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The Potential for Livestock Production and Trade in West Africa's Central Corridor

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CAER Discussion Paper No. 26, August 1994

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**THE POTENTIAL FOR LIVESTOCK PRODUCTION AND TRADE IN
IN WEST AFRICA'S CENTRAL CORRIDOR**

May 1994

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**THE POTENTIAL FOR LIVESTOCK PRODUCTION AND TRADE IN
IN WEST AFRICA'S CENTRAL CORRIDOR**

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ABSTRACT

This paper presents the principal findings of a larger study which evaluates the economic value of ruminant livestock production and the prospects for livestock trade in the West Africa's *central corridor*: Mali, Burkina Faso, Ghana and Côte d'Ivoire. The study finds that despite poor performance in the recent past, the prospects for the ruminant livestock sector of the central corridor are good. Rapidly growing demand for livestock products will create an opportunity for expansion of the sector, and economic analyses suggest that it can competitively meet this challenge, although the resources to do so will come less from traditional pastoral systems and increasingly from production in agricultural zones in the semi-arid and sub-humid tropics. However, growth of herd numbers in these regions must be accompanied by productivity increases if regional livestock is to retain its share of the regional meat market. Productivity growth will require investments to improve feed supplementation, animal health and management. Over the past decade, these investments have been discouraged by policies which have negatively protected the livestock sector. The most important of these disincentives, the overvaluation of the CFA franc has been redressed. This change has created an important opportunity for growth of livestock production and trade in the region. However, to take advantage of this opportunity, public policy needs to insure that the devaluation is sustained, that remaining restrictions to regional trade are removed, and that investments to raise productivity in production, and to increase marketing efficiency and diversification are encouraged.

THE POTENTIAL FOR LIVESTOCK PRODUCTION AND TRADE IN IN WEST AFRICA'S CENTRAL CORRIDOR¹

Study context and objectives

Ruminant livestock is the principal regionally-traded agricultural commodity in West Africa. Despite relatively stagnant production in the last decade, livestock production and marketing still account for an important component of Sahelian countries' gross domestic products. However, a number of issues confront efforts to promote trade in livestock in the region. Traditional livestock production in the region suffers from increasing competition from agriculture for resources as rural populations increase. Competition from cheap extra-regional sources of red meat have further weakened the Sahelian livestock industry. Until January 1994, overvaluation of the Sahel's currency (the CFA franc²) also contributed to an erosion of competitiveness in its principal coastal markets.

These problems have raised questions about the economic viability of West African livestock production. Some fear that because of these factors, the Sahel is losing competitiveness in its traditional market in coastal West Africa. This perception has, in turn, spawned proposals to protect the regional livestock industry through national and regional trade measures.

In light of these issues, the objectives of this study were to evaluate the region's comparative advantage in the livestock sector, the impact of public incentives on production and marketing, and the prospects for regional livestock sector policy coordination to improve the health of the regional livestock economy.

Approach and scope

To achieve these objectives, the study examined recent trends in production, consumption and trade to determine important forces operating on the sector. It then applied Domestic Resource Cost and Effective Protection methods to measure profitability, protection, and comparative advantage for scenarios linking specific production systems with alternative marketing and processing channels. In the context of these results, the study also examined projections of supply and demand for livestock products in the region through the year 2005 in order to reach long-run recommendations for national and regional public policy.

¹ This discussion paper is derived from a longer report entitled *Economic Comparative Advantage and Incentives in Livestock Production and Trade in West Africa's Central Corridor* by the same authors, dated April 1994.

² Côte d'Ivoire also uses the CFA franc, but Ghana uses its own currency, the cedi.

The study focused on the ruminant livestock sector in Mali, Burkina Faso, Côte d'Ivoire and Ghana, which lie in what has been called West Africa's *central corridor* for livestock trade. Ruminant livestock — cattle, sheep and goats — move in this corridor from Mali and Burkina Faso, which are surplus producers, to Côte d'Ivoire and Ghana, which are deficit producers.

To a large extent, the study analyses were built on data from previous research. However, little information is available on a number of issues, particularly with respect to livestock production costs. Therefore, the study used modeling techniques to simulate herd production based on secondary data from such sources as national Livestock Services, international research institutes and various production projects in the region. In addition, local consultants in each country used rapid survey methods to gather current information on factor opportunity costs, market prices and transaction margins.

