment strategy, infrastructural development, institutional reform and market development. Policy in this dimension is set in planning departments or ministries and tries

to assure consistency in sectoral development. The capacity for policy implementation is usually weak since the focus is on improved co-ordination. Third is policy regarding service provision, such as credit, agricultural research, extension, seed production and animal health. Policy in this dimension focuses on institutions, their organisation, regulations and resource deployment. If policy does not focus on public institutions involving the provision of public goods, then it focuses on the regulatory environment controlling the operation of private firms.

Policy analysis

In general, policy research is prescriptive; it analyses the consequences of current policies, evaluates alternatives to current policy and prescribes best or second-best alternatives in light of policy objectives. Underlying policy research is methodology development, data assembly or collection, model estimation and evaluation of alternative scenarios. For economic policy, there are sophisticated methodologies that have been developed for policy analysis. The problem in Africa is that the secondary data base to support such analysis is often not available. Model sophistication has to be matched to data availability (or the costs of data collection) in undertaking research. Methods for the additional two policy dimensions are either very costly and data intensive, e.g. computable general equilibrium models, or not well developed, e.g. organisational theory or optimal regulatory policy. Research priorities must, therefore, be a factor in the resources that will be devoted to methodology development and data collection in analysing particular policy areas.

Policy implementation

Policy is designed to effect change. As such, it becomes an agency for that change. Policy analysis or research should have as close a linkage as possible to policy formulation and implementation. Applied policy research, apart from purely methodological research, should have an explicit institution or set of institutions which would formulate and then implement the policy. Optimally, analysis, formulation and implementation should be embedded in the same institution in order to ensure co-ordination between policy design and implementation and to monitor and evaluate results. With each of the policy dimensions above there is an associated type of institution, i.e. principally marketing boards or authorities in the case of economic policy, agricultural, livestock or planning ministries in the case of sectoral policy and specialised service delivery institutions in the last case. The institutional landscape is a principal determinant of ILCA's policy research agenda, at least in terms of ensuring that policy analysis is turned into effective policy implementation.

ILCA and livestock policy research

The framework provided above suggests that the issues of what research areas are selected, who ILCA works with and how the research is done are linked. This section identifies particular research areas under the rubric of livestock policy. The research issues are framed in terms of sectoral policies, economic policy research, especially in the price and trade area and service delivery policy. The approach considers first the research issues within the livestock sector as a whole and then addresses the question of which may be most relevant to ILCA.

Sectoral policy

Sectoral policy may be described as policy in the broad sense, as it attempts to develop a coherent basis for planning interventions in the livestock sector as a whole. There is an institutional basis for such sectoral planning in Africa, as ministries of livestock exist in many, if not most, African countries and many of these have planning units. What does not

exist, and this is the largest challenge for livestock sector policy, is a comprehensive empirical framework in which to make that policy. The variability within and across national livestock sectors in Africa is tremendous. First, there is very little understanding of demand for meat and milk, how this demand is distributed between rural and urban groups, across income strata and between different meat sources and the response to price and income changes. Second, livestock production is an amalgamation of different livestock types (cattle, small ruminants, swine, poultry, camels and, increasingly, wildlife harvesting), produced in a diverse set of management systems, usually conditioned by the ecology and the disease challenge and with significant diversity in access to feed resources, influenced by both market development and ecology. With this diversity, how are supply responsiveness and constraints on production to be understood? Finally, what are the marketing systems that connect supply to demand? How efficient are transport systems, slaughter and dairy processing facilities, meat grades and pricing in the retailing sector, credit provision and livestock auctions?

In sum, the data, basic economic studies and conceptual framework is not yet in place to begin to do livestock sectoral planning. Such a framework also serves to set research priorities and, therefore, very much overlaps with the concerns of ILCA. The question is how analysts move beyond the Food and Agriculture Organization of the United Nations (FAO) data to an optimally minimal level of disaggregation and how such data collection is promoted and funded. I advocate developing a livestock data base for Africa based on a standardised, minimum data set. Much of this would consist of characterising diverse livestock systems in diverse ecologies with diverse feed resources. In essence, I am arguing for the development of a macro-planning frame both to aid sectoral planning and to orient in-depth micro-research.

This framework provides a static cross-sectional basis for livestock planning. Possibly as important in sectoral studies is ascertaining the growth paths of the African livestock sector. If it is expected that meat demand will be the principal driving force behind the future evolution of the livestock sector, the question arises, how demand, as influenced by increasing population growth, rapid urbanisation and increasing incomes, will be met. One solution is continued horizontal expansion in which ruminants continue to expand onto unexploited forage resources, either into drier, more marginal areas or areas currently limited by trypanosomiasis. Some consensus exists that there is little scope for expansion through this strategy, except in the subhumid zone of West Africa and tsetse areas of southern and East Africa. The predominant strategy would appear to be vertical expansion, that is, intensification. There are several potential lines of intensification and the interesting question is along which line will animal systems intensify?

The rate and pattern of intensification of animal production will principally be driven by the opportunity costs of feed resources. Initial phases in the development of an animal industry are based, essentially, on animals scavenging feed resources of low opportunity cost. Rising competition for land, especially from agriculture, limits imposed on animal migration, rising value of animals (due either to market penetration or demand rising faster than supply) or increasing animal populations can all increase the implicit value of feed resources. Increasing value of forage leads to intensification of feed production. How feed production is intensified largely determines the path of intensification of animal production, but this issue is hardly understood in Africa. Under what conditions are investments made in pasture improvement? Under what conditions can planting annual forages compete with crops for land? What is the potential of integrating forages into the farming system, such as agroforestry, forage strips, undersowing and rotation? Under what conditions does a market develop for forages and are forages efficiently transported? Answering these questions will determine the extent to which it is possible to intensify ruminant production. Another point is that investment in intensification of forage production requires increasing the certainty of return from animal production, which

implies that animal disease control becomes a complementary input into feed intensification.

The alternative path of intensification is development of the poultry and possibly swine industry where feeding is based on mixed rations. There is no understanding of the prior conditions that will motivate this path of intensification in the African livestock industry. Development of the poultry–mixed-feed industry has taken place in land-scarce Asia and in pasture-rich countries of Latin America. Only peri-urban pockets of intensive poultry production exist in Africa. The ingredients determining its development certainly include demand growth for meat and the resultant price stability; the rate at which the ruminant sector increases output, especially through increased productivity; and competition for carbohydrate sources between food and feed demand. There are apparent economies of scale in this industry, which have fuelled exponential rates of growth in many developing countries. The dynamics of grain, root crop and by-product markets will have a major influence on the development of a poultry or swine industry. The potential of a poultry–mixed-feed industry to develop in Africa is still an open question.

Economic policy

Economic policy has principally to do with government intervention in and manipulation of markets through price floors, storage and sales and imports. The ability of governments to intervene in livestock markets is more difficult than for basic grains, primarily because meat is not storable and imports are expensive due to the costs of quality control or canning. The high income and price elasticity for meat makes this doubly difficult. However, an area where policy distortions can be severe is in the dairy sector, and this is due to the special role that powdered milk can play as a storable, fungible commodity. Another principal area of market intervention is in the grain market which has implications for the development of an animal feed market.

The dairy industry is of sufficient importance to warrant a major policy study. On the one hand, a dynamic dairy industry, such as that in Kenya, can be a major source of income growth in smallholder systems. Moreover, the increased value of forage leads to investments in such things as agroforestry, rotation systems and forage strips, which improve soil resource management and the overall sustainability of the production system. On the demand side, improved milk supplies in urban areas seem to have a significant impact on the nutritional status of disadvantaged groups. Nevertheless, dairying is not an easy industry to develop, especially where it is based on extensive management or indigenous breeds. This often leads to increasing imports of dried milk, often under food aid programmes, but which are compounded by the subsidised nature of dairy pricing in exporting countries such as the United States (US) and the European Economic Community (EEC). This makes an evaluation of policy choices complex. Domestic Resource Cost (DRC) methodologies would be useful in the exploration of these choices, but this relies on a good understanding of the technical and economic feasibility of improved dairying systems, the technical parameters of which can be very location specific.

Feed markets in Africa are rudimentary at best. Their development depends on the maintenance of undistorted price signals, a condition which applies to only a small but increasing number of grain markets in Africa. There are two principal components to feed market development in Africa. First is the market for dry season feed supplementation. In this case, feed can either be transported to production areas or livestock can be transported to fattening areas, usually closer to urban markets. Development of seasonal spreads in livestock prices is essential to motivate such feeding systems, as feed prices will obviously be higher in the dry season and there would be some increase in transport costs. Any government intervention to stabilise seasonal meat or dairy prices will curtail the development of such markets. Second is the development of a mixed feed industry to service intensive non-ruminant production. Infant industries have appeared in such countries as

Kenya and Nigeria. These industries have based their feed component supply on grain by-products, lower quality grains and root flours. Initial expansion of the feed industry will probably be based on these lower quality carbohydrate sources, including yellow maize in East and southern Africa. This requires the development of price differentials in grain and root markets, something which does not usually happen with marketing boards. Case studies of market diversification, as feed markets are established, would be very useful in understanding how best to nurture this process.

Policy for service provision

Policy in the area of service provision deals with strategy definition within the service institutions, the organisation of service provision or delivery, the split in activities between the public and private sectors and financing of these services. Financing of services is often a central issue, both in the public and private sphere. One issue is whether livestock services should be provided by one single ministry of livestock or whether this would duplicate manpower and infrastructure with agriculture in the rural sector and livestock services are best integrated with agriculture in research, extension and credit institutions. The tendency is one of a movement away from the former to integrated institutions. This is due to the recognition of the need to reduce redundancy in government services. Probably more importantly, it is due to the fact that increasing integration of livestock and agricultural activities is occurring within African farming systems and delivery systems for both agriculture and livestock need to focus on the same clientele.

Following on the sectorial policy issues raised above, the key policy or planning question for the livestock sector is the development of a framework for strategy development and priority setting. How are research priorities assigned across ecologies, management systems and species? Does a strategy have to be developed for each cell in this three dimensional matrix, e.g. the strategy for pastoral goat systems in semi-arid regions? Within each of these cells, what is the relative research emphasis on increasing feed supply and quality, on animal health and on breeding for increased productivity? That such a framework is necessary is shown by the large investments that have been made in pasture research in Africa but with little investment as yet in the area of sown pastures. ILCA has a significant role to play in this area, not only in terms of better defining its own programmes, but also to help research planning in national programmes. ILCA and the International Laboratory for Research on Animal Diseases (ILRAD) should have a shared interest in the development of such a framework.

Another major issue facing service policy is the conditions under which and the extent to which animal health services are privatised. There is a perception that public veterinary services are not meeting animal health needs of the livestock sector. On the other hand, planners are concerned about how much farmers can afford to pay for drugs and veterinary services, the public benefits of co-ordinated control of infectious diseases such as rinderpest, the number of veterinarians that need to be trained to precipitate movement into private practice and the fact that incentives for private veterinarians will reside in high value, high productivity sectors and services will not be available in more marginal areas. A series of case studies are needed to explore this issue and diffuse what is a relatively dogmatic debate between those who say privatisation is the answer under all conditions and those who argue that privatisation would undercut the effectiveness of public institutions.

Livestock and natural resource management

Very little institutional capacity exists in Africa to make, much less implement, policy on natural resource management. Various institutions, among them the World Bank, have been promoting the idea of an environmental action plan, where existing ministries are

brought together to develop an integrated plan across environmental issues and delegate responsibilities. However, since the issues of deforestation, desertification, soil erosion, loss of genetic diversity and disruption of the hydrology all derive from management of the land resource, the question is whether a policy framework can be put in place to direct more optimum use of the land. The answer is that there has been very little work done on this issue in the African context and certainly the policy instruments that can be utilised to do this have not yet been fully defined, much less evaluated as to their effectiveness.

Therefore, ILCA should not undertake research on natural resource policy, but rather on research that explores how management of the livestock system influences the quality or management of the land resource and how the two can be improved together. It is important to understand how livestock systems can lead to degradation of the land resource and how that degradation can be prevented. As well, at issue is how livestock systems enhance the management of the soil resource and how this complementarity can be both enhanced and promoted. Animal production can be both a cause and a solution to environmental degradation in Africa. ILCA needs to understand both scenarios.

Overgrazing stands out as the single most important negative impact of animal systems on the land resource. It can lead to soil erosion, soil compaction and reduced moisture penetration, more variable hydrology, shrub invasion and changes in the micro-climate. Overgrazing can occur in all ecologies and understanding the causes of and solutions to overgrazing is quite specific to ecology and production systems.

Pastoralism in the arid and fringes of the semi-arid zone essentially depends on migration to maintain livestock populations and vegetation resources under a highly variable rainfall regime. There is rising pressure on these systems from increasing restrictions on the overall size of the grazing area; movement to more permanent, individual grazing areas caused by land adjudication and investments in permanent structures such as schools and clinics; and an apparent low point in the long-term rainfall cycle, at least in the Sahel. This leads to the concentration of livestock in particular areas for longer time periods, which results in overgrazing, particularly under increasingly limited rainfall. Expansion within this extensive system has always been along a horizontal rather than a vertical path. It is not clear that the grazing component in these systems can be intensified without replacing pastoralism by a completely different system. If this is so, given the pressures toward more permanent settlements, pastoralism will become an increasing anachronism in African livestock sectors. Given this inability to intensify and the fact that these fundamental pressures will only increase with time, the issue is how best to accommodate this system change in marginal rainfall areas. Diversification by exploiting revenues from wildlife has been one option in East and southern Africa.

Many of the semi-arid areas have intensified by shifting from essentially livestock systems to integrated agricultural–livestock systems. Crop production has been the key to this vertical expansion path. However, the process has generally led to even greater pressure on shrinking grazing lands (often still communally owned), at the same time that investments in land improvement go into agricultural rather than grazing land. The quality of these grazing lands has been, as a result, badly degraded. Improving grazing lands in such systems will require improving returns on the livestock enterprise, so that investment in grazing becomes competitive with investment in cropping.

Increasing population density in these zones leads to a reduction in livestock numbers and a greater focus on the quality of livestock. Market development would greatly accentuate this process and increase the returns on livestock and therefore forage production. However, technological planning has to be done in a dynamic framework, reacting to changes in land pressure and factor and output market development. This emphasises the need for a disaggregated sectoral planning frame.

Given the low population and livestock density in the subhumid zone of West Africa and the potential demand from the population centres on the West African coast, this zone is seen as a major expansion site for livestock production. Controlling trypanosomiasis will increase this potential and result in possible ruminant expansion into the humid zone and very probable expansion into tsetse areas in East and southern Africa. Given the experience in the arid and semi-arid zones and some negative experience with livestock projects in subhumid West Africa, how grazing will be managed in these as yet only lightly exploited areas remains a question. In this era of rising concern about sustainability, this is an issue of some concern. The basic issue is how the higher, and hopefully more resilient, biomass potential of these areas will respond under what will probably be an extensive development path. Land tenure, the expansion of cropping and the future role of pastoralism will all determine the types of management systems that evolve and the pressure this puts on the vegetation resources of the zone. Given that cropping also exists in these areas, how best to integrate the agricultural and livestock components should be explored.

The influence of livestock on the quality of the land resource base has been traditionally expressed in terms of carrying capacity. When animal population density exceeds carrying capacity, degradation ensues. This concept implies that farmers will alter animal populations in relation to long-term feed availability. Farmer strategies are more complex than this; short-term priorities (which focus on how to maintain the herd) will usually have precedence over long-term strategies. Wealth and security objectives may draw down natural resource “capital”, and farmers may intensify forage production. This introduces simultaneity in the relationship between livestock production and forage availability. In fact, the development paths charted above would suggest that the key issue underlying sustainable resource management under ruminants is the condition that causes farmers to invest in the production of feed resources.

Experience suggests that there is no direct path of intensification for extensive livestock systems that improves or even maintains the quality of the land resource base. Agriculture is a necessary next step to promote investment in the land. Forage production within an integrated crop–livestock system, whether through agroforestry, cut and carry strips, or ley cropping with a legume, improves the sustainable management of the soil resource devoted to cropping. However, such investments need to compete with crops for land; otherwise, livestock drops out of the system in intensive land use regions. An alternative is to intensify the animal production system (animal health and breeding interventions) while at the same time intensifying management of the land resource base. That is, increased returns to a more efficient animal production system will justify the investment in forage production. This strategy depends on well-developed markets and would be aided by any tendency for livestock prices to rise. There is, however, no experience with this development path in Africa, as it depends on a well-developed research and extension system.

