IMPROVING LIVESTOCK DEVELOPMENT IN ACP COUNTRIES:

The role of Science, Technology and Innovation in addressing the challenges to food security and economic empowerment

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ABSTRACT

This policy brief outlines the major constraints to livestock development in African, Pacific and Caribbean (ACP) Group of States and identifies strategies for addressing them. It places emphasis on the application of advances in science and technology to enhance innovation for conserving and adding value to indigenous breeds and other genetic resources and improving livestock productivity and trade. It also recommends approaches for enhancing policy processes to improve the performance of the livestock sector and its contribution to food and nutrition security, trade, economic growth and prosperity.

INTRODUCTION

It is estimated that over 65% of the rural population in ACP States participates in livestock related activities. Livestock are of economic importance, contributing on average 14-30% of agricultural GDP (CDB 2006; NEPAD 2006; UNSTATS 2006; FAO 2007). They contribute to nutritional security through the provision of high quality protein and other essential nutrients and important farm inputs such as draught power and manure to sustain soil fertility. Animals also serve as investment sinks and ready cash in times of need and are central to many socio-cultural events and ceremonies.

Livestock production satisfies between 60 – 105% of local demand for meat and milk although productivity is relatively low when compared to other regions (**Table 1**). The deficit is made up by imports at an average of 9.6 % of agricultural GDP in total aggregate terms (**Figure 1**) and at great cost per capita for fragile economies, especially the Caribbean and Pacific states (**Table 2**). This deficit can be reduced and additional income earned in external markets by improving ACP livestock production systems.

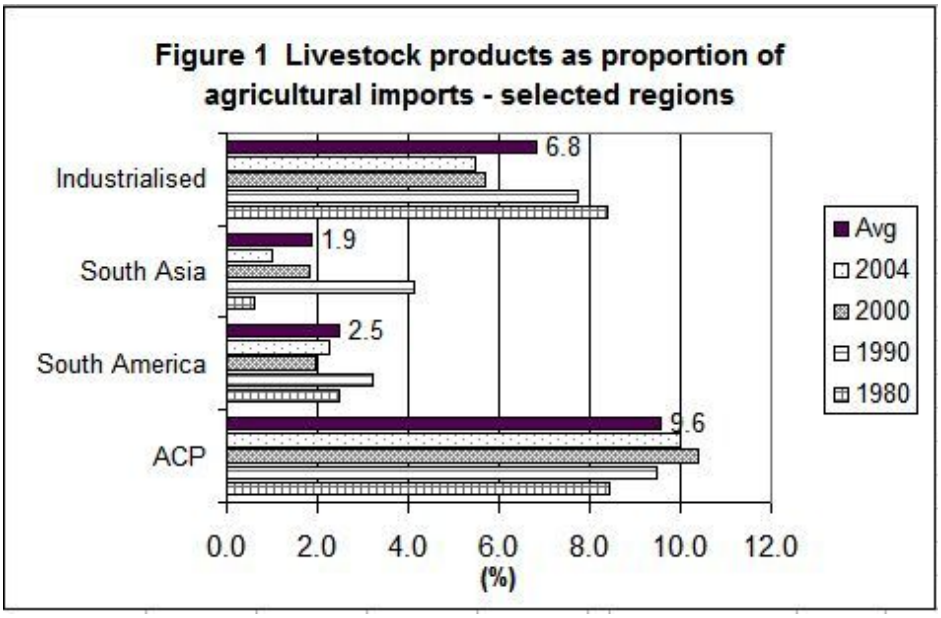
This policy brief outlines the major constraints to livestock development and strategies for addressing them in ACP countries. It

Table 1 Per capita demand and local production of livestock products, 2001-2003

Region	Meat			Milk		
	Demand (t)	Local production (t)	(% demand)	Demand (t)	Local production (t)	(% demand)
ACP	14.5	13.3	91.7	30.9	28.1	90.9
Africa	13.4	12.7	94.8	29.3	27.8	94.9
Caribbean	37	26.4	71.4	66.2	38.1	57.6
Pacific	8.0	5.2	65.0	5.2	5.5	105.8
South America	65.7	77.8	118.4	112.3	131.7	117.3
South Asia	5.8	6.0	103.4	69.9	86.0	123.0
Industrialised nations	95.8	101.8	106.3	226.6	288.7	127.4

Source: FAO 2007

places emphasis on the use of advances in science and technology for enhancing innovation and improving livestock policy formulation and implementation, to make meaningful progress in the livestock sector.