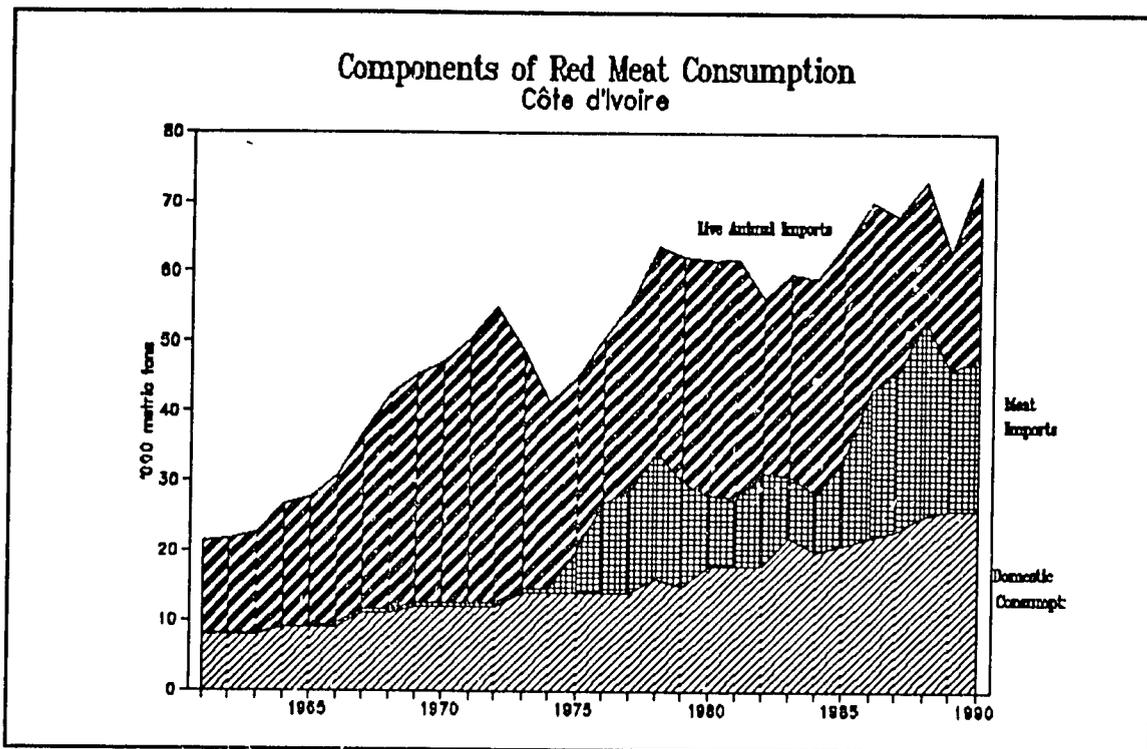
Trends in the regional livestock market

Red meat

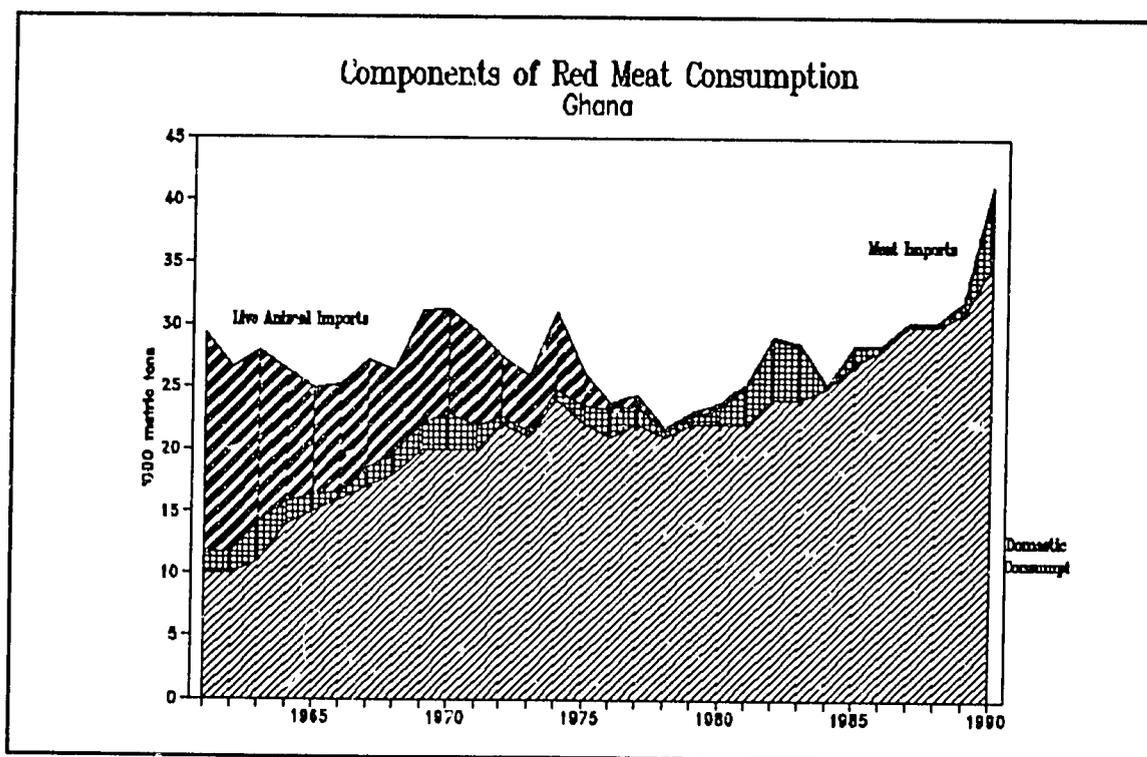
Observers of Côte d'Ivoire and Ghana have voiced concerns that, in both countries, demand for Sahelian livestock is drying up. Against a background of increasing domestic production, meat imported from the world market has partially replaced meat derived from Sahelian animals in Côte d'Ivoire, where imports increased from negligible to appreciable values in the mid-70s and became the most important source of red meat in 1988, as Graph 1 shows. In Ghana, livestock imports from the Sahel have also been displaced, but by local production, rather than red meat imports. See Graph 2.

The initial increase in meat imports to Côte d'Ivoire followed a significant drop in livestock imports from the Sahel on the heels of massive distress sales during the 1968-74 drought. The reduced Sahelian livestock supply coincided with low prices on the world market for red meat and a strong Ivorian economy based largely on buoyant cocoa prices. Together, these factors induced significant inflows of meat, initially mostly from South America. This trend reversed itself in the early 1980s when depreciation of the CFA franc in the early 1980s impaired Ivorian purchasing power and brought about a reduction in meat imports. Drought once more increased the supply of Sahelian animals on the Ivorian market during 1984-85. However, herd rebuilding following the drought shrank Sahelian supply again. This effect, combined with increasing subsidies on European Community meat exports, has caused Ivorians to sharply increase their consumption of animal protein from the EC since 1985. Most of this increase has taken the form of low-quality, fatty meats.

Meanwhile, over the 1980s and early 1990s, production in the region has stagnated. Increasingly severe feed biomass constraints largely explain the lack of growth as increasing human populations throughout the central corridor have led to an expansion of agriculture and a consequent reduction in land used for rearing livestock. In Mali and Burkina Faso, the



Graph 1

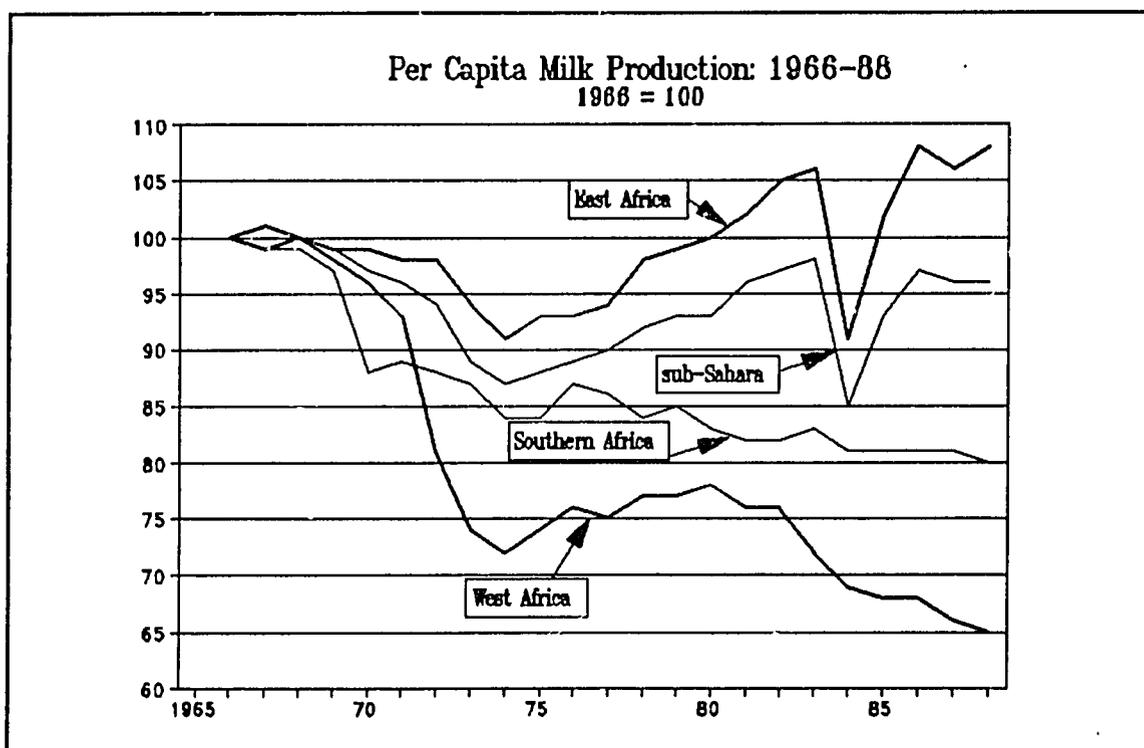


Graph 2

rapidly growing human populations have raised the domestic demand for livestock products, thereby reducing the exportable surplus. Moreover, productivity of West African livestock has not improved perceptibly over the past two decades and lies well below current norms in other parts of the world. Lastly, public-sector attempts to improve productivity through a variety of animal production, animal health, and range management interventions have proven largely unsuccessful.

Milk

Milk production in West Africa has fallen further behind population growth than in any other region in sub-Saharan Africa. By 1988, production per West African inhabitant had fallen to scarcely 60 percent of its 1966 level, while imports had increased nearly six-fold. However, most import growth took place in the period up to 1977 and, in fact, during the 1977-88 period West African imports from the world market dropped at an average annual rate of 1.6 percent.