Conclusions

It is axiomatic that good livestock policy in Africa depends on a good understanding of the pressures and possibilities facing the sector. The message of this brief synopsis is that understanding does not yet exist. The priority for livestock policy research in Africa is that more work has to be devoted to data collection—the demand studies, the characterisation of animal production systems, the evaluation of marketing systems and, most critically, the understanding of growth paths.

The livestock sector in Africa is much more complex than that in either Asia or Latin America. How it will develop is very much a question mark. Except for the dairy sector, economic policy is not going to be as dominant an issue as it has been for the agricultural sector. The real potential for intervention is in technology and service delivery. The

complex mix of health, breeding and feeding technologies will have to be finely targeted in order to achieve impact. For an international centre such as ILCA, this will require priorities, and, by definition, a capacity to set those priorities.

Discussion

- C: Overgrazing is related to aspects of credit and technology development. It is a symptom of poverty and a point in the cycle of degradation. The effects of overgrazing can be reversed. Poverty alleviation can be promoted through policy.
- C: What are the policy interventions? In the larger economy, there are so many dynamic forces which maintain the system.
- C1: Range scientists are beginning to say that their models from the US do not fit for Africa. But, the damage has been done. Livestock are unfairly being accused of desertification. There is a need to determine what is going on. For the next five years, we need to be more innovative in terms of policy. As pastoralists increasingly move into a market economy, they will want cash. This will be generated or supported through policy.
- C2: In wetter areas, land tenure becomes a major issue. Crop producers want adjudicated land. There will be a great deal of pressure put on crop agriculture. Environmental policy may need to be considered here. If there is to be degradation, it will be due to cropping, not livestock.
- C3: There will be much discussion in the next few months regarding the environment and degradation of humid areas. ILCA could play an information generating role in this respect. For instance, there is concern with the environmental impact of trypanosomiasis eradication or control. Could ILCA play a role here?
- C: The issue of environmental degradation and the control of trypanosomiasis is probably overstated.
- Q: Should ILCA complete its retreat from the arid areas? Twenty years after the Sahelian drought, we still do not understand the problem. Is it transient? spreading? contained? Who is it a problem for? We do not know what kind of interventions to make—either in terms of policy or technology.
- C: We lack an operational definition of overgrazing. It may be site specific. Past efforts to control the use of land were ineffective and very expensive. Results have led to corruption and other forms of resource misallocation. The EPMR (External Programme and Management Review) was not very flexible on this issue. ILCA has a comparative advantage to do this work.
- C: Overgrazing is location specific and ill-defined. It has a temporal dimension. What promotes sustainability? When pastures regrow from seeds, all you need is the seed. As long as there is sufficient seed stock, it will regrow. On a global scale, the issue is more complex. For instance, from a study carried out in the Sahel, stocking rate was recorded as 5–10 LU/km². If forage production equalled 0.5 tonnes/ha, there would be enough to eat. But ecosystems are not uniform. Water resources, settlement sites etc result in overgrazing. We only look at main roads; there is no overgrazing off roads. When people look for overgrazing, they look at land after a drought. We are dealing with localised under- and over-utilisation made worse/better by rainfall. This is not overgrazing.
- C: In North Africa, there are two approaches to sustainability: improving the rangeland (which did not work) and technology. Looking at herd structure in this region, 20–25% are unproductive animals. When we asked people why they kept the animals,

we were told that there were no markets. The conclusion would suggest that if you can find ways of selling animals, there would be less pressure on the range.

- C: Overstocking is linked to other activities in other sectors. The more you move into arid and semi-arid areas, the more severe the problem. There is a need to focus not only on the livestock sector, but other sectors as well (e.g. service, management etc).
- C: On this last point, TAC (Technical Advisory Committee) is thinking of putting more emphasis on ecoregions rather than commodities. This may suggest that ILCA needs to rethink its mandate.
- Q1: Is there a rationale for ILCA pulling out of the arid zone except in terms of policy questions? I see little potential for livestock production, reduction of poverty through livestock production or reduction of degradation through livestock production.
- C: I have a problem with ILCA doing policy research without anything else. In terms of the relation between pastoral societies and land, is land seen as a free good or as a resource to be maintained over time? I suspect it depends on external pressures facing them at any one time. I am also concerned about the ability of national governments to maintain environmental integrity.
- A: ILCA has a comparative advantage to monitor rangelands.
- A: ILCA pulled out of the semi-arid zone because donors wanted technology interventions that the Centre was unable to deliver. The issue is donor fatigue and the need for impact. The work requires a sustained effort. We have been unable to sell our range monitoring work to donors. We have also had only variable success getting sustained national agricultural research systems (NARS) partners. In terms of policy, we need to understand the principles of poverty. One could take pressure off by making progress in feed resources in accompanying zones. This is a potential solution.
- Q: What outputs do you expect?
- A: Hiernaux's work showed that livestock did not add pressure to the land. What we want to do is understand the dynamics of pastoral systems, causes of overstocking, how to alleviate pressures during drought.

Some sustainability and resource policy issues in ILCA's livestock research in sub-Saharan Africa

R. Rose

*Australian Bureau of Agriculture and Resource Economics
Canberra, Australia*

Challenges of the continent

The resolution of problems associated with agricultural development in sub-Saharan Africa (SSA) has increasingly challenged development agencies, including the Consultative Group on International Agricultural Research (CGIAR) and its associated international agricultural research centres (IARCs). According to the World Bank (1989), 16 of the 20 poorest developing countries are located in Africa. Of a total population figure for 1989 of 480 million (World Bank, 1991a), nearly 100 million Africans survive on diets which are below subsistence level (Eicher, 1988).

During the 1960s, Africa was a net exporter of food. It now imports eight million tonnes of food each year. This figure is likely to increase, as projections indicate a net population growth of 3.1–3.2% annually. The International Food Policy Research Institute (IFPRI) has estimated that by the end of the century, Africa's net imports of basic food staples may be seven times higher than that of the early 1980s (Hibler, 1988). These developments have occurred despite Africa's vast potential for food production and more than two decades of development initiatives by IARCs.

The causes of the present crisis are both climatic and socio-political in nature. Agricultural growth has been slow and real per capita output has declined since 1973 (World Bank, 1991a). The International Monetary Fund estimated that for SSA as a whole, the terms of trade deteriorated by 16% between 1977 and 1985 (Africa Review, 1987). Thus, export performance has been poor and, with increasing population (Table 1), problems with balance of payments and fiscal crises have been persistent. Against a background of continuing political conflict, those factors have, in turn, contributed to increasing malnutrition and accelerating environmental degradation. In 1950, the region's income per person was 11% of the industrial country average. It is now about 5%. Food production has risen more slowly than population—at an average annual output growth of less than 1.5% since 1970. Debt service obligations in 1988 were 47% of export revenues. Africa's debt increased from about US\$ 6 billion in 1970 to US\$ 134 billion in 1988 (World Bank, 1989).

Five specific categories of famine have been identified: physical, transportation, cultural, political and population (Plucknett, 1991). During the 1980s, the incidence of famine (in almost every category) in Africa increased.

Rapid population growth, agricultural stagnation and environmental degradation are interrelated and often mutually reinforcing. Population growth, without strong growth in urban employment opportunities and incomes, results in increased demands on a limited land base. People are forced to migrate onto marginal lands in arid and semi-arid areas and into tropical forests in order to establish new farms. Increased cultivation of fragile soils contributes to soil degradation, deforestation and desertification. Pressure on arable land has been worsened by the demand for wood fuel and livestock grazing. Between 1975 and

1980, approximately 37 million hectares of tropical forest were destroyed in Africa (FAO, 1983). To supplement or replace dwindling supplies of wood fuel, farmers are burning dung and crop residues that in the past were used to enrich the soil. Less organic fertiliser is available to replenish soil fertility. The threat of soil erosion and nutrient loss is worsened by the grazing requirements of Africa's 160 million head of cattle.

Table 1. *Sub-Saharan Africa and world economic indicators.*

Population			GNP					
Group	Life Expectancy	Total	Average Annual Growth			Per Capita Growth		
			(%)			(%)		
		(1989) Million	1965-73	1973-80	1980-89	1965-73	1973-80	1980-89
Sub-Saharan Africa	51	480	2.6	2.7	3.2	1.7	0.6	-1.2
South Asia	58	1131	2.4	2.4	2.3	-1.2	1.9	2.9
All developing countries	63	4053	2.5	2.1	2.1	4.2	2.5	1.5
All industrialised countries	76	773	1.0	0.8	0.7	3.7	2.3	2.3
Latin America and Caribbean		421	2.6	2.7	3.2	4.7	2.3	-0.5
World	65	5298	2.1	1.8	1.8	2.8	1.5	1.2

Source: World Bank, 1991a.

More than one quarter of sub-Saharan Africa's land area (750 million hectares) is moderately to very severely desertified (FAO, 1983). FAO (Food and Agriculture Organization of the United Nations) argues that only 13% of desertification is caused by natural changes in the environment; the other 87% is caused by human mismanagement of resources. This includes overgrazing, over-cultivation, deforestation and inefficient irrigation policies. Environmental degradation has both domestic and international implications. Domestically, it threatens agricultural productivity; internationally, it may significantly increase the tendency towards ecological imbalance and global warming.

To reverse current economic trends, population growth and accelerating environmental degradation must be checked. For the continent to achieve self-sufficiency in food on a sustainable basis, food production would have to increase at approximately

4% per annum with the available resources and without further systematic damage to the environment. This is the challenge facing national agricultural research systems (NARS) policy makers, non-governmental organisations (NGOs) and IARCs such as the International Livestock Centre for Africa (ILCA).

Experts agree that there is tremendous potential for improving the current situation in sub-Saharan Africa. As Plucknett (1991) says:

I do not believe Africa is inherently less suited to productive agriculture than other continents. Indeed, theoretical estimates of potential productivity place Africa second among the continents, behind Latin America, but ahead of Asia, Europe, North America and Australia in that order. Neither do I believe that development of scientifically based agriculture is beyond the reach of most African countries.

Technical and policy solutions

Eicher (1988) identifies five prime movers of agricultural development: a favourable economic and policy environment, human capacity and managerial skills, diffusion of appropriate technology, rural capital formation and rural institutions. The contribution of each by itself is limited, but taken together, is complementary and mutually reinforcing. Until recently, the major emphasis of development efforts was on technology. Little attention was given to developing policies for an enabling economic and policy environment and to strengthening human capacity and managerial skills. Issues relating to land tenure, the environment, the role of women and the need for institution building were neglected.

Elements of Eicher's prime movers of agriculture and related sectors are directly relevant to the activities of ILCA. First, and most obvious, is the search for useful technical advances in livestock production. Second is improvement in broad economic management policies. Third is improvement in natural resource management policies.

Technical advances in agriculture

ILCA's research strategy is based on a farming systems perspective. Research is useful only if it leads to innovations that provide some increase in the level or certainty of income. It must be practical enough to be adopted by farmers. African farming systems are complex and varied. Considering potential innovation in terms of its place in a farming system appears more likely to produce results than does a more traditional approach of specialised disciplinary research with parallel extension.

A farming systems approach is also appropriate in attempts to ensure that agricultural development is sustainable. Conway (1985) argues that viewing research and implementation in terms of the environmental setting of farms is essential to the development of agriculture that will operate successfully at a local level and that can be sustained over time.

Incorporating environmental considerations into research planning will likely generate innovations that are either more sustainable themselves or that lead to more sustainable benefits. Yet, in an environment of scarce research funds and pressing farm problems, there is a strong need for research results with very broad application. In terms of developing technologies, ILCA should focus on issues related to major ecological zones, ensuring that NARS have a strong adaptive research capacity to fine-tune technologies to their specific environments.

Need for policy research and policy research capacity

A major cause of the economic crisis facing Africa has been the incapacity of governments and institutions to respond quickly and decisively to a rapidly changing global economic

environment. The effects of inappropriate exchange rate, trade and pricing policies have been devastating for agriculture. The market signals become so distorted that farmers receive only a fraction of the value of the commodities they produce, while the inputs and goods they consume become more scarce and expensive. The unsuccessful agricultural policies of the 1960s and 1970s are still common (World Bank, 1989) for most of Africa.

Effective policy analysis and economic management are necessary for successful development in all sectors. However, Faaland (1990) concluded that a serious deficiency in policy making in the developing world, including SSA, is the lack of an appropriate research base to generate the knowledge needed for effective policy decisions. To be effective, policies must be sustainable. Sustainable policy, in turn, requires a strong sense of African ownership. There is no better way to foster the sense of ownership than to produce policies through first-rate indigenous research and policy design capacity. This capacity is scarce in almost every sector of most African countries (World Bank, 1991b). Therefore, there is a need to provide the policy research and managerial capacity in the short term and to develop a capacity to produce these skills in the longer term.

Explicit attention by IARCs to agricultural sustainability is relatively new, although it has been implicit in much of their past work. The CGIAR did not view sustainability as a separate or discrete area but as something that must influence the way in which research is planned and conducted (Hibler, 1988). Sustainable development may mean different things to different people. Swindale (1988), for example, argues that sustainability and concern for the environment cover much the same ground. Some environmental matters are closely linked to the ability of natural assets to continue to provide food, shelter and a capital base for future generations.

Pearce et al (1989: p. 48) define sustainable development as “a bequest to the next generation of an amount and quality of wealth which will at least be equal to that inherited by the current generation.” It has been suggested that such a definition is consistent with the depletion of some natural resources (Hartwick, 1977), provided that the net returns, or rents, from these resources (e.g. soils, forest) are productively invested. In an African context, with rapidly increasing population and limited development of industrial/urban capital, a condition for sustainable development would appear to be maintenance of most of the natural capital underlying agriculture. Agricultural policies must address the issues of proper pricing of resources, non-attenuated property rights, taxes and controls on pollution and investment in production alternatives. Finding a minimum cost approach to confronting environmental problems is a high priority for the region.

Resource management policies

How effectively resources are used largely depends on resource management policies. Critical policies in this context include those concerning land tenure and user rights. Shepherd (1991) points out that, for significant areas of African forest and woodland regions, stable structures of communal and individual user rights have long been in place. He argues that such systems were generally based on long-term sustainable rotations of activities centred on forest and land resources. However, such systems generally cannot survive the increasing demand for arable land, due to increasing population.

Secure tenure rights to privately held land is likely to have an important bearing on long-term management. An individual or family with inalienable title to land will have a strong incentive to develop and use the land in a way which promotes long-term sustainability. The same is not necessarily true of community or group ownership and efforts to ensure sustainability are dependent on the social cohesiveness of that group. Doran et al (1979) argue that a combination of traditional attitudes towards cattle as a store of wealth with communal grazing and limited availability of other stores of wealth underlie much of the deterioration in grazing land in eastern and southern Africa. In such circumstances,

research aimed at increasing production and quality of meat available from turn-off of young cattle may have only limited production effects. The result may instead be increased pressure on communal land.

Secure land tenure, while likely to encourage efficient long-term land use, may not guarantee such a result. First, there may be significant spillover effects, for example on other land users, that land owners have little or no incentive to consider. Second, if land owners do not have full information on the costs and benefits of their actions, they may make suboptimal decisions. Finally, farmers under pressure to survive may have little choice but to discount the long-term consequences of their actions. This may frequently be the case in African agriculture.

The most obvious potential off-site impacts of farming and grazing activities are those associated with downstream effects of increased rates of soil erosion and runoff. Those who own the land which they use may have a much stronger incentive to limit runoff and soil loss than those with short-term or more tenuous use rights. Land clearing and farming activities which increase runoff and siltation may do significant downstream damage. The converse may sometimes be true. Actions such as damming or diverting streams may, by limiting the flow of water and nutrients, reduce productive opportunities in some downstream areas. These examples serve as reminders that the range of off-site effects of agricultural activities needs to be considered.

Commodity price policies

Opportunities faced by farmers can be strongly influenced by commodity price and marketing policies. Brown and Wolf (1985) argued that widespread adoption of price policies designed to provide cheap food to urban populations has had a detrimental effect on rural incomes and subsistence levels.

Other economic and social policies, such as those regulating the development and operation of commodity markets or exchange rates, can have a large influence on smallholder agriculture. Policy settings are important to agricultural research in two ways. First, policy research may be an important primary research activity if its results can be used to influence decision makers. Second, existing policies may strongly influence the degree to which the potential of research-based innovations is realised. From the latter standpoint, there is a need to ensure that a sense of policy relevance is part of the background to setting priorities in any technical research programme.

Physical and financial infrastructure

A wide range of infrastructure and infrastructure policies may influence the opportunities available to farmers. Three sectors are of particular importance: transport, finance and commodity marketing. Market accessibility will strongly influence the types of products farmers will produce for market in addition to those produced for subsistence. For example, opportunities to market milk in Africa may be most influenced by transport.