Source: FAO 2007

WHAT ARE THE BINDING CONSTRAINTS?

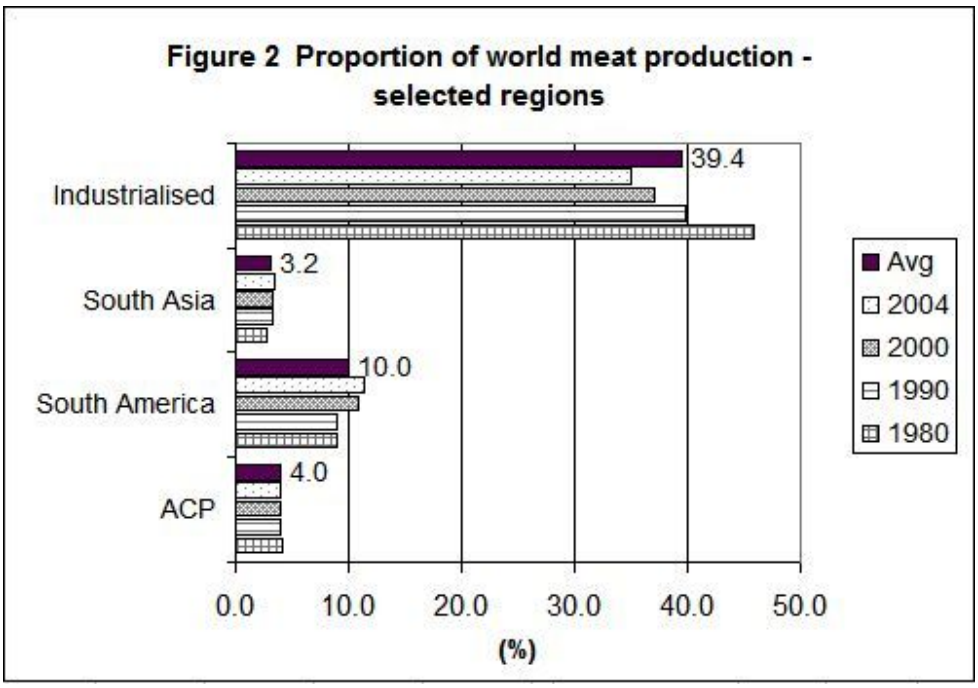
ACP livestock productivity is low when compared to other regions of the world. Meat production averages 4% of total world production (**Figure 2**). This can be partially linked to low growth rates and relatively small carcass size. For example, average carcass weights of cattle, sheep, goats and pigs in Africa is estimated at 129 kg, 13.2 kg, 11.8 kg and 48.2 kg respectively, compared to 162 kg, 14.9 kg, 12.1 kg and 72.8 kg for cattle, sheep, goats and pigs, respectively, in other countries (NEPAD 2006).

Table 2 Imports of livestock products, 2004

Region	Value of imports	
	Total (US$'000)	Per capita (US$)
ACP	2,380,365	3.4
Africa	1,566,131	2.4
Caribbean	689,094	20.1
Pacific	125,140	17.2
South America	833,274	2.4
South Asia	228,624	0.2
Industrialised nations	47,253,452	54.4

Source: FAO 2007

Several constraints contribute to the low productivity namely; **biological** (genetics, nutrition), production systems, environment, disease, **uncompetitive trade environment** and poor **institutional** framework (limited S&T capacity and un-conducive policy environment).