Graph 3

Commercial imports of dairy products have penetrated more quickly and deeply into the central corridor than meat imports, although important differences exist in milk consumption patterns among the four countries. The most noticeable difference is that Ghana's per capita consumption levels are one tenth those of the other three countries. As would be expected, the Sahelian countries have much lower imports than the coastal countries due to the larger size of their domestic herds. However both Mali and Burkina Faso have

become significant net importers since the drought of the early seventies. In addition, all countries but Côte d'Ivoire received significant contributions of milk as food aid during the early 1980s although this assistance has fallen off since 1988.

Overall, trends in red meat and milk show that the livestock market of the central corridor of West Africa has stagnated over the past decade. Per capita consumption of livestock products has fallen in all four central-corridor countries in comparison to the peak levels of the 1970s because of the declining per capita purchasing power of the population. On the other hand, population growth has sustained gradual growth of overall demand for livestock products.

Prospects for central corridor markets for livestock products

Projections of supply and demand for red meat in the central corridor are presented in Table 1. Two supply scenarios are evaluated. The first extends historical herd growth trends for the past thirty years, while the second reflects expectations of stock and productivity increases derived from various studies of livestock potential in the region.³ Demand growth relies on population growth and consumption increases due to three hypotheses of income growth.

The projection results suggest that even in the most pessimistic scenarios, there occurs a rapid rise in demand for ruminant livestock in all four countries due to rapid rates of population growth. Moreover, under all except hypotheses of negative per capita income growth in the region, demand will outstrip regional growth in production for ruminant livestock products even assuming that substantial gains in productivity can be achieved. These conclusions clearly demonstrate that there is no long-term threat of the coastal market for Sahelian livestock demand drying up. On the contrary, projections suggest that, within two decades, Sahelian countries may be unable to meet their own internal demand for livestock products unless they can significantly raise livestock productivity.

While the analysis does not concentrate on non-ruminant livestock products, these have the potential to accommodate much of the unmet protein demand created by rising populations and income. In particular, poultry and pig production can be expanded with few constraints assuming that regional and world trade in feed inputs is not restricted.

These projection results suggest that demand for livestock products will increase rapidly in the region, but that the prospects for livestock trade within the corridor are poor if current trends continue. This can only be reversed if cattle and small ruminant surpluses within the central corridor can be increased. The next section presents an economic justification for such a strategy.

³ Most notably, these expectations rely on projections of Winrock International Institute for Agricultural Development, *Assessment of Animal Agriculture in Sub-Saharan Africa*, (Morrilton, Arkansas: 1992).

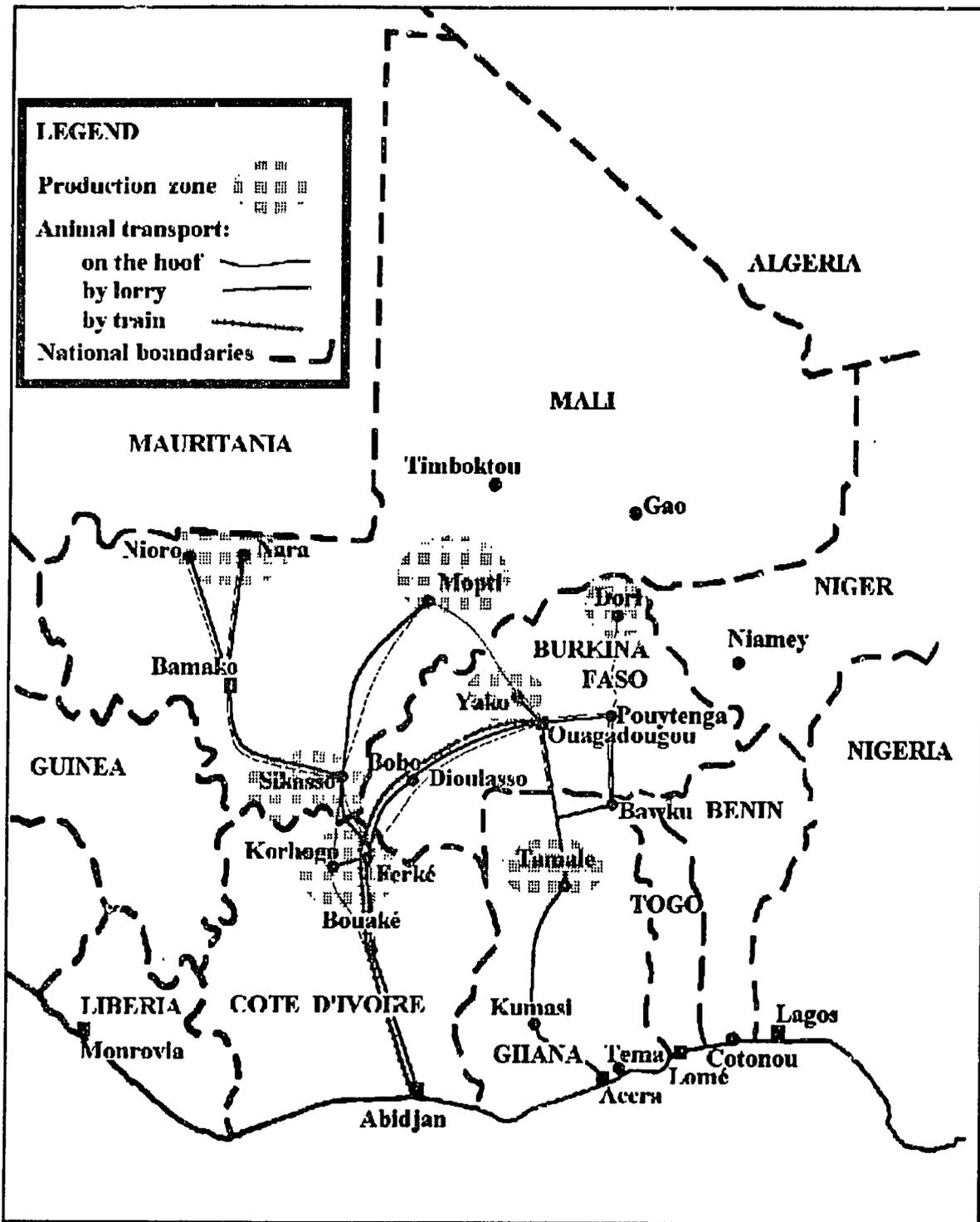
Table 1
PROJECTIONS OF REGIONAL EXCESS DEMAND
GIVEN ALTERNATIVE HYPOTHESES OF ANNUAL PER CAPITA INCOME GROWTH
(tons)

| Demand hypotheses | Pessimistic (-1% growth) | | | Base Case (1% growth) | | | Optimistic (3% growth) | | |
|---|--------------------------|---------|-----------|-----------------------|---------|-----------|------------------------|---------|-----------|
| | Yr 2005 | | | Yr 2005 | | | Yr 2005 | | |
| | as % of | | | as % of | | | as % of | | |
| | Year | Year | base-case | Year | Year | base-case | Year | Year | base-case |
| 2000 | 2005 | hypoth. | 2000 | 2005 | hypoth. | 2000 | 2005 | hypoth. | |
| Supply projections | | | | | | | | | |
| Historical Trend: | | | | | | | | | |
| Beef and Veal | 53202 | 77059 | 67% | 79020 | 115866 | 100% | 110554 | 168251 | 145% |
| Sheep and Goat Meat | 11941 | 13325 | 59% | 18217 | 22759 | 100% | 25883 | 35493 | 156% |
| Potential Stock and Productivity Increases: | | | | | | | | | |
| Beef and Veal | 28329 | 36933 | 32% | 54147 | 75741 | 65% | 85681 | 128126 | 111% |
| Sheep and Goat Meat | 2364 | -2812 | -12% | 8641 | 6621 | 29% | 16306 | 19356 | 85% |

The economic basis for ruminant production

To examine the economic value of livestock production in the central corridor, 11 cattle and 8 small ruminant production systems from 10 locations in the four countries were selected for detailed analysis. In making this selection, an attempt was made to identify representative systems. Systems were also included which hold potential for future growth, either because they appear to underexploit their resource base or because they use innovative management or technology. Map 1 identifies the location of the production systems which were evaluated and Tables 2 and 3 summarize their salient features.