Improving the performance of African agriculture will involve, *inter alia*, large investments in farmers' skills, livestock equipment and land care. Finding sufficient investment funds will be difficult at any level. Direct individual choice, rather than bureaucratic control, is important to the success of financial markets. However, the difficulty in extending the informal financial sector to smallholders arises from the close correlation of risks faced across farms. Most regionally-based financial schemes risk failure because drought, disease or falls in commodity prices are likely to be common to most participants in a scheme. Finding ways to overcome some of these difficulties may be as important as finding technical solutions to problems of livestock production.

Assessment of research

There is no simple way to set research priorities to ensure the highest net pay-off. Research is a risky activity. Setting broad programme priorities is probably the most difficult part of a research planning process because of the breadth of issues to be considered. While there is no definitive simple model for assessing the likely pay-offs to broad avenues of research, there are some lessons to be learned from application of project assessment techniques in a cost–benefit framework.

Research benefits and costs

A firm basis exists for project assessment in a modern market economy. The approach to assessment of research benefits outlined by Edwards and Freebairn (1981; 1982; 1984) can be used within a cost–benefit framework. Lemieux and Wohlgenant (1989) and Johnston et al (1992) provide examples of the use of such a framework to assess the likely pay-off from a particular research project. A concept that is relevant in this context is that the total benefits from adoption of an innovation which successfully reduces production costs increase with: the size of the industry; the size of the unit cost saving; and the elasticity of world demand for the country's product.

For a product which is not traded internationally, the demand elasticity makes little difference to total benefits but it makes much difference to the way it is shared between farmers and consumers. There may be few gains, or even losses, to farmers from innovations which reduce the costs of supply of commodities for which demand is not price-sensitive. For products which are important subsistence items for farmers, but are not generally traded, the first two points (size of industry, size of the unit cost saving) are still important. The more broadly applicable the result is, the greater the pay-off. The greater the saving in labour, land or other inputs, the greater the pay-off.

The net benefits of research depend on several factors besides those influencing gross benefits. In particular, net pay-off is an increasing function of the probability of successful adoption and the length of time for which the innovation remains useful. Net pay-off is a decreasing function of the cost of research and the time taken for the innovation to be adopted.

A further important aspect of research pay-offs concerns the degree to which a single project contributes to overall change. Even within a farming systems approach to research, an effective innovation may be the result of a number of separate research projects.

Assessing the sustainability of development

To date, the research evaluation framework discussed above has been used specifically for openly marketed private goods. Environmental impact has been assumed to be minor. In principle, there is no reason that assessment of research projects cannot include analysis of environmental impacts. For example, Dixon et al (1986) outline a cost–benefit framework for development projects that includes measures of environmental costs.

There are two broad approaches to incorporating environmental values into a cost–benefit framework. The first is that outlined by Dixon et al (1986) which involves an attempt to value environmental aspects of project impacts on the same basis as is used for other goods. The second, outlined by Pearce et al (1990), involves the imposition of conditions of sustainability of activities as constraints in a conventional cost–benefit analysis. Application of either involves some assessment of environmental impact of the proposals being analysed.

Dixon et al (1986) outline three ways of estimating values for non-marketed environmental effects of development projects. The first is based on concepts of

opportunity cost or estimates of changes in resource productivity over time. The second involves the use of indirect valuation approaches through observations of land and other asset values. The third involves survey methods such as contingent valuation. In considering research programmes for African agriculture, the first set of measures has most relevance. Most of the trade-offs in land, water and forest resource use can probably be assessed in terms of opportunity costs of alternative uses, costs to future productivity of current uses or replacement expenditure. For example, the costs of excessive soil erosion, aside from downstream effects, will accrue largely through decreased land productivity in future periods. The more complex valuation methods using such techniques as contingent valuation are not as relevant since they tend to be data-intensive, costly and less related to basic food and shelter issues of the developing world. Thus, a cost-benefit framework can accommodate environmental issues and still provide a useful basis for investigating differences in likely pay-offs to alternative research programmes.

Given that the major emphasis in the research programme is on alternative ways of promoting smallholder productivity, extreme distributional choices are not likely to become an issue. There are aspects of the research evaluation model which remain relevant. First is the size of the industry, whether uptake is regional, national or international. In this context, an emphasis on policy research, particularly resource and environmental policy, appears important. It may be easier to find broad resource policy principles that can be widely applied than to find technical innovations that can be used in many areas of Africa. Second, the size of the unit cost saving or income increase is also important. Third, projects with a high probability of producing a useful innovation will be of high value. Finally, early adoption is important.

Challenges facing ILCA

Five of the 18 CGIAR centres are located in SSA and work largely on African agriculture. ILCA is the only centre with an exclusive mandate to improve livestock production systems in Africa. The Centre is expected to help the region meet its goals in food production and to satisfy other expectations of the CGIAR. In this effort, the CGIAR looks at all aspects of efficiency, equity and the environment (Hibler, 1988).

The Centre is expected to give high priority to strengthening the capacity of NARS to integrate sustainability into their endeavours. The problems of resource management and use are more critical in semi-arid and arid areas where livestock is an important enterprise. It is in these areas that the future of agriculture appears to be most threatened.

It is not possible for ILCA to meet these challenges alone. ILCA must work with NARS, other IARCs in the region, non-governmental organisations and regional organisations. Looking at NARS, total national funding for research is still well below 0.5% of GDP. Between 80 and 90% of the total recurrent budget is spent on personnel salaries and budgets (Nyiira, 1991). In terms of budget allocation, crop research still receives a high priority. Effective policy analysis capacity is scarce in most African countries. It is within this environment that ILCA is expected to improve the livestock production systems of Africa.

The medium-term objective of ILCA's Livestock Policy and Resource Use Thrust is to help national efforts to improve policies affecting the livestock sector and to increase the efficiency with which natural and other resources are used in sub-Saharan Africa (ILCA, 1988). Given the current critical constraints and issues of African agricultural production systems, this objective is very appropriate and addresses the immediate concerns of the region. It is encouraging to note that total funds allocated to this thrust increased from 9% in 1988 to 13% in 1991. The task, then, is to determine how to meet the enormous demand for such services with the limited available resources.

Strategy for the Livestock Policy and Resource Use Thrust

ILCA should continue its activities in all six identified themes, namely policy services, policy research, range trends, semi-arid livestock, resource services and network co-ordination. Given the limited resources and the enormous regional demand for services, it is not possible for any one organisation to manage the situation. The critical element is local capacity building in policy analysis and development management. A series of reinforcing, co-ordinated actions by donors, IARCs, NARS, local universities and non-government organisations, phased over a long period, are necessary to accomplish this task. Given the acute shortage of this capacity within the region, it is disturbing to note that ILCA has reduced the budgeting allocation for policy services from almost 30% (of the total budget for the thrust) in 1988 to 6% in 1991 (ILCA, 1988). The amount allocated for policy research has increased from about 10% in 1988 to 28% in 1991. Given the large interest in policy research at the moment in SSA, it is vital for ILCA to carefully select those areas that are considered a high priority and represent a comparative advantage for the institution.

Besides ILCA, there are several other IARCs working in SSA. A number of these centres are currently involved in policy research and are working with national institutions and scientists conducting research with their respective mandated crops. In addition, other organisations such as the International Development Research Centre (IDRC), the International Centre for Research in Agroforestry (ICRAF) and the International Centre of Insect Physiology and Ecology (ICIPE) are also involved in policy-oriented research.

A number of African academic institutions, in collaboration with universities in the developed world have initiated policy work and training (e.g. Egerton University in Kenya in collaboration with Harvard Institute of International Development; the University of Zimbabwe in collaboration with Michigan State University). These institutions are acquiring the necessary organisational, managerial and technical skills to continue training and networking. The African Economic Research Consortium is another example of a potentially successful capacity-building institution. If collaborative working relationships could be established with institutions and organisations such as these, the efficiency of ILCA's operation in the region could be improved.

Two IARCs in particular can play a crucial role in shaping the activities of the Livestock Policy and Resource Unit of ILCA. The first, International Service for National Agricultural Research (ISNAR), is actively assisting NARS in strengthening their capacities in the areas of research policy, organisation and management (ISNAR, 1987). ILCA can potentially collaborate with ISNAR in changing livestock resource policies and resource allocation at the country level.

The second, IFPRI, has a strong policy orientation. IFPRI is currently involved in collaborative research agreements with national research institutions and universities in 18 SSA countries. Currently, research is underway in seven countries on the impact of policies on the welfare of the poor. Recently, IFPRI expanded its micro-economic research capabilities through its involvement in field-level data collection. At the moment, Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT) and IFPRI are jointly running a policy analysis network in eastern and southern Africa. Given IFPRI's traditional macro-focus combined with the micro-research base, it is in a position to undertake policy research (Faaland, 1990) both at a micro- and a macro-level.

ICRAF, because of its mandate and the production systems it deals with, also must look at natural resource issues. Natural resource management research must be focused on problems faced by smallholders in environmentally threatened areas, as well as the implications of past environmental degradation for current decisions faced by farmers. Thus, there is a great opportunity for collaborative research and training in the region. This requires joint planning and co-ordinated action.

Conclusion

There is considerable scope to undertake research on policies in natural resource management as related to livestock production systems. In arid and semi-arid areas, it seems essential that ILCA establish collaborative work with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). In macro-policy research, there is a great opportunity to collaborate with IFPRI. In fact, IFPRI has a comparative advantage in this area. There is a strong case for ILCA to concentrate on those natural resource issues which are unique to the livestock production systems where ILCA has a comparative advantage based on its experience and available skills. As much as possible, ILCA should embark on collaborative research programmes with stronger NARS.

Capacity building for policy analysis should be given a very high priority, with stronger linkages and working relationships with national academic institutions. Probably the best way to do this is to start with pilot projects based in a few countries while:

- strengthening joint training activities with other IARCs
- establishing joint teaching facilities with advanced NARS and academic institutions
- utilising national resource people at ILCA workshops.

A balance needs to be struck between national and regional activities. One way of doing this is to concentrate resources on developing methodologies and manuals on policy analysis frameworks for natural resources to be used by national programmes.

References

- Africa Review. 1987. *The economics business report*. 11th ed. World of Information, Essex, UK. 272 pp.
- Brown L R and Wolf E C. 1985. *Reversing Africa's decline*. Worldwatch Paper 65. Worldwatch Institute, Washington, DC, USA. 81 pp.
- Conway G R. 1985. Agricultural ecology and farming systems research. In: Remenyi J V (ed), *Agricultural systems research for developing countries*. Proceedings of an international workshop held at Hawkesbury Agricultural College, Richmond, NSW, Australia, 12–15 May 1985. ACIAR Proceedings Series 11. ACIAR (Australian Centre for International Agricultural Research), Canberra, Australia. pp. 43–59.
- Dixon J A, Carpenter R A, Fallon L A, Sherman P B and Manopimoke. 1986. *Economic analysis of the environmental impacts of development projects*. Earthscan Publications Ltd, London, UK.
- Doran M H, Low A R C and Kemp R L. 1979. Cattle as a store of wealth in Swaziland: Implications for livestock development and overgrazing in Eastern and Southern Africa. *American Journal of Agricultural Economics* 61(1):41–47.
- Edwards G W and Freebairn J W. 1981. *Measuring a country's gains from research: Theory and application to rural research in Australia*. A report to the Commonwealth Council for Rural Research and Extension, AGPS, Canberra, Australia.
- Edwards G W and Freebairn J W. 1982. The social benefits from an increase in productivity in a part of an industry. *Review of Marketing and Agricultural Economics* 50(1):193–209.
- Edwards G W and Freebairn J W. 1984. The gains from research into tradable commodities. *American Journal of Agricultural Economics* 66(1):41–49.
- Eicher C K. 1988. *Food security battles in sub-Saharan Africa*. Paper presented at the VII World Congress for Rural Sociology, Bologna, Italy, 26 June–2 July 1988.
- Faaland J. 1990. *IFPRI—New frontiers*. Paper presented at the International Centres Week of the Consultative Group on International Agricultural Research (CGIAR), Washington, DC, USA, 2 November 1990.
- FAO (Food and Agriculture Organization of the United Nations). 1983. *The food crisis and population pressure in Africa: The origin of the crisis*. FAO, Rome, Italy.

- Hartwick J M. 1977. Intergenerational equity and the investing of rents from exhaustible resources. *American Economic Review* 67(5): 972–974.
- Hibler M. 1988. *TAC and sustainable agricultural production*. Annual Report—Consultative Group on International Agricultural Research, 1987–1988. CGIAR, Washington, DC, USA. pp. 15–22.
- ILCA (International Livestock Centre for Africa). 1988. *Sustainable production from livestock in sub-Saharan Africa: ILCA's programme plans and funding requirements, 1989–1993*. ILCA, Addis Ababa, Ethiopia. 106 pp.
- ISNAR (International Service for National Agricultural Research). 1987. *Working to strengthen national agricultural research systems—ISNAR and its strategy*. ISNAR, The Hague, The Netherlands. 40 pp.
- Johnston B, Tulpule V, Foster M and Gilmour K. 1992. *SIROSPUN— The economic gains from sirospun technology*. ABARE Research Report 92.5. AGPS, Canberra, Australia.
- Lemieux C M and Wohlgenant M K. 1989. *Ex ante* evaluation of the economic impact of agricultural biotechnology. The case of porcine somatotropin. *American Journal of Agricultural Economics* 71(4):903–914.
- Nyiira Z M. 1991. *Research resources in national research institutions in eastern and southern Africa*. IDRC (International Development Research Centre), Ottawa, Canada. 45 pp.
- Pearce D, Markandya A and Barbier E B. 1989. *Blueprint for a green economy*. Report prepared for the UK Department of the Environment. Earthscan Publications, London, UK.
- Pearce D, Barbier E and Markandya A. 1990. *Sustainable development: Economics and environment in the third world*. Edward Elgar, Aldershot, UK.
- Plucknett D L. 1991. *Saving lives through agricultural research*. Issues in Agriculture 1. Consultative Group on International Agricultural Research (CGIAR) Secretariat, Washington, DC, USA. 20 pp.
- Shepherd G. 1991. The communal management of forests in the semi- arid and sub-humid regions of Africa: Past practice and prospects for the future. *Development Policy Review* 9(2):151–176.
- Swindale L D. 1988. Agricultural development and the environment: A point of view. *CGIAR Annual Report 1987/88*. CGIAR (Consultative Group on International Agricultural Research), Washington, DC, USA. pp. 7–14.
- World Bank. 1989. *Sub-Saharan Africa—From crisis to sustainable growth: a long-term perspective*. World Bank, Washington, DC, USA. 300 pp.
- World Bank. 1991a. *The challenge of development: World development report*. World Bank, Washington, DC, USA. 290 pp.
- World Bank. 1991b. *The African capacity building initiative: Toward improved policy analysis and development management in sub-Saharan Africa*. World Bank, Washington, DC, USA.

Discussion

- C: We do not need more research, but we do need to look at the interaction between political systems and the policies generated by those systems.
- C: Regarding the consequences of structural adjustment on the environment, in Côte d'Ivoire, the environmental issue is degradation. Cost–benefit analysis did not clarify the problem. It is difficult to come up with an appropriate methodology to identify the reasons for the problem.
- C: I am not sure of the value of using a cost–benefit framework. Regarding land tenure and property rights structures, the structures define the flow of costs and benefits. In land tenure research, your point is well taken—rent seeking is very important.
- C: To return to the first comment and the relationship between rent seeking and the issue of politics, it is difficult to account for these things. In terms of cost and benefits, I start from the position that we are concerned with societal welfare. As such, impact

must pass a cost–benefit test. Part of this test is to determine the distributional effect on different groups. A cost–benefit framework should be seen as a framework of analysis, not necessarily as a method.

Environmental degradation in sub-Saharan Africa: Issues for policy analysis

S. Ehui

*International Livestock Centre for Africa (ILCA)
P O Box 5689
Addis Ababa, Ethiopia*

The problem

There is currently widespread concern about degradation of natural resources in the developing world. Degradation threatens both the economic prospects of future generations and the livelihoods of current users. In sub-Saharan Africa (SSA), deforestation threatens biological diversity and contributes to alteration of the global climate. Soil erosion is increasing which reduces the capacity of many countries to satisfy the expanding demand for food. It also jeopardises the benefits from water resource development. Deposition of eroded soil in reservoirs, for example, diminishes hydroelectricity production and reduces irrigation and water supplies (Southgate et al, 1990).