Source: FAO 2007

BIOLOGICAL CONSTRAINTS

Genetic resources

The ACP region is endowed with a diversity of indigenous livestock genetic resources. Over the years traditional breeding and selection tools have led to the development of sturdy tropical breeds of cattle and sheep; e.g. Barbados Blackbelly sheep, Jamaica Hope and Siboney of Cuba. However, a decline in human and technological capacity has led to genetic erosion. Advances in biotechnology (genomics) can be used to map genetic stock to identify unique traits for improving robustness and productivity (Makkar and Veljoen 2005). Recent advances in endocrinology and *in vitro* fertilization techniques also make it possible to increase reproductive rates. Cuba in the Caribbean is a leader in the development and use of these technologies. South Africa is engaged in collaborative research work to map the genes of indigenous breeds. Both countries can serve as models for other ACP states.

Nutrition and feeding

Fluctuations in feed quality and quantity compromise nutritional quality (Owen et al. 2005). One of the main limiting nutrients is protein (Rufino et al. 2006). Recent developments in optimizing the use of legume shrubs and trees and propagating them in all agro-ecological zones ranging from arid to wet areas can improve protein quality of feeds. Another constraint is the scarcity and poor quality of forages used as energy sources. Improvements in microbial genomics and biotechnology have made it possible to increase the acreage and utilization of these feed resources for ruminants (Makkar et al. 2005).

PRODUCTION SYSTEMS

Sere and Steinfeld (1996) categorised the wide range of livestock production systems into six broad groups based on integration with crops, land size, agro-ecological zones and intensity of production (**Box 1**). These variations must be considered when identifying science, technology and innovation intervention strategies. Intensive production in mixed rainfed system and inclusion of local and indigenous knowledge; such as tracking of nutrients and water by herders and use of local strategic patch grazing resource areas can enhance livestock productivity (Scoones 1995). Research on animal welfare under the various ACP production systems needs attention.

ENVIRONMENT

Global warming and resulting climatic changes contribute to the modification of ecosystems. Changes in vegetation zones, shifting grazing patterns and a concomitant migratory trend of livestock from arid and semi arid zones to the sub–humid zones have been observed. The result is an over concentration of livestock in the sub-humid zone and, where human population settlements exist. Livestock productivity - both ruminants and non ruminants and livestock disease patterns are being negatively impacted. The demographic changes and the increase in demand for livestock products are also creating conflict especially between pastoralists and governments.

Box 1 Livestock production systems

Solely livestock production systems (L) Livestock systems in which more than 90 per cent of dry matter fed to animals comes from rangelands, pastures, annual forages and purchased feeds *and* less than 10 per cent of the total value of production comes from non-livestock farming activities.

Landless livestock production systems (LL) Subset of the solely livestock production systems in which less than 10 per cent of the dry matter fed to animals is farm-produced and in which annual average stocking rates are above ten livestock units (LU) per hectare of agricultural land.

Grassland-based systems (LG) Subset of solely livestock production systems in which more than 10 per cent of the dry matter fed to animals is farm-produced *and* in which annual average stocking rates are less than ten LU per hectare of agricultural land.

Mixed-farming systems (M) Livestock systems in which more than 10 per cent of the dry matter fed to animals comes from crop by-products or stubble or more than 10 per cent of the total value of production comes from non-livestock farming activities.

Rain-fed mixed-farming systems (MR) A subset of the mixed systems in which more than 90 per cent of the value of non-livestock farm production comes from rain-fed land use.

Irrigated mixed-farming systems (MI) A subset of the mixed systems in which more than 10 per cent of the value of non-livestock farm production comes from irrigated land use.