The economic analysis of these systems was conducted on the combined or "joint product" of a "reproductive unit" which represents a reproductive female and the share of the other animals which accompany her in the herd. In the analysis, three products — the meat, milk and hide or skin — make up this "joint-product" for cattle. Milk is not considered a tradeable product for small ruminants. The economic value of each joint-product component is evaluated in comparison to its value in world markets. In the scenarios considered, meat is consumed on the coast, either in Abidjan or Accra, in competition with world imports, or it is exported to Gabon by air. Milk is consumed in the region of production, and hides and skins are either exported, in the case of animals slaughtered in Abidjan, or eaten, in the case of animals slaughtered in Ghana. The analysis considers other products (manure, offal, head, tail, hooves, horns etc.) as non-tradeable byproducts and values these at local market prices at their point of sale (if sold). Marketing costs in each analysis assume that animals are trekked to collection markets and then trucked to the final destination markets.



Map 1 Production zones and marketing routes

Table 2
COMPARISON OF PRINCIPAL CHARACTERISTICS OF CATTLE PRODUCTION SYSTEMS

| Location | Rainfall (mm) | Breed | Management type | Feed source | Labor use | Agriculture | Commercial feed inputs | Health inputs | Fixed inputs |
|---------------------|---------------|-------|---|--|---------------|---|---|--|---------------------------|
| BURKINA FASO | | | | | | | | | |
| Dori | 450 | zebu | transhumant pastoral some fattening | open range, village pasture crop byproduct, commercial feeds | family, hired | dryland millet | salt, cotton seed, hay, c.s. cake, bran | vaccines, pesticides | -- |
| Yako | 600 | zebu | sedentary agro-pastoral some fattening | pasture, crop byproducts minor commercial feeds for fattening | family | dryland millet, sorghum | salt, cotton seed | trypano prophylactic, pesticides | trough, manger, corral |
| Pouytenga | 600 | zebu | fattening | commercial feeds, crop byproduct | family, hired | dryland millet, sorghum | salt, cotton seed, hay, c.s. cake, molasses, bran | vaccines, pesticides | trough, manger, corral |
| MALI | | | | | | | | | |
| Nara | 350 | zebu | transhumant agro-pastoral some fattening | open range, village pasture crop byproduct, commercial feeds for fattening | family, hired | dryland millet | salt, mixed feed | vaccines, pesticides, trypano prophylactic | -- |
| Mopti | 300 | zebu | transhumant agro-pastoral | open range, flood plain | family, hired | irrigated rice, dryland, millet, flood recession sorghum | salt, mixed feed | vaccines, pesticides trypano prophylactic, rice bran | -- |
| Sikasso | 1000 | zebu | sedentary agricultural | village pasture, crop by- product, commercial feeds | family, hired | dryland maize, rice, sorghum, potatoes | salt, rice, bran, mixed feed | vaccines, pesticides, trypano prophylactic | -- |
| Bamako | 600 | zebu | sedentary dairy peri-urban | village pasture, commercial feeds | family, hired | dry & irrigated rice, sorghum, maize | salt, minerals, c.s. cake peanut cake | vaccines, pesticides trypano prophylaxis | trough, corral |

Table 2 (continued)

| Location | Rainfall (mm) | Breed | Management type | Feed source | Labor use | Agriculture | Commercial feed inputs | Health inputs | Fixed inputs |
|----------------------------|---------------|------------|---|---|---------------|---|--|--------------------------------|----------------------------|
| COTE D'IVOIRE | | | | | | | | | |
| Tahouara Korhogo | 1000 | zebu | transhumant (T0) | village pasture, crop byproduct | family, hired | rice, cotton, peanut, maize vegetables | salt | vaccines, trypano prophylactic | mixed feed storage |
| Korhogo | 1000 | cross | traditional (S0) sedentary agricultural | village pasture, crop byproduct | hired | rice, cotton, peanut, maize vegetables | salt | vaccines, pesticides | -- |
| Sokouo Korhogo | 1000 | cross | improved (S3) sedentary agricultural | village pasture, crop byproduct, commercial feeds | hired | rice, cotton, peanut, maize mixed feed vegetables | salt | vaccines, pesticides | corral, well, feed storage |
| GHANA | | | | | | | | | |
| Kpong- Tamale Tamale | 1500 | WASH | sedentary byproduct | village pasture, crop | family | peanut, guinea corn, vegetables, corn | salt | vaccines pens | corral, crush |
| Accra Plains Accra | 1000 | zebu cross | sedentary dairy peri-urban | village pasture, commercial feeds | family, hired | dry & irrig. maize, rice sorghum | salt, minerals, silage, hay, molasses block, copra cake, manioc, maize, bran | vaccines, dewormer | crush pens, drinking pans |

Table 3

**COMPARISON OF PRINCIPAL CHARACTERISTICS OF
SMALL RUMINANT PRODUCTION SYSTEMS**

| Location | Rainfall (mm) | Breed | Management type | Feed source | Labor use | Agriculture | Commercial feed inputs | Health inputs | Fixed inputs |
|---------------------|------------------|---------------------------|--|--|------------------|--|---|---|--|
| BURKINA FASO | | | | | | | | | |
| Dori | 450 | sahel. "Peul" sheep | transhumant, pastoral | open range, village pasture crop byproduct, commercial feeds for fattening | hired | dryland millet | salt, c.s. cake, cotton seed, bran | vaccines | -- |
| Yako | 600 | "Mossi" sheep | sedentary agro-pastoral | pasture, crop byproduct, minor commercial feeds for fattening | family | dryland millet, sorghum | salt, c.s. cake, cotton seed | trypano prophylactic, pesticides | trough, man- ger, corral, hanger |
| Pouytenga | 600 | sahel. "Peul" sheep | fattening | commercial feeds, crop byproduct | family | dryland millet, sorghum | salt, cotton seed, bran, c.s. cake, molasses, hay | vaccines, pesticides | trough, man- ger, hanger |
| MALI | | | | | | | | | |
| Nara | 350 | sahel. "Peul" sheep | transhumant agro-pastoral little fattening | open range, village pasture crop byproduct | family, hired | dryland millet | salt | -- | -- |
| Mopti | 300 | macina sheep | transhumant agro-pastoral | open range, flood plains | family, hired | irrigated rice, flood sorghum, coarse grains | salt, bourgou hay, mixed feeds | vaccines, trypano prophylactic | enclosure, hanger, house |
| Sikasso | 1000 | D'jal- lonke sheep | sedentary agricultural | village pasture, crop by- product, commercial feeds | family, hired | dryland maize, rice, potatoes, sorghum | salt, rice bran | vaccines, pesticides, trypano prophylactic | -- |