These various elements are linked together in a cause-and-effect chain. For example, when forests are cleared, the physical and chemical properties of soils undergo significant changes, leading to nutrient loss and accelerated soil erosion (Sanchez, 1976; Ehui and Hertel, 1992). This, in turn, results in a decline in crop and livestock yields which exacerbates rural poverty and income inequality.

Although the dependence of sustainable economic development on sound environmental economic development is increasingly recognised, economists' attention to date on the macro-economic implications of environmental matters has been somewhat fragmentary. In this paper, a broader perspective on the causes of environmental degradation is taken and issues for policy analysis are examined.

Social scientists, including agricultural and resource economists, have a vital role to play in policy analysis; their specialised knowledge is vital to understanding people's behaviour in order to predict their responses to economic or other incentives introduced by government policies. Policy analysts identify causes, measure relationships and formulate policy options evaluating their cost effectiveness with due consideration of political constraints.

Causes of natural resource degradation

Population growth is a primary catalyst for the expansion of agricultural production into marginal lands as well as the abandonment of fallowing and other practices that maintain soil fertility. Continuous agricultural production is now the norm in some places, resulting in low yields. With the exception of the highland zones, much of the soil in SSA tends to be thin and not very fertile. Diminished fallow periods cause yields to fall off substantially. Applying fertilisers often compensates for only part of this decline (Lal, 1981). As land deteriorates, farmers colonise marginal hinterlands or migrate to urban areas.

Where behavioural analysis of resource degradation in SSA has been conducted, simple Malthusian explanations are widely circulated. Other than the general recommendation that human fertility be controlled, these explanations offer little guidance for the design of conservation strategies.

Malthusian assumptions are that population growth is reflexive, accelerating whenever living standards rise above subsistence levels. The idea that agricultural technology never changes was also shared two centuries ago. Together, these assumptions imply that expansion of agricultural land is the only possible response to market and demographic shocks. To Malthus, since in the long run the quantity of land is absolutely fixed, the principle of diminishing marginal productivity of labour implied serious problems for the future of humanity (Southgate et al, 1990).

Investigation of social realities in SSA reveals that the behaviour of rural people is much more complex than classical economists believed. Demographers find that increased rural population density induces various reactions. Fertility rates tend to fall as incomes rise. Relocation to urban areas or the agricultural frontier is also a possibility (Bilsborrow, 1987). Similarly, the assumption that technology for crop and livestock production never changes has been rejected. In various ways, agricultural land can be used more intensively as rural populations rise or as demand for agricultural commodities increases (Boserup, 1965; Pingali et al, 1987). Intensification often begins with a decline in fallowing cycles, which usually diminishes soil quality. Other intensification options are available which can enhance output without accelerating resource depletion. They include, for example, increased employment of non-land inputs (e.g. fertiliser, labour), a switch to new crops and mechanisation.

The central point of this paper is that government policy and property arrangements have much to do with the countryside's reaction to markets and demographic shocks. Evidence, however, shows that the environmental impacts of rural population growth and increased demand for agricultural commodities greatly depend on government policy and property arrangements. Inadequate investment in research and extension, governmental interventions that keep food prices low and other policies hindering agricultural development accelerate the depletion of natural resources. In addition, formal and informal tenure arrangements often discourage the adoption of conservation measures, encourage excessive land clearing, or both. In many parts of SSA, deforestation is a prerequisite for formal and informal land tenure and conversion of forests into cropland and pasture is directly or indirectly subsidised. Under these circumstances, population growth and increased demand for agricultural commodities usually induce excessive migration to hinterlands as well as depletive forms of extensive settlement.

Property arrangements

Insecure tenure, multiple ownership, common property, lack of clearly defined and securely held property rights over resources, including land, result in over-exploitation, under-investment and general mismanagement of resources. Other factors which may explain suboptimal land or resource use are uncertainty, myopia, high discount rates, imperfect capital markets and ignorance coupled with high information costs. These market failures, as they relate to land use patterns and resource management will be examined in turn.

Insecure ownership or land tenure inhibits optimum land use in a number of ways. First, it reduces the incentive for improvement since insecure owners with insecure rights or tenants, while having to incur the full cost of investment in land improvement, are uncertain whether they will receive the full return from their investment—which may be spread over a number of years. Second, for the same reason, these owners and tenants are unlikely to put land under perennial crops or forest which take a number of years to mature

and yield a stream of income extending into an uncertain future. Third, even if insecure owners had the incentive to invest in land improvement and perennial land uses, they are deprived from doing so since untitled land cannot be used as collateral for securing credit except from non-institutional sources at exorbitant interest rates. This makes such investments unprofitable. Finally, untitled land cannot be sold or legally transferred. Therefore, land continues to be put to inferior use. As a result, those who possess, but do not own the land, remain in poverty, unable either to improve or liquidate the land or even to move away for fear of losing the land.

Multiple land ownership, however secure, has detrimental effects on investment analogous to those of insecure tenure. No single joint owner has sufficient incentive to invest in land improvement when he or she knows that all other co-owners have a right to the benefits from his/her investment. A recent joint International Livestock Centre for Africa (ILCA) and University of Wisconsin Land Tenure Center study on the relationships between land tenure and the uptake of alley farming indicated that those with the longest record of continuous alley farming had obtained their land through divided inheritance, i.e. land divided among the heirs, giving each full control over individual parcels of land. In contrast, most farmers who had not adopted alley farming and those who had stopped, obtained their land through undivided inheritance (ILCA, 1991), i.e. land that passes to heirs collectively with the result that no one person has absolute control over any part of the land (multiple ownership).

Common property¹ or open access, is an extreme but common case of multiple ownership, whereby every citizen of a country is a joint “owner” of the resource. Examples include forest lands, pastures and rangelands. Common property not only inhibits development but also induces “exploitative” behaviour. Since everybody’s property is nobody’s property, no single individual or group has sufficient incentive to either improve or manage the commonly owned resource. To the contrary, the individual has every incentive to deplete the resource as soon as possible as there is no guarantee that whatever he or she leaves unharvested today will be available tomorrow.

While insecure ownership and common property or open access are almost certain to lead to mismanagement and waste, secure individual ownership is no guarantee that land will be put to its best use or that the resource will be conserved and properly managed. Uncertainty, political instability, a general feeling of insecurity, shortsightedness and sheer ignorance may induce people to put even securely-owned resources under uses which yield quick profits but deplete the resources needed to sustain productivity.

Capital markets

Another reason for suboptimal resource use, especially in poverty areas, is the severe capital constraints faced by farmers combined with highly imperfect and distorted capital markets. The scarcest of resources for farmers, especially in poverty areas, is often not land, but cash for both consumption and investment. The availability of credit and its costs are crucial factors in this regard. In many rural areas, institutional credit is either not available or the poor are not eligible, while non-institutional credit is too costly. Interest rates from informal credit sources are as high as 110% (Lele, 1975). The result is that many farmers are unable to put their land to best use even if they know how and have the incentive to do so. Those farmers, unable to borrow or meet the repayments on borrowed funds, join the ranks of landless labour. They then seek refuge in common access areas which are

1 Communal property, as distinct from common property, could be a secure and effective form of ownership and management if the community has sufficiently cohesive and effective internal organisation to be considered a management unit.

already susceptible to environmental degradation. Since they rely more than other groups on informal credit markets, smallholders are, in general, discouraged from short-term sacrifices for the sake of future gains. Activities such as applying conservation measures to existing farmland and the clearing of new land for crop or livestock production are, therefore, not practised.

Commodity prices

Just as policy-induced distortions in rural financial markets result in smallholders' paying high real rates of interest, policy-induced distortions in markets for agricultural commodities result in their receiving low prices for crops and livestock. Influenced by both affluent and poor urban clientele, governments use price controls and other policy instruments to keep food prices cheap. Receiving low prices for crops and livestock, smallholders in SSA are discouraged from investing in natural resource conservation measures.

Monetary policy

The linkage between exchange rate policy and land resource development is the same as the relationship between pricing policy and the use and management of resources. Setting official exchange rates above market exchange rates discourages the production of agricultural exports. This, in turn, diminishes derived demand for land which discourages individuals from managing existing farmland well.

Marketing

The lack of adequate marketing facilities is another key factor contributing to environmental degradation and low productivity on marginal uplands. The ability of farmers to improve and invest in agroforestry and livestock-based systems relies, in part, on the returns from their marketing efforts. In studying agricultural mechanisation and the evolution of farming systems in SSA, Pingali et al (1987) showed that for a given population density, improved market access caused further intensification of the farming system. Their survey results support the hypothesis that with poor access to markets, extensive forms of farming, such as forest and bush fallow, are usually practised.

Issues for policy research

Research needs for resource management policy are massive. While all market failures and policy issues described above have the same effects—the suboptimal use of land and depletion of resources—it is of paramount importance both from an analytical and policy perspective to distinguish between them. At present, the issue of how resource degradation comes about is still much disputed. Unicausal theories abound and range from placing responsibility on population growth to climatic variations. It is clear from the above discussion that in many, if not most cases, causation is a complex mix of exogenous factors such as climate and exogenous price changes, alterations in the social control over resources, population change and immediate policy factors such as endogenous price changes. Understanding which are more important and how they interact is clearly essential for any policy analysis. Better understanding of the chain of causality leading to severe environmental problems is therefore required in order to identify remedial policies. The following research areas are suggested as those that merit attention.

Macro-economic policies and property arrangements

There is need to review the literature and test possible relationships between macro-economic policies and property arrangements. Such studies should encompass:

- the extent to which common property or open access resources lead to resource degradation, with special reference to the types of social control exercised over such resources
- the linkages between population change and resource degradation
- the linkages between livestock stocking behaviour and natural resource degradation
- the relationship between macro-economic policies (e.g. prices, exchange rates) and environmental degradation
- examination of the economic and environmental trade-offs in crop–livestock systems by ecological zones.

Household behaviour and resource management

The ultimate target for incentives designed to improve resource management is the household or the farm unit. This is because smallholders, including pastoralists with small herds, are often held responsible for environmental degradation. In recent years, modelling of household behaviour has improved considerably (e.g. Singh et al, 1986), however, modelling of decision making, within the household, relevant to natural resources is still lacking. Particular interest should centre on decisions about fuelwood collection, land use, labour time distribution between subsistence and cash crops, livestock, tree planting and land clearance. What needs investigation is how these decisions are made and what factors influence them. It should then be possible to identify those factors that are open to policy influence and those that are not. Such a modelling exercise should also have regard to gender issues within the household or the farm.

Valuation of resources

A bias against sound environmental management has been encouraged by the difficulty of assessing the monetary value of environmental goods and services. A major limitation of conventional approaches to natural resource economics is their concern with only those resources which directly provide economically valuable productive services, to the exclusion of environmental services such as waste absorption and ecological and life support mechanisms. For example, while it has been possible in some cases to estimate the external benefits which the forests confer upon agriculture, it has been difficult to estimate other positive externalities such as preservation of genetic diversity (Ehui and Hertel, 1989). The challenge that economists face is to devise a more comprehensive approach to cost–benefit analysis where rigorous attention is paid to the non-monetary consequences of investments. More significant improvements in environmental management are likely to result from efforts aimed at integrating environmental concerns into macro-economic and other government policies.

Productivity and sustainability measurement

Related to the above is the issue of productivity and sustainability measurement. Agricultural productivity measurement is an important indicator by which technical change is measured. Many studies have been dedicated to the measurement and explanation of technological change. In these studies, however, very limited attention has been given to the environmental effects of changes in production technologies. Given the importance of resource degradation in SSA, conventional productivity measures will be influenced. Thus, there is a need to revise standard productivity measures and to incorporate the environmental effects of agricultural production.

In one approach, Ehui and Spencer (1990; 1993) merge biological, physical and economic measures into a single economic index of total factor productivity (TFP). TFP is defined as the aggregate index of all outputs produced by the system over one cycle, divided by the aggregate index of all inputs used by the system over the same cycle. In normal practice, the outputs and inputs would comprise those attributes that are recognised as economic variables, namely purchased inputs, labour costs, the value of harvests, etc. Ehui and Spencer (1990; 1993) have adjusted this by valuing and costing natural resources used in the system, such as soil nutrients and the costed inputs and outputs are aggregated to give the TFP index. If TFP shows a constraint or upward trend over a period of time and does not fluctuate widely, then the system is sustainable. One advantage of the approach is that the TFP index can be decomposed to determine which factors contribute to the sustainability of the system. Although this approach was strictly applied to cropping systems, there is scope for improving upon it to account for mixed crop–livestock systems. This is a challenge faced by ILCA economists.

Appropriate methodologies

Engineering models

Economic analysis of policy factors on resource management at farm and national levels can be analysed using mathematical programming models (Bogess and Heady, 1980; Batie and Grumbach, 1983; Kramer and McSweeney, 1983). The parameters for these models can come from various sources. For example, soil erosion rates can be computed using the Universal Soil Loss equation or by direct field measurement. These models can be very effective in uncovering potential long-term implications of various agricultural and conservation policies because they incorporate technical practices as prescribed by scientists.

For example, this approach may be useful in the area of economic and environmental trade-offs in crop–livestock systems. It is hypothesised that animals increase overall net productivity and reduce environmental degradation by serving as alternatives to crops on marginal area farms and by utilising crop residues as feed. The need for animal feed often broadens the crop base to include crops that prevent soil erosion (Grove T L, Winrock International, Arkansas, USA, unpublished data). If that is the case, then it is appropriate to ask what price or policy incentives might induce farmers to operate in a manner consistent with national environmental objectives. The problem, however, with the engineering models is that the outcome is conditioned by the technical parameters selected rather than observed behaviour.

Behavioural models

A behavioural model can help explain the link between various agricultural policies and environmental degradation (e.g. soil erosion, deforestation) on actual, as opposed to “synthetic” farms as in the case of engineering models. Recent developments in the economic theory of duality where all economically relevant technological information about a firm indirectly, through a cost or maximum profit function are derived, sound quite attractive. For example, how might commodity prices, taxes or subsidies be expected to affect deforestation or erosion rates?

The use of an explicit behavioural approach also facilitates the development of a dynamic model, whereby the farm is assumed to maximise intertemporal profits. This dynamic formulation also gives way to some additional important hypotheses. For example, because forests, soil or livestock are “stock” resources which must compete with other investment alternatives, economists hypothesise that the rate at which resources are depleted will depend in part on the real rate of interest. When the latter rises, we expect

resource depletion to increase as farmers will attempt to recoup the return on their investment. Where interest rates are relatively constant, this may not be a problem. Once such a behavioural model is developed, it can be utilised to forecast the effect of alternative policy scenarios on crop and livestock mix, input and resource use.

General equilibrium

Most public policies, whatever their purpose, will have an impact on the environment in some way. Similarly, policies designed explicitly to affect the environment will have impacts elsewhere. The way in which economists would like to capture the various interactions is through the construction of a general equilibrium model, showing how sectors within the economy are interlinked. The technical linkages are best captured by an input–output model. The operational use of such models for simulating public policy has advanced considerably in recent years. Computable general equilibrium models (CGE) should be investigated for policy impacts on the environment.

Comparative advantage of ILCA

The centre that immediately comes to mind in terms of international policy research is the International Food Policy Research Institute (IFPRI). This centre has the mandate to identify and analyse alternative national and international strategies and policies for meeting worldwide food needs, with particular emphasis on low- income countries. As such and with a critical mass of policy researchers, IFPRI appears to have a net comparative advantage over commodity oriented centres such as ILCA in conducting policy research. The contribution of IFPRI in policy analysis and research cannot be over-emphasised. However, given its worldwide mandate and its location in Washington, DC, IFPRI does not have the opportunity to address more location-specific issues. It can successfully collaborate with ILCA which can bring to bear its multidisciplinary research teams and the wisdom of its biological scientists.

Conclusions

The serious degradation of natural resources in developing countries stems primarily from the cumulative effects of many small agricultural operations. Remedies must include changes in economic policies and incentives to promote sustainable resource use by large and small enterprises and households, and to channel economic and demographic growth into activities that raise incomes while preserving important natural resources. Existing studies on the relationship between government policies and environmental management only serve to underline the importance of these linkages.

Population growth explains a large part of depletive human interaction with the natural environment in SSA. However, accepting a simple Malthusian analysis of resource degradation does not leave much room for optimism. Government policies and property arrangements have much to do with the use of natural resources in SSA. As a result, extensive agricultural production on fragile hinterlands, instead of sustainable land intensification, is the principal response to demographic and market shocks. In addition, existing tenure regimes often discourage tree planting and encourage deforestation. Policies and property arrangements must be changed in order to foster environmental conservation.