Livestock-environment interaction is a complex issue as confirmed in a study by de Haan et al. (1996, **Box 2**). Environmentalist and conservationists now blame environmental degradation (deforestation, soil degradation, overgrazing, biodiversity change, green house gases, etc.) on livestock. But it is not all negative as livestock also have a positive effect on the environment as farmyard manure is used to replace chemical fertilisers. Scientific data on green house emissions, nutrient cycles (plant-animal-soil) and movement of animal would facilitate dialogue among all stakeholders and enactment and implementation of policies that address the underlying causes of environmental degradation and conflict situations.

Box 2 Complexity of livestock-environment interactions

Livestock-environment interactions are typically second level problems, because it is not livestock *per se*, but the way in which livestock are used by growing human populations that governs their impact on the environment. The purpose of livestock is determined by human needs, and technology translates these into different levels of natural resource use and sustainability. Quite clearly, livestock do not set out to destroy the environment; it is the socio-economic-political context, defined by humans, which determine livestock's effect upon their surroundings. While the analysis has focused on problem areas, let us not forget that there are large areas where livestock have remained in equilibrium with natural resources and, even more importantly, are helping to maintain ecosystem health, diversity, flexibility and societal cohesion. Livestock and the environment can achieve a balance while at the same time fulfilling humanity's food needs and contributing to sustainable economic growth.

DISEASE CONTROL

Control of animal diseases under traditional pastoralist and subsistence methods has remained a critical limiting factor influencing productivity, trade and marketing as most livestock are reared. The tropical humid climatic conditions generally give rise to a multitude of viral, bacterial, fungal, parasitic, nutritional and management related diseases. They can decimate livestock populations in entire regions and ACP livelihoods. (FAOSTAT 2006). It has been estimated that in Sub-Saharan Africa alone, losses from livestock disease amount to over US$ 4 billion (CAADP 2002)

Destroyed Cattle: FMD eradication Botswana 2006. **Foot and Mouth Disease Oral Lesions Photos: Hameed Nuru**

Some diseases such as Foot and Mouth Disease (FMD), Rinderpest, Contagious Bovine Pleuro-pneumonia (CBPP) and Rift Valley fever are classified by the OIE as serious

livestock diseases of economic importance (OIE 2007). Trans-boundary diseases (TADs) such as ticks and Trypanosomiasis, previously unknown in some regions, spread very fast as animals move from one agro–ecological zone to another. Indigenous genetic stock is also lost due to uncontrolled interbreeding. Disease control measures including early warning systems and costly vaccine and eradication programmes are usually very expensive and difficult to upkeep and require high quality technical expertise, local support and cross border cooperation.

Globally, the focus is now on re-emerging and new diseases such as Bovine Spongiform Encephalopathy (BSE) or Mad Cow Disease and Highly Pathogenic Avian Influenza (HPAI) or bird flu. Both have been reported in ACP countries and pose a threat to humans because they are zoonotic and are able to cross the species barrier (FAO; AU-IBAR 2005). With faster methods of travel, these emerging diseases can easily spread across continents; ACP countries being favoured tourist destinations are vulnerable in this respect.

The veterinary service delivery and control systems in most ACP countries are inadequate and in selected cases, almost non existent (OIE 2007). There are limited well equipped veterinary laboratories which are suitably staffed and able to carry out rapid confirmatory diagnosis or cutting edge research. There is also little research cooperation for identifying and controlling animal diseases. Research on the use of traditional herbal medicines in disease management is also country specific. The efficacy of control systems is compromised and funding for their up keep is not always factored into national budgets. Significant government and donor funding is needed to upgrade facilities and retool staff to minimize the potential negative impact of new and re-emerging livestock diseases.