Table 3 (continued)

| Location | Rainfall (mm) | Breed | Management type | Feed source | Labor use | Agriculture | Commercial feed inputs | Health inputs | Fixed inputs |
|-----------------------------|---------------|---------------------------|---------------------------|---|-----------|---|-----------------------------------|--|------------------------------|
| COTE D'IVOIRE | | | | | | | | | |
| Katanu-ogo Korhogo | 1000 | D'jal-lonke sheep | transhumant | village pasture, commercial feeds | family | rice, cotton, crop byproducts vegetables | salt, peanut, maize mixed feed | vaccines, pesticides trypano prophylactic | stable, herder's house |
| GHANA | | | | | | | | | |
| Kpong-Tamale, Tamale | 1500 | small short-hair sheep | sedentary agricultural | crop byproduct, maize, guinea corn, cassava, yam peels, corn stover, pito mash | family | vegetables, peanut | salt | -- | pens |
| Akyem Swedru Forest zone | 1500 | W.A. Dwarf goat | sedentary agricultural | village pasture, open range, crop residue | family | cocoa, maize, rice, yams | -- | -- | crush pens, drinking pens |

Table 4 summarizes the results of the economic analysis. These results are presented as unitless domestic resource cost (DRC) coefficients to permit comparisons across systems, species, currencies and countries. The DRC coefficient is the ratio of the cost of domestic resources expended in production and marketing of the joint product, on the one hand, to the value added (product value less tradeable costs) gained in its production, on the other. Thus DRCs < 1.00 reflect a comparative advantage in production and correspond to a positive net economic value, while DRCs > 1.00 reflect inefficient domestic resource use and therefore economic losses.

Overall, the DRCs are substantially less than one in nearly all cases where the animals are sold in either Accra or Abidjan. They suggest that there exists a strong comparative advantage for Sahelian livestock production in competition with world markets for meat exports to coastal West Africa, and for delivery of dairy products to local populations within the Sahel. Moreover, the results suggest that traditional systems throughout the central corridor have approximately the same degree of advantage in competing with imports from world markets in coastal cities. This is because higher productivity in northern Sahelian production systems approximately offsets lower marketing costs enjoyed by southern producers nearer to the coastal consumption centers. Only relatively intensive peri-urban dairy production shows weak economic profitability in competition with world markets.

Fattening in small private schemes (e.g. Pouytenga, Burkina Faso) appears to provide positive economic value added, although marginal benefits are lower than for production without fattening. Therefore, fattening under such schemes represents an attractive area for investment to increase meat production on the intensive margin as demand for meat products increases. Large-scale cattle fattening in a parastatal scheme (at Ferkessédougou, Côte d'Ivoire), on the other hand shows substantial economic losses. The possibility of exporting red meat beyond the traditional coastal markets may exist, as reflected in the DRCs less than one for export to Gabon for cattle from Mopti, and for all transhumant Sahelian sheep systems. However, success in meat exports depends on lowering the costs of air transport to more distant markets, improving the value of the product sold and meeting health and sanitation restrictions on world markets.

These conclusions are generally robust, even with substantial increases in labor or capital costs, or significant reductions in productivity or world meat prices. However, they rest on the assumption of no economic costs to range, pasture, fallow and crop residue biomass, although the analysis incorporates other direct or implicit costs in obtaining access to these feed sources, such as grazing fees or exchanges for manure or milk. This assumption reflects the lack of a market for these low-quality feed sources (except in urban and peri-urban areas).

Table 4
COMPARATIVE ADVANTAGE OF RUMINANT LIVESTOCK PRODUCTION
IN WEST AFRICA'S CENTRAL CORRIDOR
(Domestic Resource Cost Coefficients)

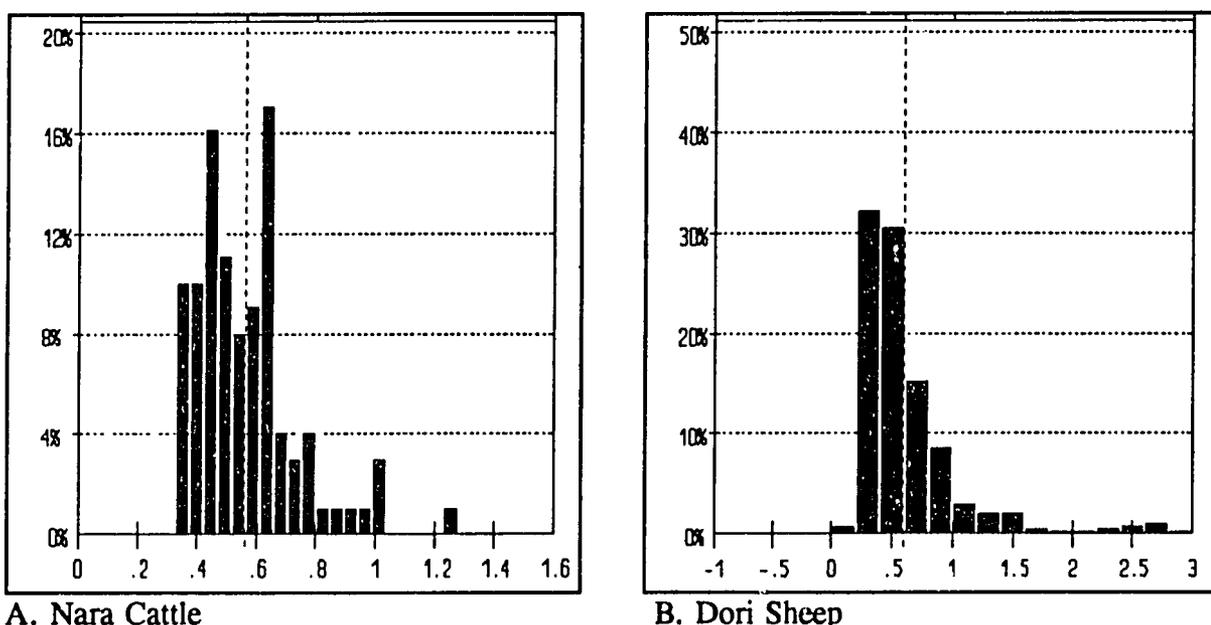
| | | CATTLE SYSTEMS | | | SMALL RUMINANT SYSTEMS | | |
|------------------------|---------------------------------|----------------|---------|-------|------------------------|---------|-------|
| | | Accra | Abidjan | Gabon | Accra | Abidjan | Gabon |
| Market of animal sale: | | | | | | | |
| Production systems: | | | | | | | |
| MALI | | | | | | | |
| Nara | Tranah. | 0.54 | 0.52 | 1.10 | 0.63 | 0.31 | 0.57 |
| Mopti | Tranah. | 0.40 | 0.41 | 0.76 | 0.23 | 0.26 | 0.58 |
| Sikasso | Sedent. | 0.66 | 0.53 | 1.52 | 0.45 | 0.29 | 1.20 |
| Bamako | Dairy | 1.24 | 1.00 | 1.91 | NA | NA | NA |
| BURKINA FASO | | | | | | | |
| Dori | Tranah. | 0.72 | 0.63 | 1.60 | 0.57 | 0.48 | 0.81 |
| Yako | Sedent. | 0.57 | 0.58 | 1.68 | 0.66 | 0.50 | 1.02 |
| Dori & Pouytenga | Tranah. & small-scale fattening | 0.75 | 0.65 | NA | 0.65 | 0.56 | NA |
| COTE D'IVOIRE | | | | | | | |
| Korho.T | Tranah. | NA | 0.59 | NA | NA | NA | NA |
| Korho 0 | Sedent. | NA | 0.57 | NA | NA | NA | NA |
| Korho 3 | Sedent. | NA | 0.63 | NA | NA | 0.17 | NA |
| Korho & Ferkessédougou | Sedent. & large-scale fattening | NA | 1.17 | NA | NA | NA | NA |
| GHANA | | | | | | | |
| Tamale | Sedent. | 0.55 | NA | NA | 0.25 | NA | NA |
| Accra | Dairy Cattle | 0.73 | NA | NA | 0.24 | NA | NA |

The analysis uses current, historically low, but unsubsidized world prices to evaluate the economic reference price for livestock products. This assumption does not reflect the reality of heavily-subsidized European meat currently entering West African markets. However, these subsidies are not expected to persist in the intermediate future due to the fiscal burden they represent to the European Union and to their incompatibility with new GATT rules. Yet even if current subsidy levels are incorporated into the analysis, most production systems remain weakly competitive.