Effective reform is also a challenge because piecemeal changes in policy and property arrangements can be ineffective or counter-productive. For example, if food and timber markets are deregulated but tenurial disincentives for resource conservation remain in place and no investment in research and extension is made, then wasteful exploitation of

the countryside is likely to worsen. The chances for environmental conservation are significantly better when all policies and tenurial arrangements are reformed simultaneously. All these require that a sound analysis of the policy factors affecting environmental degradation be conducted. A few of them have been discussed in this paper. It is hoped these can be of use to foster resource management policy research at ILCA as well as in collaboration with our sister institutes, particularly, IFPRI.

References

- Batie S and Grumbach A. 1983. *Cross compliance as soil conservation strategy*. Paper presented at the AAEA (American Agricultural Economists Association) Annual Meetings, West Lafayette, Indiana, August 1983.
- Bilsborrow R. 1987. Population pressure and agricultural development in developing countries: A conceptual framework and recent evidence. *World Development* 15:183–203.
- Bogess W G and Heady E O. 1980. *A separable programming analysis of US agricultural exports, price and income, and soil conservation policies*. CARD Report 89. Iowa State University, Ames, Iowa, USA.
- Boserup E. 1965. *Conditions of agricultural growth: The economics of agrarian change under population pressure*. Allen and Unwin, London, UK.
- Ehui S K and Hertel T W. 1989. Deforestation and agricultural productivity in the Côte d'Ivoire. *American Journal of Agricultural Economics* 71(3):703–711.
- Ehui S K and Hertel T W. 1992. Testing the impact of deforestation on aggregate agricultural productivity. *Agriculture, Ecosystems and Environment* 38:205–218.
- Ehui S K and Spencer & 1990. *Indices for measuring the sustainability and economic viability of farming systems*. RCMP Research Monograph 3. Resource and Crop Management Program, IITA (International Institute of Tropical Agriculture), Ibadan, Nigeria.
- Ehui S and Spencer D. 1993. Measuring the sustainability and economic viability of tropical farming systems: A model from sub-Saharan Africa. *Agricultural Economics* (in press).
- ILCA (International Livestock Centre for Africa). 1991. *ILCA 1990: Annual report and programme highlights*. ILCA, Addis Ababa, Ethiopia. 84 pp.
- Kramer R A and McSweeney W T. 1983. *Attitudes towards and potential effects of cross-compliance: A case study in the coastal plains of Virginia*. Paper presented at the AAEA (American Agricultural Economists Association) Annual Meetings, West Lafayette, Indiana, August 1983.
- Lal R. 1981. Soil erosion problems on Alfisols in Western Nigeria. *Geoderma* 25:215–230.
- Lele U J. 1975. *The design of rural development: Lessons from Africa*. Johns Hopkins University Press, Baltimore, Maryland, USA. 276 pp.
- Pingali P, Bigot Y and Binswanger H P 1987. *Agricultural mechanization and the evolution of farming systems in sub-Saharan Africa*. Johns Hopkins University Press, Baltimore, Maryland, USA. 216 pp.
- Sanchez P. 1976. *Properties and management of soils in the tropics*. John Wiley, New York, USA. 618 pp.
- Singh I, Squire L and Strauss J. 1986. A survey of agricultural household models: Recent findings and policy implications. *World Bank Economic Review* 1(1):149–179.
- Southgate D, Sanders J and Ehui S. 1990. Resource degradation in Africa and Latin America: Population pressure, policies, and property arrangements. *American Journal of Agricultural Economics* 72(5):1259–1263.

Environmental issues and ILCA research agenda

B. Swallow

*International Livestock Centre for Africa (ILCA)
Nairobi, Kenya*

ILCA, livestock and the environment

Africa's populations of cattle, sheep and goats have the potential to make greater contributions to economic development and improved self-reliance for rural Africans. Livestock contribute to the supplies of food, skins, traction and animal wastes, the demands for feed and rural labour and serve as substitutes for insurance and credit markets. The International Livestock Centre for Africa (ILCA) seeks to increase the absolute magnitude of those contributions and to ensure that those contributions can be sustained over the long term. As an international agricultural research centre, ILCA advances that objective by undertaking policy-related and production-oriented research and by supporting the ability of its national agricultural research systems (NARS) partners to better undertake policy and production research (ILCA, 1987; 1992).

Since its inception, ILCA has been concerned with the inter-relationships between livestock production and the environment. To be environmentally sustainable, Africa's livestock subsector must develop in ways that are consistent with the long-term productivity of its resources and the long-term viability of its ecological systems. Livestock can have net positive, net negative or ambiguous environmental impacts. On the positive side, it is generally acknowledged that moderate levels of livestock grazing can be beneficial for maintaining a mix of forage species that minimises soil erosion and is most productive in terms of livestock output. Also, in mixed crop/livestock systems, livestock can have positive impacts on nutrient cycling and the processing of organic matter into fuel. On the negative side, "overgrazing" by livestock is often seen (perhaps unjustly, as is suggested below) as an important cause of rangeland deterioration.

As the only international centre that is solely concerned with African livestock, ILCA has a responsibility to play a lead role in defining the agenda of research issues related to livestock development and environmental policy in Africa. In the next section of this paper a framework appropriate for defining that agenda and for guiding analysis of particular research issues is offered. The following section goes into some detail on how ILCA might approach the specific area of range management policy in the arid and semi-arid areas.

Environmental policy and livestock development

To define research priorities on environmental policy issues, ILCA scientists might consider using a procedure with the following steps:

- A) Identify the resources and ecological systems that are at risk. De Leeuw (1992) presented a matrix of resource pressures and impacts by agro-ecological zone (p. 5) in which he identified certain "danger areas" in which "the human support capacity of land has been or will become insufficient to feed its population and where as a consequence, environmental degradation is likely to be greatest" (1992: p. 4). Danger areas identified include pasture lands in highly populated areas of the semi-arid and

highland zones, water resources in the highlands and forest resources in the lightly populated areas of the subhumid and humid zones.

ILCA might consider developing an expanded version of this matrix with greater ecoregional distinctions (both at the pan-African level and the regional level) and an expanded list of resources (including various domesticated and undomesticated genetic resources). The matrix could then be used to prioritise ecological issues for analysis.

- B) Study the dynamics of resource use that are associated with livestock production and environmental change (James et al, 1990). In particular:
- Identify long-term driving forces impacting the rural economy and the biosphere (e.g. population growth, reduction in the power and legitimacy of customary authorities, concentration of livestock wealth in the hands of fewer resident livestock keepers and an increased number of absentee owners, increased importance of market relations, technical changes in animal health and water provision).
 - Identify future conditions which are likely to cause severe perturbations in those long-term trends (e.g. severe drought, epizootics, liberalisation of output marketing and input delivery systems).
 - Identify irreversible processes and how they might be related to livestock development and policy (e.g. extinction of species, loss of distinct breeds of West African shorthorn cattle, clearance of ancient forest).
- C) Within each agro-ecological zone and/or farming system, identify groups of people who pose environmental risks and groups who are at greatest risk from environmental change. For example, livestock producers posing environmental risks might include:
- those who earn income by cutting and selling firewood and charcoal from communal forest areas
 - peri-urban dairy producers located upstream from other users of ground and surface water resources
 - entrepreneurs who construct new bore holes in areas that formerly were used only for grazing during the wet-season
 - owners of mixed agropastoral production units who use animal traction to expand cultivation in areas of marginal agricultural land
 - pastoralists who use state managed water resources without paying adequate attention to the long-term implications of their resource use
 - absentee herd owners who exploit collectively managed rangeland resources without adhering to the customary institutions regulating their use.

People who are at risk from environmental change and the environmental externalities of livestock production include: those who live downstream from peri-urban dairy operations and use water which has been contaminated by upstream users; those who specialise in livestock production and lack access to non-livestock related sources of income; or particular groups, often including poor people and women, who are reliant on communally managed resources but lack the voice to influence decisions affecting the way those resources are managed or used.

- D) Identify the economic, institutional or political factors that contribute to the environmental problem. For example,
- people who utilise benefit streams generated by resources may feel that their property rights are insecure or ambiguous
 - people may largely ignore the future consequences of their current actions if they have difficulty achieving subsistence levels of consumption in current periods or if there are constraints on the credit or insurance markets

- individuals in the current generation of resource users, unless they have a strong bequest motive, will tend to discount the consequences of current resource use on future generations
- the state may have declared itself to be the sole “owner” of resources without having the managerial capacity or legitimate authority to effectively manage the use of those resources
- environmental goods, such as clear air or water, are public goods which will never be supplied to an optimal level by private decision makers
- certain individuals or groups may be taking advantage of new institutional arrangements to extract increased economic rents or other forms of social, economic or political power.

E) Identify the types of policy instruments that can be used to advance environmental objectives, their actual and potential impacts and those that have the greatest potential to be effective. Policy instruments can be grouped into regulations, property rights, fiscal policies and provision of public goods.

African governments, following colonial precedents, have tended to address potential environmental risks by enacting laws and regulations specifying what rural residents may do, what they may not do and what punishments will be imposed for deviant behaviour. Lesotho’s grazing regulations and the West African forestry codes are examples. However, those same governments tend to be very inefficient in their enforcement of most regulations. In Lesotho, it appears that the government may be most effective in enforcing opening dates and closing dates for the mountain rangelands and least effective in enforcing restrictions on the number of livestock that may be grazed (Lawry 1990; Swallow 1990).

Resource use is crucially dependent upon the rights or entitlements that individuals and groups have to the streams of benefits emanating from natural resources and the duties that others have to respect those rights. African governments can play key roles in defining and protecting property rights and enforcing duties. Important questions are: (a) How will property rights be protected by property rules, liability rules, or inalienability rules? With property rule protection, an agent Alpha may not take actions that interfere with another agent Beta without Beta’s consent. With liability rule enforcement, Alpha may take actions that interfere with Beta, but must compensate Beta for damages. And with inalienability rule enforcement, Alpha may not interfere with Beta under any circumstances (Bromley 1991: p. 46). In Africa, traditional governance systems tend to rely very heavily on liability rules; (b) Should rights be held by individuals, groups of individuals or the state? (c) What social and/or political units should have the authority and responsibility to enforce rights and rules related to resource use? (d) What conditions should be placed on the rights of individuals and groups?

Fiscal policies are favoured policy instruments in industrialised countries for stimulating private individuals to make resource use decisions that are consistent with the public interest. Fiscal policies can affect output prices or factor prices through tariffs, subsidies, export promotion activities, guaranteed prices or tax exemptions. In addition, fiscal policies can promote certain resource usages through direct subsidies. For example, the US Conservation Reserve Program is a subsidy programme that stimulates individual farmers to remove the most erodible lands from agricultural production. To achieve their objectives, however, taxes and subsidies must be administered fairly and at low cost. Accountability is essential.

Government investments in public infrastructure can have positive environmental impacts. For example, public marketing infrastructure can help livestock owners to destock before and during periods of drought and restock after those periods. More obvious, however, are the instances in which government investments have negative impacts. Roads through forest areas usually lead to greater exploitation, and often over-exploitation, of the forest resources that are thus made more accessible. Publicly owned bore holes have

contributed to the over-exploitation of former dry season grazing areas in such countries as Senegal, Botswana and Niger.

- F) Establish research priorities, identify potential collaborators and identify the Centre's comparative advantage. Because of ILCA's location between research conducted in the more developed countries and the problems of African livestock owners, ILCA policy analysts generally have a comparative advantage in operationalising and testing the concepts and theories that are developed in the more developed countries. For example, Ehui and Spencer (1990) have operationalised the total factor productivity approach for analysing the sustainability of cropping systems.

African range management policy

Four issues that are likely to be identified as deserving high priority for ILCA's environmental policy research are: (1) range management policy, especially in the arid and semi-arid areas; (2) disease control policy in the humid and subhumid areas; (3) policies promoting the development and extension of agroforestry and improved fallow techniques in the semi-arid and subhumid areas; and (4) soil and water protection policies in situations of intensified animal production. In the remainder of this paper I discuss range management policy in some detail.

Introduction to the problem

The myth that communal rangelands will be over-grazed and that overgrazing will invariably lead to irreversible deterioration in rangeland quality, was supported by theories developed by western economists and range managers in the 1950s and 1960s. For an entire generation, that myth has influenced the way that livestock and range management projects and policies were designed and implemented. Very few of these projects or policies have been declared to be successes. Many, in fact, have been declared economic, social and ecological failures.

The myth, the theories that support it and the policies it has promoted, have been slow to die. Since the early 1980s, a mass of empirical evidence has accumulated to challenge both the alleged "inefficiency" of common property rangeland institutions and the alleged "degradation" of Africa's commonly managed rangelands. Alone, however, such empirical evidence has not been sufficient to debunk such clever clichés as "the tragedy of the commons" (Hardin, 1968).

In the late 1980s and the early 1990s, alternative conceptual frameworks have emerged to replace the "succession-retrogression" model of range ecology. The empirical work of ILCA scientists has been key to the development of the "state-transition" or "persistent non-equilibrium" models of rangeland systems. On the resource management side, Sandford's (1982) model of "opportunistic management" has proven to be invaluable in challenging the simple "tragedy of the commons" model of resource management. Policy makers still encounter difficulties, however, in devising positive interventions to serve the interests of livestock owners and ensure the protection of Africa's rangelands. ILCA is well placed to undertake further conceptual and empirical studies on the management of common property resources. The Centre is also well placed to provide intellectual leadership to the NARS and the international donors as they search for more appropriate resource management policies and programmes.

To help us think through the potential role for ILCA in this area, I present very brief summaries of the "old" models of range ecology and range tenure, the main criticisms regarding the applicability of those models and the "new" models that are now emerging.

*The new African range ecology*¹

In very simple terms, the old range ecology assumes that each area of rangeland has a single state, called the climax, that it will eventually achieve if subjected to no grazing pressure. A rangeland that is lightly stocked will succeed along a smooth sequence of states toward the climax, while a range that is heavily stocked will retrogress through those states away from the climax. The carrying capacity of the range is exceeded—the range is overstocked and there is rangeland degradation—if the grazing pressure is so high that the range retrogresses away from the climax state.

In recent years, a number of range ecologists (e.g. Ellis and Swift 1988; Westoby et al, 1989) have offered propositions that challenge the applicability of the old model to African rangelands. Those propositions can be summarised into the following:

- (P1) On African rangelands, there tends to be an inverse relationship between mean rainfall and the temporal and spatial variation in rainfall.
- (P2) Rangelands are not spatially homogeneous but rather are comprised of various “patches” and “key resources.” Certain patches may be grazed 10 or 20 times as heavily as other areas. Patch use varies across years and seasons (Scoones, 1989).
- (P3) The concept of rangeland carrying capacity is of little use for rangeland management policy. The appropriate stocking rate for an area of rangeland depends upon variable climatic conditions and upon the production system and management objectives of those who use the rangeland (Caughley, 1979; Bell, 1985).
- (P4) The “succession” model of range ecology—in which the concept of carrying capacity plays a key role—is only appropriate for conceptualising “equilibrium” range systems with perennial grasses, high levels of soil nutrients, high rainfall and relatively little temporal variation in rainfall.
- (P5) The “state-transition” model is more appropriate for conceptualising “persistent non-equilibrium” range systems. Non-equilibrium rangelands are dominated by annual grasses, receive relatively little rainfall and are kept in perpetual disequilibrium by episodic climatic events. The state-transition model assumes that each rangeland has several discrete and relatively stable states or vegetation communities. Transitions between states can be triggered by substantial changes in weather, fire, or perhaps less often, grazing pressure (Westoby et al, 1989; Dodd, 1991).
- (P6) The concept of degradation should be re-evaluated for non-equilibrium rangeland systems. For changes in a rangeland to be called “degradation,” they should be long-term and have negative impacts on the capability of the rangeland to produce economically important products.
- (P7) For non-equilibrium systems, livestock/rangeland policies should be devised that facilitate “opportunistic management” (Sandford, 1982) of the variable forage and water resources.

¹ For my brief review I draw upon a paper that J. L. Dodd prepared for the Winrock Study and upon a document recently published by the Commonwealth Secretariat entitled *Rethinking range ecology: Implications for rangeland management in Africa*. The latter document summarises the proceedings of a meeting on “Savanna Development and Pasture Production” held at Woburn, UK in November 1990.

New range management and tenure theory

Range management policy needs to account for more than ecological realities. It also needs to consider the economic, social and institutional dynamics that shape the policy environment. This is where ILCA policy research comes in. Policy makers need new concepts and models of rangeland tenure and rangeland management.