National Vaccination campaign Botswana Botswana 2005 **Disease control Infrastructure: Cattle crush Photos: Hameed Nuru**

TRADE IN LIVESTOCK AND LIVESTOCK PRODUCTS

One of the central pillars for promoting a "livestock revolution" in ACP countries is the growing local and regional demand for meat and other livestock products (Perry et al. 2005). Danger exists that informal and illegal trans-border trade could derail the revolution (Scoones and Wolmer 2006). However, it is the un-competitiveness of livestock trade in international markets which leaves the ACP industry very exposed. Achieving economies of scale and

meeting international standards specifically Sanitary and Phyto-sanitary (SPS) measures, technical standards and requirements, including certified abattoirs, residue analysis and traceability, as well as animal welfare and environmental concerns are limiting factors. Countries like Botswana, Namibia and Swaziland have managed to comply with most of these requirements to export beef to the EU (see **Box 3**) but they are in the minority. Under the Economic Partnership Agreements (EPAs), ACP countries can be assisted to build the requisite human and physical infrastructure.

Box 3 Southern African beef exporting countries meeting EU SPS standards

The EU's beef imports under Cotonou have generally come from regions of countries that satisfy Status 4, "FMD-free country or zone where vaccination is not practised, there is free zone separated from others by surveillance zone or other barriers, there are measures to prevent FMD entry, there is effective disease surveillance and reporting, there is no outbreak of FMD for 3 months and animals are slaughtered at approved abattoir." The Southern African beef exporters have satisfied these requirements by applying the traditional method from which both small and large cattle producers can benefit. Essentially it involves the construction of physical barriers between the FMD-carrying buffalo and protected cattle, together with externally inspected abattoirs within the FMD-free zone. Anyone raising cattle of the appropriate quality standard within the FMD-free area is able to participate in the export trade – and the gains have been considerable. Botswana has also, in recent years, introduced a traceability system.

Source: Koroma and Deep Ford 2006 quoting Perry et al. 2003

A new challenge is being able to compete with cloned meat and other products in domestic markets. In 2007, the Food and Drug Administration of the United States concluded that cloned meat products are safe for human consumption. At present the ACP capacity to respond to biosafety issues is limited but the region must demonstrate a willingness to invest in the use of technology and disseminate scientific information to guide the region (refer ACP Policy Brief 1 – ACP Region must harness biotechnology, http://knowledge.cta.int/).

ACP countries must ensure that technical standards for livestock products and facility designs are updated and properly regulated and use scientific evidence to protect their local markets, trade and the health of their citizens. For example, during the outbreak of "mad cow" disease and Foot-and-Mouth disease in Europe, the Governments of the Caribbean mandated the region's veterinary services to harmonize import regulations to prevent the entry of livestock and livestock products from the affected countries.

INSTITUTIONAL CONSTRAINTS

Capacity in livestock ST&I

ACP states have institutional capacity in genetics, breeding and reproductive science, nutrition and feeding and production and management systems but these have declined over the years. Animal research and development programmes are primarily based on systems that were set up during colonization. These programmes were not given priority and current budgetary allocation for livestock research is low compared to other commodities especially crops. This has contributed to the erosion of capacity in livestock research, production,

processing and marketing.. Observations of the FAO Council on capacity deficiencies in Small Island Developing States (**Box 4**) are still relevant (FAO 1999).

Box 4 Capacity deficiencies in Small Island Developing States

- Agricultural research, mainly government-funded, is constrained by very scarce skilled manpower, institutional internal weaknesses and financial resources and tends to be oriented to cash crops. It is weakly linked to extension, the farmer and other sectors such as agro-processing and tourism.
- They lack adequate statistical organization and personnel, and coordination between statistical offices and economic analysis, planning and decision-making agencies. Particular attention should therefore be paid to establishing an institutional interdisciplinary framework

(a) (b) (c)

ACP capacity in genetics and reproductive science (a), nutrition and feeding (b) and production and management systems (c) Photos (a) Ministry of Agriculture and Rural Development, Barbados and Jose Morales, IGAT, Cuba, (b) and (c) CARDI

Livestock science in ACP states would benefit from greater investments and international collaboration. Technological innovations widely used in Cuba, China, India, Brazil, South Africa and the EU could be accessed through South-South and North-South cooperation agreements and exchange programmes. These, together with advances in information flows can enhance ACP ST&I capacity for improving the performance of the livestock sector from production to processing and marketing.