Graphs 4A and 4B present an analysis of the strength of the results to the combined effects of independent variations in world price, exchange rates, and productivity parameters

for meat and milk yields. The analysis uses Monte Carlo simulations of DRC outcomes given independently estimated normal distributions for each parameter. The graphs show the likelihoods of DRCs exceeding unity for two representative Sahelian production systems — the Nara cattle system and the Dori sheep system. The results illustrate the robustness of each scenario as an economic competitor in the coastal countries in the face of variability in these important determinants of economic performance: the cattle model shows less than a 5 percent probability of its DRC exceeding 1.00, while the sheep model shows less than a 15 percent probability.

GRAPH 4 DRC PROBABILITY HISTOGRAMS FOR VARIATION IN WORLD PRICE, EXCHANGE RATE AND PRODUCTION PARAMETERS



(DRC expected value = 0.56)

(DRC expected value = 0.58)

A separate analysis examined the performance of livestock markets in the central corridor. Based on cost data collected for the study, a regression analysis estimated the unit costs of cattle transport and marketing by mode and country. Table 5 displays the resultant coefficients. The results were statistically convincing and indicated that costs per kilometer are slightly lower by hoof than by truck in all countries, and that costs are similar between CFA countries, although Ghanaian costs are significantly higher. With a few exceptions, these results agreed with recent available data from other sources. The analysis also showed that marketing costs for live animals have fallen as a component of final product costs over time. Trekking remains the least expensive form of transport in Sahelian countries, but has lost market share to trucking because of convenience, security and a narrowing of cost differences. The relative consistency of transport costs across modes and countries and the declining real cost trends all suggest that livestock marketing in the region is competitive and efficient given constraints of infrastructure and policy.

Table 5
ESTIMATED TOTAL COSTS OF CATTLE TRANSPORT
(FCFA per kilometer per head)

| | Burkina Faso | Mali | Côte d'Ivoire | Ghana |
|-------|--------------|------|---------------|-------|
| Hoof | 17 | 18 | 21 | NA |
| Truck | 25 | 18 | 23 | 30 |
| RATIO | 0.67 | 0.97 | 0.90 | NA |

Note: The R^2 for the regression equals 0.89. All coefficients were significant at the 1% level except for trekking ("Hoof") in Côte d'Ivoire.

The impact of national policies on the regional livestock sector

The past decade has witnessed a retrenchment of public initiatives in the livestock sector, as manifested by the downsizing, liquidation or sale of most of the large meat production, marketing and transformation parastatals that all four governments had established during the previous decade. Simultaneously, large livestock development projects have nearly vanished as donors have become disenchanted with their typically poor performance. Lastly, all four governments have taken measures to liberalize the functioning of livestock input and product markets, and to spur private sector actors to play a greater role in these markets.

In this context, remaining policies affecting the sector are composed primarily of border taxes on livestock products and a combination of minor subsidies on inputs to production and taxation of livestock marketing. The analysis demonstrates that taxes in transport and marketing represent the most important policy impact on livestock sector costs. They are only minimally offset by subsidies in all countries on animal vaccinations. Overall, these input taxes make up between ten and twenty percent of total production and marketing costs. A component of these taxes is illegal taxation (*taxes sauvages*) which typically is applied to live animals traded in the corridor. The analysis has demonstrated that these taxes are not strongly significant in changing the incentives to trade, although they may alter the routes and modes of transport used.

Border policies affecting livestock product prices are of two sorts. Borders between the countries in the region have relatively low or nonexistent levels of taxation for animals leaving the Sahel and entering the coastal countries. On the other hand, Ghana and Côte d'Ivoire have relatively high border taxation protecting their markets from world prices.

To measure the combined effect of policy impacts on both inputs and products of livestock production, the analysis evaluated the effective protection for the joint products of each production system. The **effective protection coefficient (EPC)** measures the ratio of

financial to economic "value added"⁴ in a given production/marketing scenario. When the financial value (numerator) exceeds the economic value (denominator) the ratio exceeds unity, demonstrating positive protection⁵ for use of domestic factors of production in the activity in question.

Three versions of this indicators were evaluated. First, the *official policy* EPC evaluates financial values (the numerator) at levels that would pertain if only official policies were accounted for the entire difference between financial and economic values. Second, the *market* indicator evaluates financial value-added (numerator) using prices which pertain in internal markets at the points of comparison of the domestic and world-market products. Thus, whereas the official indicator captures the distortions which policy ought to create, the market indicator measures the net effect of factors that influence actual price levels. For livestock products these influences include not only official taxes, but also unmeasured distortions due to monopolies, quantitative restrictions on imports, sanitary restrictions, as well as strategies to evade these policies. For inputs, the market price includes estimates of *taxes sauvages* as well as official taxes. For both the *official* and the *market* EPCs, the denominators evaluate economic (world) prices at official exchange rates. Last of all, a *net* EPC maintains the market price comparison in the numerator, but evaluates the economic reference price in the denominator at equilibrium rather than official exchange rates. In comparison to the *market* EPC, the *net* EPC thus incorporates the impact of overvaluation on product protection. Because the analysis was undertaken before the devaluation in January 1994, market prices in CFA countries reflected the overvalued local currency.

A further distinction made for the EPC was between two different perspectives on the assumed sphere of protection: the "national" perspective, and the "regional" perspective. The "national" protection coefficients examine effects of policy in the country of production only, while "regional" protection coefficients incorporate policies in both the country of production and the country of final sale for products which are traded between countries within the central corridor. The "regional" and "national" analyses differ only for Sahelian ruminant livestock systems which sell animals in the coastal countries. For Sahelian systems, EPCs were also calculated for the two cases of marketing livestock either to Accra or Abidjan. Table 6 presents the results of the effective protection analysis for a selection of cattle and small ruminant systems.

⁴ Value added is defined as the net value in production and marketing generated by non-tradeables after deducting tradeable input costs from tradable product value.

⁵ By convention, "positive" protection occurs when $EPC > 1$ and "negative" protection when $EPC < 1$.