In very simple terms, the old theory of range management and range tenure is that African livestock owners are forever driven to accumulate more and more livestock. When those people have access to collectively used rangelands, this accumulation is only constrained by their ability to breed and purchase new animals, by periodic droughts and by diseases such as rinderpest and trypanosomiasis. According to this model, the only way to limit the overgrazing that this promotes is to introduce people to the market value of their livestock and confine each individual's livestock to his/her own individual plot of land.

The new theory is based on more careful analysis of livestock owners' incentives, the operations of common property regimes and the impacts of governments. Sandford's (1982) proposition about the potential benefits of "opportunistic management" is a central tenet of the new theory. Also important are the studies that have shown that African livestock owners are very rational in using their animals as credit and insurance market substitutes (Fratkin, 1986; Swinton, 1986). Some of the analysts who have challenged the applicability of the open access model have offered new theoretical models of common property (Runge, 1981; Runge, 1985). In Swallow (1991), I argue that the common property regimes for African rangeland resources are comprised of diverse constellations of rights, rules, conventions and contracts. To understand the operations of those institutions, one must consider the governance structures on which they are based, the nature of the dynamic interactions between resource users, the incentives of individual resource users and the incentives of those individuals and agencies who are charged to enforce the terms of the institutions.

The economic, social and institutional environment

Where would researchers interested in range management policy go with these new concepts and models? Several propositions from the theoretical and applied literature that have implications for the development of range management policy have been distilled and are presented below.

- (P1) The more variable their environmental conditions, the more mobile, flexible and diverse—opportunistic in Sandford's terminology—livestock owners' strategies must be. In highly variable environments, livestock owners will favour strategies that maximise flexibility in their management practices, market transactions, portfolio choices and institutional transactions (Swallow, 1990). Livestock owners will have reason to react against policies that attempt to restrict their mobility and flexibility.
- (P2) The structure of livestock ownership has changed dramatically in the last twenty years. In many places there has been a democratisation of ownership that has reduced the power of traditional authorities. In most places there has also been a centralisation of ownership among livestock owners and across Africa there has been an increase in absentee ownership of livestock. Traders, government employees and urban workers are increasingly becoming the new class of livestock owners (Little, 1985). Policies must take account of the diversity of interests among livestock owners.
- (P3) African governments have generally proved to be ineffective in managing rangeland resources as state property. Policies should be encouraged that support individual or group rights to commonly-used resources.

- (P4) Governments may have important roles to play in the definition and protection of the property rights of groups and individuals. With population increase and economic and institutional changes occurring elsewhere in society, the customary property rights of livestock owning groups are generally being undermined (Shanmugaratnam et al, 1991). In such situations, governments can play important roles in defining the “boundaries” of common property regimes.
- (P5) Governments can provide research and extension support to livestock owners and others to facilitate the opportunistic management of rangeland resources exhibiting high spatial and temporal variability. Research needs to be redirected to be consistent with the new models of rangeland ecology and rangeland tenure.
- (P6) Governments, or perhaps more appropriately non-governmental organisations (NGOs), can play roles to protect the interests of livestock owners who are most vulnerable to the effects of drought. Even when they lose all of their livestock capital in droughts, pastoralists still have great capability to take advantage of favourable post-drought ecological conditions. Restocking programmes may be the most cost-effective form of famine relief in many circumstances (Hogg, 1987).

ILCA's comparative advantage

ILCA needs to determine an appropriate balance between policy research, research that aids the development of more appropriate policies and organisational research providing intellectual leadership to help guide others' research and development programmes. In terms of policy research, there are three research areas in which ILCA has comparative advantage: (1) resource tenure, ILCA's previous work on land tenure and alley farming, its links with the University of Wisconsin (Land Tenure Center and International Agricultural Programs) and the interests of many of our economists strengthen this advantage; (2) the dynamics of livestock keepers' portfolio choices, production strategies and marketing strategies; and (3) the distributional impacts of environmental change and new livestock production techniques.

In terms of organisational research, ILCA can play a great role in terms of intellectual leadership by providing a bridge between the theoretical, conceptual research of western research organisations and the practical environment in which NARS and NGOs operate. Several institutional arrangements and networks already exist among research organisations (see Annex for a partial list).

References

- Bell R H V. 1985. Carrying capacity and offtake quotas. In: Bell R H V and McShane Caluzi E (eds), *Conservation and wildlife management in Africa*. US Peace Corps, Washington, DC, USA.
- Bromley D W. 1991. *Environment and economy: Property rights and public policy*. Basil Blackwell, Oxford, UK.
- Caughley G. 1979. What is this thing called carrying capacity? In: Boyce M S and Hayden-Wing L D (eds), *North American Elk: Ecology, behavior and management*. University of Wyoming Press, Wyoming, USA.
- Dodd J L. 1991. *Animal agriculture and desertification/degradation in sub-Saharan Africa*. Rough draft. Background paper for the Winrock study of animal agriculture. Winrock International, Morrilton, Arkansas, USA.
- Ehui S K and Spencer D S C. 1990. *Indices for measuring the sustainability and economic viability of farming systems. RCMP Research Monograph 3. Resource and Crop Management Program*, IITA (International Institute of Tropical Agriculture), Ibadan, Nigeria.

- Ellis J E and Swift D M. 1988. Stability of African pastoral ecosystems: Alternate paradigms and implications for development. *Journal of Range Management* 41:450–459.
- Fratkin E. 1986. Stability and resilience in East African pastoralism: The Rendille and the Ariaal of Northern Kenya. *Human Ecology* 14:269–286.
- Hardin G. 1968. The tragedy of the commons. *Science* 162:1234–1248.
- Hogg R. 1987. Development in Kenya: Drought, desertification and food scarcity. *African Affairs* 86:47–58.
- ILCA (International Livestock Centre for Africa). 1987. *ILCA's strategy and long-term plan: A summary*. ILCA, Addis Ababa, Ethiopia. 25 pp.
- ILCA (International Livestock Centre for Africa). 1992. *The potential for impact: ILCA looks to the future*. ILCA Working paper 2. ILCA, Addis Ababa, Ethiopia. 58 pp.
- James D E, Nijkamp P and Opschoor J B. 1990. Ecological sustainability and economic development. In: Archibugi F and Nijkamp P (eds), *Economy and ecology: Towards sustainable development*. Kluwer, Dordrecht, The Netherlands.
- Lawry S W. 1990. *Tenure policy and natural resource management in Sahelian West Africa*. LTC Paper 130. Land Tenure Center, University of Wisconsin, Madison, Wisconsin, USA. 20 pp.
- de Leeuw P N. 1992. Potential environmental impacts. In: *Potential for impact: ILCA looks to the future*. ILCA Working Paper 2. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. pp. 11–25.
- Little P. 1985. Absentee herd owners and part-time pastoralists: The political economy of resource use in Northern Kenya. *Human Ecology* 13:131–151.
- Runge C F. 1981. *Institutions and common property externalities: The assurance problem in economic development*. PhD dissertation. University of Wisconsin, Madison, Wisconsin, USA.
- Runge C F. 1985. Common property and collective action in economic development. *World Development* 14:623–635.
- Sandford S. 1982. Pastoral strategies and desertification: Opportunism and conservation in dry lands. In: Spooner B and Mann H S (eds), *Desertification and development: Dryland ecology in social perspective*. Academic Press, New York, USA. pp. 61–80.
- Scoones I. 1989. Patch use by cattle in a dryland environment: Farmer knowledge and ecological theory. In: Cousins B (ed), *People, land and livestock*. Proceedings of a workshop on the socio-economic dimensions of livestock production in the communal lands of Zimbabwe. Centre for Applied Social Sciences, Harare, Zimbabwe.
- Shanmugaratnam N, Vedeld T, Mossige A and Bovin M. 1991. *Resource management and pastoral institution building in dryland Africa*. Report to the World Bank. Draft. Norwegian Centre for International Agricultural Development, Agricultural University of Norway.
- Swallow B M. 1990. *Strategies and tenure in African livestock development*. LTC Paper 140. Land Tenure Center, Madison, Wisconsin, USA. 67 pp.
- Swallow B M. 1991. *Common property regimes for African rangeland resources*. PhD dissertation. University of Wisconsin, Madison, Wisconsin, USA. 338 pp.
- Swinton S M. 1986. Drought survival tactics of subsistence farmers in Niger. *Human Ecology* 16:123–144.
- Westoby M, Walker B and Noy-Meir I. 1989. Opportunistic management for rangelands not at equilibrium. *Journal of Range Management* 42:266–274.

Annex

Research centres and networks studying pastoralism and range management (I acknowledge the assistance of Dr. Angelo Maliki Bonfigliou of Nomadic People's Association (NOPA), Nairobi, Kenya, in helping to prepare this list.)

1. African Centre for Technology Studies (ACTS), Nairobi, Kenya. International Development Research Centre (IDRC) and International Institute for Environment and Development (IIED) have offered to assist ACTS to establish a Drylands Research Institute. This is still at the planning stages. Dr. Juma (Executive Director of ACTS) has indicated interest in the possibility of ILCA scientists providing advisory assistance.
2. Arid Lands Unit, Oxfam (Oxford Committee for Famine and Relief), UK and Réseau international des terres arides (RITA), Dakar, Senegal. The Arid Lands Unit publishes an information exchange bulletin. Responsibility for publishing the bulletin is soon to be transferred to RITA.
3. Turkana Resource Evaluation and Monitoring Unit (TREMUR), Lodwar, Kenya. There is a possibility that TREMUR will expand into a subregional resource management centre with the support of United Nations Sudano-Sahelian Office (UNSO) and the Scandinavian Institute of African Studies (SIAS).
4. United Nations Sudano-Sahelian Office (UNSO), Nairobi, Kenya. The Nairobi office of UNSO supports research and development organisations for the arid areas of eastern Africa.
5. Nomadic People's Association (NOPA), Nairobi, Kenya. This project is jointly sponsored by United Nations Children's Fund (UNICEF) and UNSO and is based in Nairobi. One goal of NOPA is to network university lecturers, researchers, technicians, Non-Governmental Organisations (NGOs) and leaders of pastoralist groups through a pastoral network (PANET). NOPA maintains a directory of African researchers interested in pastoral issues, has recently compiled a large annotated bibliography on pastoral issues (that will be made available as a bibliographic data base) and supports discussion groups of those researchers in several countries.
6. International Institute for Environment and Development (IIED). IIED, under the co-ordination of Drs Charles Lane, Camilla Toulmin and Ian Scoones, are just beginning a multi-country, multi-centre, programme of research on pastoral land tenure. The goal of this programme is "to support and inform the debate on common property resource management and contribute to the resolution of conflicts over land, clarifying the policy options available to national planners and donor agency personnel and providing the basis for more efficient land use in dryland Africa." Under this programme, IIED intends to support government commissions (in Kenya, Tanzania, Niger), NGOs (Oxfam and the Advisory Committee on Energy Research and Development (ACORD)), independent research centres (ACTS in Kenya and Centre for Basic Research (CBR), Makerere University in Uganda), universities (Zimbabwe), pastoral organisations (Tanzania) and individual researchers (in Ethiopia, Somalia, Sudan, Mauritania, Mali, Tanzania, Kenya, Uganda and Nigeria). Dr. Lane has indicated his interest in possible collaboration with ILCA.
7. Commonwealth Secretariat (CS). Since 1987 the Commonwealth Secretariat has been undertaking a study on the management and sustainable use of communal rangelands in Africa. The CS organised the Woburn and Matopos meetings. The proceedings of the Woburn meeting are to be published by the World Bank in the form of a book.
8. Information Centre for Low-Input and Sustainable Agriculture (ILEIA), The Netherlands. ILEIA supports information exchange through its newsletter. A forthcoming 1992 issue of the ILEIA newsletter will focus on the role of livestock keeping as a key to human use of natural resources in the drylands.
9. Pastoral and Environmental Network in the Horn of Africa. This UK-based organisation produces another information exchange newsletter.

10. World Bank. A team of researchers from the Norwegian Centre for International Agricultural Development has recently completed a study of World Bank activities to support pastoral organisations (Shanmugaratnam et al, 1991).
11. University of Wisconsin (UW). The University of Wisconsin is a strong intellectual leader in the area of natural resource management in developed countries. ILCA has recently concluded a collaborative project with the UW's Land Tenure Center to examine the relationships between land tenure and the adoption of alley farming. The Land Tenure Center has now initiated a similar study with the International Centre for Research in Agroforestry (ICRAF). Also, the UW College of Agriculture and Life Sciences has recently begun a five-year project for United States Agency for International Development (USAID) to conduct research on resource institutions and pricing for developing countries and Eastern Europe.
12. Scandinavian Institute of African Studies (SIAS). SIAS has a long history of research on pastoral issues and publishes the journal *Nomadic Peoples* under the editorship of Anders Hjort and Mohammed Salih. SIAS is now working with Swedish International Development Authority (SIDA) and Southern Africa Development Coordination Conference (SADCC) to support the Range Management Department of the University of Nairobi to develop a multi-disciplinary Masters Programme in Pastoral Management.

Discussion

- C: It is not just the model that needs to be changed, but the framework as well.
- Q: What do you expect to get out of range management work in the arid areas?
- A: ILCA's mandate is not only to increase milk and meat production. We have a responsibility to the resources and the people. There are many vulnerable people in the area. The question is, what can we do to help these vulnerable groups?
- C: If ILCA's goal is to reduce poverty, then identifying the factors contributing to environmental degradation and poverty are important and the Centre has a role to play here. Therefore, it is key to identify policy factors that will help alleviate poverty in those areas.
- Q: How can you address poverty if you do not address production?
- A: Protecting the environment is a way of improving productivity.
- C: There are some differences in the arid and semi-arid zones that could be technologically exploited. Keeping people in agriculture could help reduce poverty for producers and consumers.
- C1: If there is alleviation of poverty, it will be among consumers. If producers incomes rise, it will be because they leave and go elsewhere.
- C2: Regarding priorities, ILCA has a comparative advantage to look at the physical mechanisms/processes of resource degradation. This is the basis for doing policy research.
- C: I do not agree that livestock production increases consumer income by reducing prices.
- C: Donors want to promote productive employment provided it is within the Centre's mandate. Much of the work on rural contractual arrangements is superficial.
- C: I agree that we know little about the physical processes of degradation. In Ethiopia, the causes of desertification are being identified and the extent of degradation has

been evaluated. There is a lack of information regarding what should be conserved. ILCA could have a role to play here.

General discussion

- C: Monitoring is another area of comparative advantage for ILCA. ILCA has been in the forefront using remote sensing data. We have mainly used it in the Sahel. We have developed close collaboration with those using remote sensing as a tool of measurement.
- Q: Regarding Dr. Ehui's presentation on behavioural models, we have done a lot of behavioural studies with cattle. How does this type of knowledge get integrated into the economists' behavioural model? What is the connection between the two?
- A: The economist's model is used to explain the behaviour of people.
- Q: How do we link the micro- and macro-level work?
- A: It depends.
- C: Do not forget about human resources. There are many people in these zones with a great deal of knowledge. They should be consulted/involved when we talk about livestock policy research. They can help us set our agenda and provide valuable information regarding technology and the transfer of technology.
- C1: I am concerned that our focus on policy research is on the arid areas alone. I think we should expand our horizon.
- C2: The Fulani, Maasai and Borana all epitomise pastoralism under dry land conditions. Fifty years from now, they are likely to still be traditional rather than be part of a market economy. They may stay out of a cash based economy. We do not know what to do until we commit ourselves to a vision of the future.
- C: It is a complex issue. It is hard to know how they will change.
- C: Many Fulani have been integrated into a market economy for a long time. My question would be, how will they diversify? The point is to look at how groups are evolving.
- C: This is a researchable issue and an area where sociology is needed.
- C: The greatest pay-off from land tenure studies will be in the highlands, subhumid and humid zones, not necessarily in the arid zones.
- C: The problem of resource management and degradation is in all areas. ILCA, however, may be the only centre looking at these issues in the arid zone. Thus, we may, in fact, have the greatest comparative advantage for work in the arid zone.
- C: Regarding land tenure, we know it responds to a few factors. This has been measured before. ILCA will not change it. The Centre can synthesise the literature, but has no leverage to change it. I think your land tenure studies would only confirm what is already known. It would be more fruitful for the Centre to estimate real degradation areas and develop technologies where they seem to be significant.
- C: This goes to the issue of our target audience. It might be different for technology generation and policy. Technology generation is targeted for livestock producers. Policy research is more difficult to identify. Twenty-five to 30 years from now, 700–800 million people will need to be fed. We need to think about who will benefit. Most probably, it will be those who are more powerful, e.g. those who can get into the market. We need to look at high potential zones and what might happen there. Because of the population dynamics that may evolve, we may also wish to look at larger-scale producers.