Livestock policy formulation and implementation

The limited scientific evidence and advice are major contributing factors for inadequacies in policy formulation and implementation. This is best illustrated by the low percentage of national resources devoted to livestock training and research and inadequate budgetary provisions for livestock health and safety systems. The weak networking and limited communication platforms for facilitating information and knowledge flows amongst stakeholders within countries and amongst regional organizations for supporting the policy process are further constraints.

WHAT ARE THE SOLUTIONS PROPOSED

General

Recent advances in biotechnology, information and communication technology, animal biology, environmental and management sciences, offer opportunities for addressing some of these binding constraints. Scientific and political capacity must be mobilized to ensure that focus is given to generating the competent and highly skilled human resources, providing the financial resources and creating the conducive policy environment needed to bring about the desired changes.

What are the responsibilities of ST&I institutions?

Research and academic excellence and science based policy advice are needed to underpin policies and interventions for improving livestock production, processing, marketing and distribution and maintaining the genetic resource base. The ST&I institutions must provide the critical mass of skilled human resources and undertake the research and outreach needed for improving the performance and competitiveness of the livestock industry. The scientific community must interact with stakeholders especially small-scale producers and policy makers.

What are the responsibilities of regional policy makers?

Regional policy networks, such as the African Union-InterAfrican Bureau for Animal Resources (AU-IBAR), the Caribbean Economic Community and Common Market (CARICOM) and the Pacific Island Forum Secretariat (PIFS), in collaboration with their scientific and technical national and regional partners, should address the related policy issues including the technical and non-technical barriers to trade in animal and animal products. They need to advocate for and create an enabling policy environment for facilitating and ensuring competitiveness of ACP livestock trade and the protection of ACP consumers from unsafe products. They need to sensitize member states to new threats e.g. loss of indigenous genetic resources - wild life or domesticated animals; emerging diseases and international trade requirements and new products such as cloned meats, and their implications. They also need to identify new market opportunities e.g. for free range and

organic livestock products for domestic and export niche health conscious regional and international markets.

What are the responsibilities of the governments?

ACP Governments must provide leadership, appropriate policy framework and the resources to build the endogenous S&T capacity, expand market opportunities and increase trade in livestock and livestock products. Governments must avail themselves of the scientific and technical expertise available and make use of the facilities negotiated under international trading regimes including e.g. WTO and EPAs to support capacity building and upgrade veterinary services and laboratory infrastructure.

Given the various challenges facing the ACP States, governments are encouraged to update the relevant policies and enact legislation throughout the production-processing-consumption cycle to firstly, encourage improved productivity; secondly, protect the health of livestock and citizens and; thirdly, maintain socio-economic stability. In view of the limited pool of well-trained highly motivated scientists and personnel in policy formulation and with the majority of livestock farmers operating at the subsistence level, it is imperative that a programme of institutional strengthening and capacity building be developed for: enhancing research including traditional herbal medicines for treating livestock diseases, training including market-oriented training for farmers, technology acquisition and biosecurity control; promoting the use of agro-industrial products for livestock feed and biofuels; and safeguarding indigenous breeds.

CONCLUSION

Good governance and stable democracies are needed to engender the confidence of national, regional and international institutions and civil society to support intensified, diversified and sustainable livestock development. Policy makers in collaboration with the scientific community should formulate relevant livestock development policies. Governments must exercise the political will and leadership and provide the budgetary support for building capacities in ST&I, disease control, trade facilitation and environmental mitigation. They are required to demonstrate their commitment to the international community to attract additional funding. ST&I institutions are called upon to use modern information and communication technologies to engage all the actors to take advantage of scientific advances and technological innovations to address the constraints within the ACP livestock sector. The support of the international donor community is encouraged.

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Web Resources

CTA Knowledge for Development Website - http://knowledge.cta.int