Table 6
EFFECTIVE PROTECTION COEFFICIENTS FOR RUMINANT SYSTEMS

| | MALI | | | | BURKINA FASO | | COTE D'IVOIRE | GHANA | |
|----------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | Nara - Extensive | | Bamako - Dairy | | Dori - Extensive | | Korhogo SG | Tamale | Accra ¹ |
| | National protection | Regional protection | National protection | Regional protection | National protection | Regional protection | National protection | National protection | National protection |
| CATTLE | | | | | | | | | |
| Official Policy EPC | | | | | | | | | |
| sale to Accra | 0.95 | 1.15 | 1.10 | 1.21 | 0.98 | 1.23 | | 1.29 | 1.79 |
| sale to Abidjan | 0.92 | 1.29 | 1.07 | 1.41 | 0.95 | 1.34 | 1.30 | | |
| Market EPC | | | | | | | | | |
| sale to Accra | 0.62 | 0.72 | 2.39 | 3.04 | 0.41 | 0.75 | | 0.78 | 1.72 |
| sale to Abidjan | 0.93 | 1.31 | 2.27 | 3.54 | 0.95 | 1.33 | 1.20 | | |
| Net EPC | | | | | | | | | |
| sale to Accra | 0.41 | 0.48 | 1.59 | 2.02 | 0.27 | 0.50 | | 0.72 | 1.50 |
| sale to Abidjan | 0.62 | 0.87 | 1.52 | 2.37 | 0.64 | 0.88 | 0.80 | | |
| SMALL RUMINANTS | | | | | | | | | |
| Official EPC | | | | | | | | | |
| sale to Accra | 0.70 | 0.80 | | | 0.85 | 1.04 | | 1.28 | 1.08 |
| sale to Abidjan | 0.84 | 1.04 | | | 0.68 | 0.82 | 1.18 | | |
| Market EPC | | | | | | | | | |
| sale to Accra | 0.45 | 0.52 | | | 0.52 | 0.61 | | 0.77 | 0.45 |
| sale to Abidjan | 0.96 | 1.19 | | | 0.89 | 1.10 | 1.18 | | |
| Net EPC | | | | | | | | | |
| sale to Accra | 0.30 | 0.35 | | | 0.35 | 0.41 | | 0.71 | 0.42 |
| sale to Abidjan | 0.64 | 0.80 | | | 0.58 | 0.73 | 0.79 | | |

Note: ¹ This column refers to the dairy system near Accra for cattle, but to goat production at nearby Akyem Swedru for small ruminants.

National policy impacts

(i) Extensive systems

From a national policy perspective, *official* effective protection in Mali and Burkina Faso was found to be slightly negative for most extensive systems marketing either cattle or sheep to Accra and Abidjan: EPCs range from 0.70 to 0.98. These results demonstrate that, in both Sahelian countries, the combined effects of national policies affecting inputs and products of extensive livestock systems selling animals to coastal destination were to penalize these systems. As noted above, in both cases, taxes in marketing loom large among the policies bringing about this negative protection. In addition, Burkina Faso continues to tax its livestock exports directly, further penalizing its livestock producers, as well as Malian animals which would transit Burkina Faso. As would be expected, as net importers of meat, both coastal countries showed significantly positive *official* effective protection (EPCs range from 1.18 to 1.30) reflecting border tariffs for imported meat.

For livestock sales to Abidjan, the real effect in terms of *market* rates of protection was almost identical to the theoretical impact measured by the *official* EPC, but was significantly lower for sales to Accra. This finding demonstrates the fact that prices in Abidjan were determined by border prices, marked up by official tariffs. In Accra, however, red meat prices remained significantly below world market levels and therefore were largely divorced from policies affecting world trade.

A second conclusion that can be drawn from the near identity of *market* and *official* measures of protection in cattle and sheep sales to Abidjan was that the impact of distortions other than official policy were minimal. This implies that problems of *taxes sauvages* in marketing, quantitative restrictions or other controlling measures on imports, or of inefficient performance by livestock marketers are not very important in affecting prices of meat and, by extension, incentives to produce livestock.

(ii) Peri-urban milk systems

Peri-urban milk production systems were a notable exception to nearly all the conclusions reached above for extensive ruminant systems. First of all, unlike extensive systems (transhumant and sedentary) in Mali and Ghana, peri-urban dairies in these countries received positive protection in both locations as a result of border taxes on milk products, which are importable. Secondly, the divergence of *market* from *official* protection was not great in Ghana for these systems. The explanation lies in Ghana's high protection on milk which contributed to raising the joint-product protection: Ghana relies much more heavily on milk imports than on imports of red meat. And finally, in contrast to extensive systems, *market* protection of the Malian dairy system appeared to benefit from much higher protection than was warranted by the *official* policies which exist to protect these systems (*market* EPC

= 2.3 while *official* EPC = 1.1). This result may reflect poor marketing data or that markets for imported milk perform poorly. Further investigation is needed to clarify this issue.

Regional policy effects

For Sahelian systems marketing animals to coastal markets, policies in the coastal countries theoretically provide an additional protection against world markets. In the case of the Abidjan market, where world market imports determine internal market prices, this protection was real, and resulted in roughly equivalent levels of *market* effective protection for Sahelian and Ivorian livestock. The rate of effective protection afforded to extensive livestock production in the region was about 30 percent above world prices (*market* EPC = 1.3) and close to 200 percent (*market* EPC = 3.0) for dairy systems.

In the case of the Accra market, however, border protection against world markets was an ineffective incentive to regional trade because low domestic prices for red meat relative to world prices result in consistently negative *market* effective protection rates for both Ghanaian and Sahelian livestock. The persistence of low market prices for red meat in Ghana confirmed the findings of the comparative advantage analysis which suggest that Ghanaian meat production is strongly competitive with world markets in the local economy.

However, negative **regional** protection also indicates that for Sahelian exporters, Accra is a much less attractive market than Abidjan and an unprofitable market in its own right. This result was supported by the finding of negative private profitability of sales to Accra and confirmed by Sahel-Ghanaian livestock trade statistics which show very low levels of trade.

The impact of overvaluation

The analysis of *net* effective protection illustrates the problem which overvaluation of the CFA has posed for the region. Using equilibrium exchange rates, all *net* EPC's for extensive livestock systems throughout the region fall below unity, and the differential between protection in Accra and Abidjan markets is greatly reduced. This result confirms, firstly, that overvaluation in the FCFA zone has substantially penalized producers in this zone in competition with world markets in Abidjan and Accra. Secondly, however, this effect illustrates that with devaluation of the FCFA to its equilibrium level, conditions in Côte d'Ivoire should come to reflect those in Ghana. That is, red meat prices in regional markets should fall below world market prices, resulting in a dramatic reduction in world imports to the region and a rejuvenation of trade between the Sahel and the coast. Lastly, a reduction in differentials in profitability between routes leading to Abidjan and Accra should stimulate trade with Ghana.

Potential for ruminant livestock production and marketing

While projections from past performance do not predict sufficient production growth to meet expected increases in central-corridor demand, the analyses of comparative advantage suggest a natural advantage for regionally-produced ruminant livestock in coastal markets. The semi-arid and sub-humid zones are strongly competitive in producing ruminant livestock products under current techniques. This comparative advantage suggests that there is still significant potential to raise livestock sector production economically. This production growth can come at the extensive margin from increasing herd numbers, or at the intensive margin by raising herd productivity through the use of commercial inputs.

The expansion of livestock production

The evaluation of different types of livestock-producing systems found in the central corridor suggests that biomass availability will allow for considerable growth in herd size in all but the northern arid zones of the corridor, while disease and poor feed quality effectively rule out herd growth in southern humid areas. However, in the intermediate semi-arid and sub-humid zones, considerable potential for herd growth exists.