C1: This goes back to your goals as an institution. The rate of urban and overall population growth are exogenous variables. If you go into high potential areas, you could influence the direction of growth. It is all interrelated. The policies you choose to focus on will affect how the arid zone will look in the future.

C2: My plea is that you look at what livestock development can do for poor people with a focus on the rural (although not exclusively) poor.

End of Thursday, 26 March 1992 general session.

SESSION V

**Working group presentations
and discussion**

Group 1: Trade and macro-economic policies: Priorities for sub-Saharan Africa and ILCA

Presenter: G. Mullins

*Group members: K.H. Shapiro (Chair), G. Mullins
(Rapporteur), E. Betubiza, N. Gizaw,
A.Niang, W.Oluoch-Kosura, T. Williams*

As the context in which livestock activities take place and to which they ultimately must respond, the macro-economic environment plays a crucial role in the development of the national livestock sector. In addition, macro-economic policy conditions opportunities for trade and may thereby facilitate expansion of the livestock sector, or conversely, limit sectoral growth. In the presentations made by invited speakers and during subsequent discussion, the following trade and macro-economic policy issues were highlighted as being of particular consequence for sub-Saharan Africa's (SSA) livestock sector development:

- 1) Structural adjustment/liberalisation
- 2) Regional economic integration
- 3) The evolving comparative advantage of various SSA countries in different livestock products
- 4) Impediments to trade (trade barriers)
- 5) Harmonisation of regional macro-economic policies
- 6a) Market prospects for different products among various consumer groups
- b) Preparation of a "directory" of livestock markets and marketing institutions
- 7) World market conditions
- 8) Coping with variability
- 9) Improving data
- 10) Encouraging price policy reform
- 11) Credit supply
- 12) The role of livestock in African economic development
- 13) Land policy reform

The working group evaluated each of the above policy issues with respect to its comparative need for research. It deselected the following issues for the indicated reasons:

- impediments to trade: these are well known and documented
- harmonisation of regional macro-economic policies: may be considered an integral part of regional economic integration
- preparation of a directory of livestock markets and marketing institutions: this is not a strategic research issue *per se*
- world market conditions: work of this kind is already being carried out by other institutions
- improving data: while unanimously agreed to be in need of greater attention and financial support, it cannot generally be deemed a research activity

- encouraging price policy reform: perceived as a component of structural adjustment impact research
- land policy reform: more appropriately addressed as a resource management policy issue.

The group appraised the remaining research issues in terms of their priority for research, and for each articulated: the underlying need for this particular research, the institutions either working on these issues or best qualified to do so, ILCA's comparative advantage and envisioned role in the subject area and opportunities for collaboration. Group deliberations established the following set of research priorities, based on the stated justifications.

Priority 1: The effects of structural adjustment/liberalisation on livestock production but concentrating on supply and demand effects resulting from changes in economic incentives and constraints.

Structural adjustment is already a reality for many sub-Saharan African countries. While its impacts on the public sector maybe documented, specific research is needed on potential Structural Adjustment Programme (SAP) impacts on the livestock subsector. Research on producer supply response would be expected to provide greater insight regarding the constraints that inhibit producer response. This would then afford policy makers a clearer view of the structural changes necessary to stimulate the livestock sector. The International Bank for Reconstruction and Development (IBRD), the United Nations Economic Commission for Africa (UNECA), the African Development Bank (ADB) and the Food and Agriculture Organization of the United Nations (FAO) are involved in this area, and all constitute potential partners for collaboration. The International Livestock Centre for Africa (ILCA), however, has superior understanding of the biological and technical issues surrounding livestock production which are required to fully assess SAP impacts on the livestock subsector.

Priority 2: The effects of and impediments to freer regional trade via economic integration.

The emergence of regional trade agreements and economic communities such as the Economic Community of West African States (ECOWAS), the Preferential Trade Areas (PTA) and the European Economic Community (EEC), bear testimony to renewed interest in economic integration. Especially if European efforts are successful, there will be strong incentive for African countries to form countervailing economic unions. Beneficial integration will require informed policy decisions. Policy research would include projecting changes in national comparative advantage in livestock production enterprises over time (i.e. dynamic comparative advantage) as well as identifying "winners and losers" from removal of existing trade impediments. Analysis of the arguments for and against protective tariff barriers around these regional economic systems would also be required. The Southern African Centre for Cooperation in Agricultural Research (SACCAR), the newly formed African Economic Community (AEC) and the United Nations Development Programme (UNDP) are already examining the consequences of regional integration. Again, however, ILCA's biological and technical expertise makes it an invaluable partner in the assessment of potential costs and benefits of such arrangements with regard to national and regional livestock industries.

Priority 3: Structure of demand for animal products.

Considerable work on food demand in SSA has been undertaken by the International Food Policy Research Institute (IFPRI). However, relatively little attention has been devoted specifically to animal product demand. Consequently, ILCA's data bases and understanding in this area are poor. Thorough understanding of the effects on livestock product demand due to macro-economic policy adjustments affecting relative prices of beef, mutton, fish and other foods, requires knowledge of demand structures. This information will also be needed to complete our understanding of micro-level impacts on household consumption. On yet another level, understanding the complexities of market segmentation can provide useful insight into the distributional effects of changes in macro-economic variables. Knowledge of the geographical attributes of different consumption patterns will provide further understanding about the distributional effects of policy change and may guide locational decisions for livestock development. IFPRI's substantial data bases and its proven expertise in food policy analysis, identify it as the lead partner in this area of research; ILCA's need for estimates of demand for different livestock products necessitate its involvement.

Other important areas of policy research

Coping with variability as a result of drought and world market fluctuations

Cyclical droughts and down-turns in world prices for livestock products have had catastrophic consequences for SSA's livestock owners. Currently, there are no effective policy mechanisms for softening the blows of these events, though the potential benefits of such mechanisms would be substantial. Perhaps livestock policy research could borrow aspects of crop insurance schemes or STABEX (Export Stabilization System) lending to devise means of protecting livestock owners against these periodic phenomena. Ideas on this subject could be explored together with the International Monetary Fund (IMF), IFPRI, or individual specialists, e.g. P. Hazell.

Credit for livestock adoption, production and trade

The issue of credit is often put forth as an impediment to livestock technology adoption. Still others contend that formal lending institutions cannot compete with indigenous informal credit institutions for their efficiency. Further research needs to be done in order to clarify these and other credit-related issues. ILCA's technical expertise and its interest in the adoption of the livestock technologies which it has developed—and will develop in the future—give it a comparative advantage in this area. Likely partners in this area of research are national agricultural finance institutions, universities and perhaps more interestingly, non-governmental organisations involved in livestock promotion, such as Heifer Project International.

The above review of possible research issues and of ILCA's role in that research suggests that trade and macro-economic policy should not be a major focus for ILCA. However, the Centre does have a role to play in facilitating and supporting analysis of livestock-related issues in the first three broad topics listed above. ILCA must redouble its efforts to develop or identify appropriate policy analysis tools through its own research and make sure the ability to use these tools is transferred to national policy analysts. One approach suggested for transferring these analytical tools is to include analytical appendices in all of ILCA's research publications.

The group unanimously agreed that some central repository for African livestock data was needed and that it would be most desirable if this data could be standardised. It was suggested that ILCA spearhead this effort by defining a standard set of data needed to

conduct livestock policy research. It could then contact other livestock monitoring agencies, e.g. FAO, United States Department of Agriculture (USDA) etc to discuss gaps in existing data and how to go about filling them. In the meantime, ILCA should continue with its present approach to African livestock data collection, i.e. down-loading FAO data tapes and augmenting these with available national data.

The body of African livestock policy analysts appears too small to merit transforming African Livestock Policy Analysis Network (ALPAN) to a collaborative research network. Alternatively, perhaps ALPAN could be used to fund existing regional research journals. At the very least, the hope was expressed that ALPAN would serve the function of keeping African livestock policy analysts informed about research in progress.

Discussion

Q: What kind of policies/benefits are likely to come out of these research efforts?

Q: Can you repeat the issue of credit and technology uptake?

A: Credit plays a role in the adoption of livestock technology and sustainability. It is an important area of research but should not be accorded priority above variability and control. Some of the group members thought that informal credit markets are more efficient at present.

A: There was a split in the group regarding whether credit was still an open question or well researched. In the end, there was no consensus. Thus, we said maybe more research is important.

C: Credit, variability and livestock production may be issues more important to Group 2. I am not sure that this is a macro-level problem. The biggest issue in terms of variability and livestock production is the poverty dimension which is a more micro-level issue. Additionally, if credit was perceived as a macro-level issue, it would need to be viewed for individual situations.

Q: Given the movement towards structural adjustment and liberalisation, do you think that a secondary data base is sufficient to move into sectoral analysis?

A: No, but we need to recognise that this is an important issue. This will help tease out non-price effects. I do not think this will be a major role for ILCA.

Q: Which issues on your list are priority areas for ILCA?

A: The group consensus was that ILCA should look at the livestock sector while the World Bank could look at structural adjustment on a global level. ILCA has a comparative advantage in terms of biology and technology issues. The concern is that the livestock sector will be overlooked unless we somehow get involved, i.e. as a junior partner.

C: This sounds like an affirmation for multidisciplinary input. Would the group allow for ILCA to serve as facilitator and identify expertise? On the statement made that benefits from livestock development are small, I would argue that compared to crops, livestock development has done well. Development has been low because the financial input has been low.

C: We were thinking more in terms of policy output. Maybe we do not have a comparative advantage in macro-economics and trade policy.

C1: ILCA does have a comparative advantage in terms of regional trade issues. To understand these issues, they must be backed up with solid micro- and farm-level information that ILCA does have. This may be done with other groups. The producer

price response was de-emphasised by the group because the non-price structures were viewed as more important.

- C2: In terms of demand for livestock products, ILCA should not enter into demand projections. So much is already done. Since demand will not run out for some time to come, it should be left alone as a researchable issue.
- C: A great deal of work is going on in reference to regional trade markets. ILCA should consider this work.
- Q1: How high a priority should research on regional trade be for ILCA? Would it have high enough impact in terms of policy implications?
- Q2: In terms of demand projections, one point to consider is the location(s) and nature of the demand. Could this be a researchable issue?
- A2: Yes, but this should be done by national institutions.
- Q: Does FAO, rather than ILCA, have a comparative advantage as a data base clearinghouse?
- A: The group suggested that a repository be developed and standardised but we did not specify/suggest that it be ILCA.
- C: FAO is an intergovernmental organisation. They are less likely to support non-governmental data unless it is supported by governments. ILCA is in a better position to do this.
- C: Should ILCA be archiving data? The Centre should not compete with FAO but it has a comparative advantage in terms of collecting primary data on livestock production. If the data could be standardised and made available, then archiving becomes an issue. Do we have proper documentation? Such a data base would be useful.
- Q: Does the Livestock Information Management System (LIMS) have this capacity?
- A: The package is so flexible in defining variables, that it can serve many purposes, including archiving.
- C: The quality of livestock data is abysmal. To do policy analysis with this data is questionable.
- Q: I detect some hesitation to push forward the collection of primary data. Is this an accurate perception?
- A: At all locations, primary data collection is taking place.
- A: There is no reluctance—rather, a recognition that it has been difficult to pool information from surveys for cross-site comparisons. As we get better at these comparisons, more will come out. Our networks are also contracting to carry out surveys.
- C: ILCA's role in the collection of national statistics has been useful.
- Q: Can you say more about policy analysis tools?
- C: The key point may be training and information, not policy tools and instruments.
- C: National institutions need new tools and models for analysis. We need to help policy analysts access information etc so that they may do this type of research on their own. ILCA cannot take a lead on macro-policy but there is room for collaboration, advisory services etc.

Group 2: Technology policy, markets and institutions

Presenter: B. Shapiro

*Group members: P. Pinstrup-Andersen (Chair),
B.I. Shapiro (Rapporteur), F. Dolberg,
M. Jabbar, M. Lipner, J. McIntire,
D. Perthel, L. Reynolds, J.Y. Yao*

Making a distinction between policy and other types of economics research in the areas of technology, institutions and markets is not meaningful. Micro-level research in these areas should be linked with addressing policy questions so that the policy implications of the micro-work become clear.

Priority areas and topics

The following areas and topics are considered priorities for the International Livestock Centre for Africa (ILCA) economics research in the coming years.

Identification of priority research topics

Species and commodities that are of importance in fulfilling ILCA's objectives are those that have the potential to increase production and improve the welfare of farmers and the urban poor. The framework for determining the potential impact of research on specific species and commodities should include consideration of the following factors that influence the potential for change:

- enterprise location: market access; rural/urban impact (target populations)
- enterprise scale: potential for economies of scale
- degree of specialisation: mixed to specialised.

This *ex ante* evaluation work should be carried out by agro-ecological zone to identify species and commodities as well as technologies that ILCA should be working on. This can be collaborative work carried out with national agricultural research systems (NARS). The specifics of how this work should be carried out can best be determined jointly by ILCA and NARS.

Topics of importance that should be investigated within this framework include:

- dairy: goats, cattle
- fattening: cattle, small ruminants
- swine and poultry.

Research on these topics can be policy-oriented and not necessarily technology research.

Economic incentives and technological change

How price and non-price factors influence technological change.

- Factor markets
 - land tenure
 - credit

- labour

Price policies and institutional factors indirectly affect technology adoption through the factor markets.

- Output markets
 - input and product prices
 - non-price factors (quality, infrastructure, market efficiency)

More emphasis should be given to non-price factors since much progress has been made in recent years to remove price distortions. Furthermore, there is a need to advance the theoretical and empirical study of non-price factors.

Political economy of national agricultural research and extension programmes

This is an important issue for livestock development in sub-Saharan Africa (SSA). However, given that this is a new area of research for a commodity-focused research institute such as ILCA, the group recommends an exploratory approach making use of a post-doctoral or visiting scientist with a social science specialisation. It is essential, however, that the trial period for this exploratory work be not less than two years since it takes time to understand the relationships involved and carry out this type of political science research. It is recommended that this work be carried out collaboratively with institutions such as the International Food Policy Research Institute (IFPRI), the International Service for National Agricultural Research (ISNAR) and national institutions that have this type of expertise.

Priority research topics should include:

- institutional structures and linkages
- political economy of technology generation and transfer
- political economy of national decision making.

Strengthening national agricultural research and technology transfer systems

Although ILCA does not have a comparative advantage to carry out this important area of research alone (ISNAR and similar institutions are better equipped to do this type of work), ILCA should be involved with ISNAR etc since the Centre has the technical expertise in the areas related to livestock.

Priority research topics should include:

- institutional change
- government expenditures and allocation
- institutional structures and linkages
- efficiency of resource use and service delivery (public and private roles).

Consumption and demand of livestock products

This important area of research would explore the implications of consumption patterns for livestock policy. It should begin by exploiting existing data sets for sites in SSA, collected by ILCA and other research organisations, including NARS. This is a prime area for collaboration with IFPRI.

Gender issues

Gender issues were not specifically identified as a separate priority area of research. Although the working group recognises that gender issues, as well as issues related to other family member relations, are often critical in the area of technology, institutions, markets

and policy research, it was felt that these are best considered within each of the priority research areas where they are hypothesised to be relevant. Gender and family relations should be understood and incorporated as needed into ILCA research.

ALPAN and the policy analysis course

The working group considered at length the effectiveness of present endeavours and possible areas of modification. The group concluded that both are successful at achieving their current objectives and could not be easily modified to achieve other objectives, such as providing research training and promoting collaborative research.

It is recommended that one way in which ILCA could provide further research training and promote collaborative research would be by institutionalising short-term training as a part of collaborative research projects. Thus, when a collaborative research project is identified, collaborating NARS scientists could be brought to ILCA for short periods for project planning, methodology training etc.

Discussion

Q: Within ILCA, we are overwhelmed with areas of potentially highly significant impact. Did this group consider a better alternative to ALPAN and the training course? Drop them and move money to areas of potentially high impact?

A1: We do not think there is high impact from ILCA's training of policy analysts through the present course. A better approach is to bring in collaborators to receive training in order to help them carry out research. This is better than bringing in people for general training. However, the opportunity costs of collaborative training for ILCA scientists are high.

A2: By providing solid conceptual training (the existing training course), there is pay-off. The communication link provided by ALPAN is also seen as important.

C: It is a good question. There are many institutions doing policy analysis. Using national collaborators is the key. Returns on quality and costs should, however, be improved.

Q: I mis-stated myself. It is not the difference between policy research and other research. It is these two activities themselves. Does the group recommend that these two non-research activities be continued?

A: They should be kept but transfer costs to another account.

C: With your points on political economy, with no comparative advantage, we become viewed as facilitators of relationships rather than a research institution.

C: The political economy of NARS is definitely a research issue.

C: It is important to capture the linkages between NARS and ILCA in terms of technology development.

C: It sounds like you are talking about the role of ISNAR.

C: ILCA has comparative advantage for looking at linkages between technology generation and technology transfer. ISNAR could take the latter aspect—diffusion.

C: You have to understand the technology in order to analyse it.

Q: When analysing market structure, did you decide it was not important to look at output markets?

A: We are interested in output markets but recommend concentrating on non-price factors.

- Q: You have listed a number of researchable issues. Is it possible to prioritise them?
- A: We did discuss this briefly and felt that they were all useful and important issues.
- C: Location, scale, specialisation and market location—Group 1 grappled with this as well. It seems like such a large and difficult undertaking. I am not sure about the output.
- C: It may be more of a problem in your area, trade and macro-economic policies, than for Group 2.
- C: We did look at species and commodities when discussing scale/ location/ specialisation.
- C: We had specific species in specific locations in mind for economies of scale studies.
- Q: You recommend a post-doctoral scientist for some of this work. Is this the best way to go?
- A: Our point was to suggest that this not, at first, be a big effort.

Group 3: Resource management policy

Presenter: B. Swallow

Group members: J. Lynam (Chair), B. Swallow (Rapporteur), S.K. Ehui, Getachew Asamenew, P. de Leeuw, G. Perrier, R. Rose, K. Mashingaidze, A. Lahlou-Kassi

The working group began by identifying key environment and resource issues that are related to livestock development in Africa. In some cases, these issues represent a potential solution to environmental problems; in other cases they are a potential contributor to the problems. Environmental/resource issues were identified for each of five different ecological/production systems: (1) pastoral production systems in the arid zone; (2) mixed crop/livestock production systems in the semi-arid and subhumid zone; (3) newly-introduced livestock production systems in the humid forest zones of West and Central Africa; (4) intensive mixed crop/livestock production systems in the highlands; and (5) smallholder dairy production systems in various peri-urban settings across Africa. For each of these systems, the group identified systems and causes, research needs to diagnose and understand the causes of the resource/environmental problem, policy research to identify solutions and policy research to evaluate alternative instruments for achieving environmental objectives (Figure 1). This matrix was then used to define resource policy needs and research priorities for ILCA.

Recommended research priorities for ILCA

Research priorities were ranked by group—i.e. group 1 is ranked as higher priority than group 2—and within group—i.e. item 1a is ranked as a higher priority than item 1b.

1. Study the effects of resource management institutions (defined as the rights, rules, conventions and contracts that govern the use and management of resource benefits by individuals and groups) on resource use and how changes in government policies affecting those institutions might advance environmental objectives:
 - a) In the mixed production systems of the semi-arid and subhumid zones, this will involve a study of resource competition/complementarity between different land uses and enterprises.
 - b) In the humid areas, this will involve an analysis of the relationships between disease control, livestock development, resource use and the environment.
 - c) In the pastoral production systems of the arid zone, this will involve a study of the linkages between rangeland tenure and rangeland ecology for various ecosystems.
2. Study the effects of credit, commodity pricing and selected macro-economic policies on resource use and the environment, especially in the mixed production systems of the semi-arid and subhumid zones, the highlands and humid areas.
3. Study the environmental implications of new production techniques (e.g. improved fallow, agroforestry etc). This will involve the following:

Figure 1. A matrix of environmental and resource problems and research issues by ecosystem.

Ecosystem/production system	Symptoms and problems	Diagnosis of causes of problem	Research to identify solutions	Research to study policy options
Arid/pastoral	resource and income variation	continued monitoring of resource trends and strategies; reassess systems;	understand linkages between tenure and ecology	government policies toward resource use; policy consistency
Semi-arid/subhumid mixed	nutrient loss and transfer; loss of woody cover; soil loss	management/ownership conflicts; expansion of cash crops; reduced fallow periods; commodity prices; credit	agroforestry; improved fallow; controlled burning; closer linkages between use and management	government policies toward resource use and tenure
Humid/forest areas	loss of woody cover; removal of ancient forest; loss of genetic resources	reduced fallow periods; disease control; commodity prices; forest and macro-policies	trypanotolerant livestock; disease control	relationship between disease control, livestock development resource tenure and the environment
Highlands	soil and water erosion; resource competition	shortage of feed resources; waterlogging; credit; commodity prices	cut-and-carry systems; terracing; contour cropping	review of resource use issues across highland areas
Peri-urban dairy	soil and water erosion; runoff	high population density	movement of resources between uses	government policies toward resource use and tenure

- a) develop and test appropriate methodologies—cost/benefit analysis, sustainability criteria;
- b) examine household and community behaviour and resource management.(e.g. fuel wood collection);
- c) link the results of these studies back to the problem diagnosis and technique development stages of the research process and to technology policy.

4. Selected reviews

- a) In pastoral production systems in arid areas—a synthesis across systems of the dynamics of ecological systems and individual and group behaviour.
- b) In the highlands—a review to determine if there are systematic environmental and resource management issues in the various highland areas of Africa.

5. Environmental monitoring/appraisal

- a) low cost reassessment of systems previously studied,

- b) methodology for linking information collected by environmental monitoring systems to do policy;
- c) soil loss and nutrient transfer.

Selected issues related to environmental policy

Following the mandate given it by the conference organisers, the group also considered several selected issues related to ILCA's research on environmental policy.

1. African Livestock Policy Analysis Network (ALPAN)—It is recommended that ILCA continue to support ALPAN as an information exchange forum. The editors might encourage contributions on topical issues and recommend that certain contributions be referred to relevant journals such as *African Livestock Research*.
2. Networking with potential collaborators—It is recommended that ILCA not undertake the administration of a collaborative research network for policy research. Rather, it should operate through other existing networks administered by ILCA (e.g. feed resources, small ruminant, cattle meat and milk) or networks outside of ILCA (e.g. IIED [International Institute for Environment and Development] network of research on rangeland tenure).
3. Policy analysis training course—In its current form the course has good potential. Issues that need to be addressed are:
 - a) Have past participants benefited and need the material?
 - b) Are the best clientele attending the course?
 - c) Should a condensed course or workshop be convened for higher-level planners and policy makers?
 - d) Should local educational institutions be encouraged to take over the teaching of the course and ILCA provide training materials and instructional assistance? The International Service for National Agricultural Research (ISNAR) and the International Food Policy Research Institute (IFPRI) could be encouraged to provide similar support.

On the subject of training for potential collaborators, the group suggested that ILCA may want to hold short-term intensive workshops (e.g. one week) on well defined research topics.

4. Potential collaborators
 - a) For research on resource management and tenure in the arid and semi-arid areas, several potential collaborators were mentioned including: IIED and their network of African researchers, University of Wisconsin (Land Tenure Center), Utah State University, African Centre for Technology Studies (ACTS) in Nairobi, IFPRI and the International Centre for Research in Agroforestry (ICRAF), especially for issues related to agroforestry (see full list in Swallow presentation, this proceedings).
 - b) IFPRI and Centre ivoirien de recherches économiques (CIRES) were identified as collaborators on credit, commodity pricing and macro-economic issues.
 - c) For research on resource use and environment in the subhumid and humid areas, the International Institute of Tropical Agriculture (IITA), the International Laboratory for Research on Animal Diseases (ILRAD) and the Food and Agriculture Organization of the United Nations (FAO) were suggested.
5. Methodologies—The group focused on disciplinary needs for this research programme. Research on resource tenure will especially need to draw upon various

social science disciplines since it is recognised that the way that resource tenure institutions operate and evolve depends upon a variety of social, economic and political factors. Agricultural economists, sociologists, anthropologists, political scientists, ecologists and all of the biological sciences represented at ILCA would be necessary for the research programme to be a success. Where ILCA lacks the appropriate expertise, collaboration must be sought.

Discussion

- C: We are heading towards a general restructuring of our concept of ecology, rangelands, savannahs. While some of our system studies may be out of date, it might be important to look at this again.
- Q: If so many people are working in this area, where does ILCA have a comparative advantage?
- A: We can catalyse—act as facilitators.
- C: You have to justify your investment in anthropology/sociology etc and indicate what you will get out of these disciplines in the future.
- C: In order to protect at the national level, there is work that should be done at the community level. Also, under point 3, it might be important to examine community behaviour; look at how externalities effect community level behaviour.
- Q: Under point 2, did you examine non-economic factors? Did you look at macro-economic and non-economic issues?
- A: It was raised in discussions in terms of rent seeking, but this is not reflected in the group recommendations.
- Q: What is the expected output of these suggestions?
- A: In part, enhancement of local tenure reforms, micro-level research etc.
- C: Regarding the inclusion of social scientists, I have problems with nutritionists and social scientists. I agree with an earlier comment—they are academics and do not relate to the real world. Both animal and social scientists have proved to be a block to the development process in the tropics.
- C: Social scientists should come into an institution with a more problem-oriented basis and background (e.g. community studies).
- C: Successful policy research is that which forces people to change policies. Therefore, target your audience. You could do very good academic research, but have no impact.
- C: I have worked in multidisciplinary teams; there is a need for dialogue between biological and social scientists. When we deal with non-economic factors, who is going to do the work—e.g. understand community behaviour? Unless we have this information, I doubt we will get very far in our efforts.
- Q: In terms of soil loss in relation to expansion of cash crops and the loss of nutrition, would it be possible to find ways of avoiding the negative effects beforehand?
- C: My observation is that although we have talked about soil erosion as a problem, when we speak of resource use, we talk about how government puts resources to use. We do not have an understanding of the resources themselves. We need to better understand the capabilities of the resources before we attend to their uses.
- C: We looked at each of the areas and discussed whether or not appropriate work had been done in the area. My opinion is that a good deal of work is needed in the area of soil erosion.

- Q: Does your recommendation 1a overlap with the recommendation of group 2? Does recommendation 1c imply a return to group ranch analysis? What is the comparative advantage for ILCA on recommendation 2? Finally, is recommendation 5 seen as a high priority for the investment of resources?
- A1: On priority recommendation 5, rangeland ecology is on the brink of having a major input into redesigning rangeland projects. The role of the Centre is not in terms of experimental design, but to provide intellectual leadership for the next step (in terms of cross-site knowledge).
- A2: On recommendation 1, we do need to focus on micro-level studies (land tenure research)/analysis and link this information to policy. There are many social institutions that shape policy; let us clearly define research objectives. When we have identified specific political and social institutions that are important, then we can bring in other expertise.
- C: Recommendation 3 calls for a clear multidisciplinary approach. This is a methodological issue and fits in at the level of micro-analysis. Once done, the link could then be made between the micro- and macro-level.
- C1: Is there a comparative advantage for ILCA to do work on recommendation 2? I would suggest yes, depending on the nature of the problem identified and identifying key policy issues affecting farmers.
- C2: Regarding land reform, ILCA should take a supportive role for others who are doing research on this.
- C: Groups 1 and 2 seem to be on more solid ground. Given the recommendations of Group 3, I wonder if the Centre goals need to be redefined. Should ILCA's goals be wider. Should we widen our focus from participation in poverty alleviation to an ecoregional centre?
- C: ILCA is combining ecology and economics. They are different disciplines. Conservation is important. There might be demands here that are not part of commodities or poverty alleviation. How does conservation get integrated?
- C1: Among the international agricultural research centres (IARCs), ILCA and ICRAF keep debating this issue because our commodities are fairly high up the ecological chain. In order to improve productivity, we have to take into account most of everything that is going on in the ecosystem.
- C2: Poverty alleviation is not only an issue for the present. Sustainability, however, is for the future.
- C: Recommendations 1a, 1b and 3 need economic analyses of their environmental costs due to technology generated by ILCA. This is an area where ILCA has a special niche.
- C: Of all the centres, ILCA is the only one that stands out as having a comparative advantage for work in the arid areas.

Closing remarks

[What follows is a summary of comments made by Drs Ehui, Fitzhugh and Walsh.]

The concept for this workshop came about during the 1991 ILCA Annual Programme Review. There was a recognition that the Centre needed to develop a research agenda for the next five years. To help develop this agenda for livestock policy and resource use, we identified key individuals for this workshop.

The objectives of the workshop have been met. You have encouraged us to continue work in the areas of livestock policy and resource management.

It is important that we revise ILCA's strategy at this time. Strategy guides us. In this respect, we need guideposts. The overall desired output is a balanced portfolio. The debate this week renewed our sense of balance. What has emerged reflects a good deal of parallelism with and conformity to the last five-year Centre plan. There are some differences, e.g. emphasis on the environment. ILCA now needs to find ways of achieving as many of your recommendations as possible.

It is clear that what needs to be done cannot be accomplished by ILCA alone. We need partnerships. As well, we will be constrained by TAC (Technical Advisory Committee) and the CGIAR (Consultative Group on International Agricultural Research). Nevertheless, we are optimistic and grateful for your participation and contributions.

March 1992

List of Participants

Abebe Tefferi

Head , Planning Services
Ethiopian Tourism Commission
P.O. Box 2183
Addis Ababa, Ethiopia

Inca Alipui

Executive Assistant
ILCA
P.O. Box 5689
Ababa, Ethiopia

Eustacius Betubiza

Agricultural Economist
ILCA
P.O. Box 5689
Addis Ababa, Ethiopia

Frands Dolberg

Political Scientist
University of Aarhus
c/o DANIDA, Denmark

Simeon Ehui

Agricultural Economist
A/Head, LED,
ILCA
P O Box 5689
Addis Ababa, Ethiopia

Hank Fitzhugh

DDG (Research)
ILCA
P O Box 5689
Addis Ababa, Ethiopia

Getachew Asamenew

Agricultural Economist
ILCA
P O Box 5689
Addis Ababa, Ethiopia

Gizaw Negussie

Senior Advisor
Ministry of Agriculture
P.O. Box 62347
Addis Ababa, Ethiopia

M. A. Jabbar

Agricultural Economist
Team Leader
c/o IITA, PMB 5320
Ibadan, Nigeria

Peter de Leeuw

Ecologist
ILCA
P O Box 46847
Nairobi, Kenya

Michele Lipner

Sociologist
ILCA
P O Box 5689
Addis Ababa, Ethiopia

John Lynam

Regional Economist
Rockefeller Foundation
P.O. Box 47543
Nairobi, Kenya

K. Mashingaidze

Chairman, Crop Science
University of Zimbabwe
P.O.Box MP 167
Mount Pleasant
Harare, Zimbabwe

John McIntire

Senior Economist
World Bank
LA2AG/31420 Room 1-7100
Washington, DC 20433, USA

Gary Mullins

Agricultural Economist
ILCA
P O Box 80147
Mombasa, Kenya

S. C. Nana-Sinkam

Director, JEFAD
UN-ECA/FAO
P.O. Box 3001
Addis Ababa, Ethiopia

Abdoulaye Niang

Livestock Development Officer
UN-ECA
P.O. Box 3005
Addis Ababa, Ethiopia

W. Oluoch-Kosura

Economist
University of Nairobi
College of Agriculture
and Veterinary Sciences
Department of Agricultural
Economics
P.O. Box 29053
Nairobi, Kenya

Gregory Perrier

Coordinator, International
Program
College of Natural Resources
Utah State University, Logan,
Utah 84322-5200, USA

Dirk Perthel

Economist
Winrock Int'l, 08 B.P. 1603
Abidjan, 08, Cote d'Ivoire

Per Pinstруп-Andersen

Director-General
International Food
Policy Research Institute
1200 17th Street, N.W.
Washington, DC 20036
USA

R. Rose

Assistant Director
Bureau of Agricultural &
Resource Economics
GPO 1563
ACT 2601
Canberra, Australia

L. Reynolds

Animal Scientist
ILCA
P.O. Box 80147
Mombasa, Kenya

B. Shapiro

Agricultural Economist
ILCA
P O Box 5689
Addis Ababa, Ethiopia

K.H. Shapiro

Associate Dean & Director
1300 University of Wisconsin
Madison, WI 53706, USA

Michael Smalley

Director
Training & Information
Department
ILCA
P O Box 5689
Addis Ababa, Ethiopia

Brent Swallow

Agricultural Economist
ILCA
P O Box 46847
Nairobi, Kenya

John Walsh

Director General
ILCA
P O Box 5689
Addis Ababa, Ethiopia

Timothy O. Williams

Agricultural Economist
ILCA Semi-Arid Zone
Programme
B.P. 12404
Niamey, Niger

Joseph Yao

Agricultural Economist
Director
CIREC
08 B.P. 1295
Abidjan 08, Côte d'Ivoire