Livestock herd growth is occurring in the semi-arid and sub-humid zones primarily in association with agriculture. These mixed farming systems offer a more diversified use of resources, and therefore a more secure livelihood. Livestock can contribute to this association through animal traction, manure, and the generation of a cashflow to finance agricultural investments. In turn, animal production benefits from production of crop byproducts, access to fallow lands, and reduced disease threats in areas kept cleared for agriculture. A second and related trend in herd growth is the movement of herd concentrations southward. The principal force behind this movement is human population growth in the arid and semi-arid zones: the very limited agricultural resource base in these zones has forced agricultural populations southward. With this movement, livestock numbers have risen in the semi-arid and sub-humid zones. In addition, two severe droughts in the last two decades have forced arid-zone herds into southern zones for survival and many have not returned north.

The analytical results of the study suggest that transitions to sedentarization, and settlement of the wetter semi-arid and sub-humid environments need not reduce the economic viability of livestock production. However, this conclusion is based on a static analysis of current conditions in these zones and does not capture the impact of changes which may accompany this transition. For example, disease threats, particularly trypanosomiasis, must be reduced before livestock can be sustainably produced in the more humid areas at arid-zone levels of productivity. However, without public support, livestock herds can be expected to grow no faster than the expansion of the agriculture to which they are linked. Labor resources may also become more constraining with increasing integration of livestock and crop agriculture. Under certain conditions a labor constraint may lead to further livestock

integration with farming through animal traction, while in others it may result either in greater specialization in livestock rearing or in the exclusion of livestock from agriculture. Environmental problems associated with increasing animal densities, such as soil erosion due to the denuding of land through overgrazing, and water contamination from animal use will also inevitably occur. However, given the high economic value of systems which are already practiced in these zones, the prospects are good that herd growth in the semi-arid and sub-humid zones will continue to retain a net economic benefit, despite these extra costs.

Intensification

Production "intensification" as defined in this study concerns the use of commercial inputs, primarily feeds, in livestock production. This process represents another strategy for increasing the potential of the livestock sector in the central corridor. The analysis suggests that with feed intensification the margin of comparative advantage is reduced and that increasing reliance on commercial feeds will eventually eliminate any comparative advantage (though much intensification may take place before this limit is reached). On the other hand, the results also demonstrate that feed intensification can substantially increase the net economic benefit to the livestock sector under certain conditions for fattening, dairying, or if it results in improvements in overall herd productivity.

Market reorientations

Costs of marketing animals from areas of surplus in the northern part of the central corridor to consumer markets in the south form an important component of total livestock product costs. Trekking has largely replaced trucking as the predominant mode of transport in the last two decades, especially downstream in the market chain. Rail remains an economically feasible alternative in Burkina Faso, although problems with access to and reliability of service have reduced its use. Unit costs of marketing and transport appear to be fairly competitive across routes and transport modes, although within Burkina Faso and Ghana costs are higher than in Mali and Côte d'Ivoire because of greater explicit and implicit taxation of transport. This suggests that lowering the various official and illegal taxes would reduce the costs of marketing to Accra. Also, an increase in the volume of animals marketed from the Sahel to Accra may further reduce costs as economies of scale develop.

Aside from deriving marginal cost savings in marketing, another option for raising the potential revenue from meat sales is finding new markets for these products. However, this strategy must rely on taking advantage of the price premium placed on prime cuts of meat. Exporting carcass meat beyond the West African region already shows weak potential for economic profitability. With greater product differentiation and more competitive transport costs, meat exports could become an attractive option. However, success would also depend on the ability of central-corridor countries to meet the health standards of foreign markets without large additional expenses.

A strategy for the sector

This study has suggested that demand for livestock products will increasingly exceed the central corridor's ability to produce them. At the same time, it shows that ruminant production holds a strong competitive edge against world trade. Ironically, however, the overall effect of policies affecting ruminant livestock is to penalize its production and trade, both at a national and regional level. Under these conditions, projections for production growth are low, and are expected to derive primarily from gradual expansion of herd numbers into higher rainfall areas, with increasing integration with crop agriculture. This situation calls for a regional strategy to promote more rapid livestock production through measures to redress negative effective protection of the sector, encourage more rapid stock increases and promote higher herd productivity, but without significant environmental costs. Several components of this strategy which have been raised in this report are addressed below.

Unrestricted intra-regional trade

Direct and indirect taxation of livestock marketing from interior zones of production to coastal consumption points represent more than 10% of total costs and over 30% of marketing costs. Measures are needed in all countries to reduce market taxation, simplify administrative procedures, and discourage collection of illegal fees by public authorities. Under the "Cissokho Initiative"⁶ and a multi-donor sponsored action plan, initiatives are already being taken to streamline trade. In addition, consideration should be given to reducing the high indirect taxation of livestock marketing resulting from taxation of transport fuel and vehicles.

Increased market efficiency

Given high unit transport costs, the multiple stages and numerous intermediaries in Sahelian livestock marketing, and the long distances between production and consumption points for animals, both Sahelian countries should take further measures to improve market efficiency. With increasing use of trucks, changes in the structure and conduct of livestock marketing should be anticipated and promoted. These changes will ultimately reduce the number of links between producer and final consumer, and in so doing, reduce market margins. To facilitate these changes, market infrastructure designed to accommodate the special needs of trucked animals may be needed. More importantly, policies which slow trucking transit times should be eliminated. In addition, Burkina Faso should examine how to better use the railway to Côte d'Ivoire to provide a more competitive transport alternative.

⁶ Ministers of Agriculture from West and Central African nations have been preparing plans for regional integration for various agricultural commodities, including livestock, under the "Cissokho Initiative", named for the Senegalese Minister of Agriculture.

Rational input use

Commercial feed use has been shown to be minimal in most ruminant production systems, but shows promise as a supplement for increasing herd performance, milk production and for fattening. Policies affecting feed prices are going to become increasingly important as intensification proceeds. Introduction of these feeds will increase producer dependence on markets and will raise production costs. However, subsidies for commercial feed use to promote production can encourage overstocking of range lands and eventually stimulate production beyond economically or environmentally beneficial levels. With increasing integration of livestock and crop production, a number of additional inputs will become more important (e.g. additional medications, insecticides, enclosures/pens etc.). Given the novelty of many of these technologies to traditional production systems, public assistance in the rational use of these relatively new inputs will be needed.

More broadly, with the progression of livestock-crop integration, and of increasingly intensive livestock production, a need to develop new techniques of production adapted to the particular conditions in each region will be required. Some specific production issues which have been inadequately examined in this study include optimal use of crop byproducts in ruminant production; cost-effective control of trypanosomiasis; and management options to address labor and land conflicts between livestock and agriculture. Public investments in research and extension will be required to address these and other issues which will occur on the extensive and intensive margins where this production growth will occur.

Product differentiation

The analysis illustrates the disadvantage faced by regional livestock in competing with low-quality meat imports. At least some cuts of meat derived from central-corridor livestock far exceed these imports in quality. It has been suggested that locally-produced livestock products be better differentiated so that higher prices can be obtained in more lucrative markets for the high-quality cuts. This would require identification of prospective markets, investment in the processes and training necessary to supply differentiated products, and promotion of these products. Establishment of integrated production/slaughtering schemes which meet the necessary health standards to penetrate prospective markets would also be necessary. This process of differentiation may create opportunities for other value-added activities in the meat sectors, including canning, drying or freezing meat. Correspondingly, in the dairy sector, value-added may be increased by manufacturing milk derivative products. Such schemes will require significant private investments and may not be immediately feasible. However, small steps to improve and differentiate product quality will create conditions in which greater value can be obtained from the livestock sector's product.