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 ACP countries. It places emphasis on the need for building science and technology capacity and applying advances in science and technology to enhance innovation in livestock productivity, marketing and trade. It also identifies the need for improving the ST&I policy framework for creating the enabling environment to enhance the performance of the livestock sector and its contribution to food and nutrition security, trade and economic growth and prosperity.

INTRODUCTION

Livestock play an integral part in rural life in the ACP Group of States. It is estimated that over 65% of the rural population participates in livestock related activities. Livestock are of economic importance, contributing, on average 14-30% of the agricultural GDP (data compiled from CDB, 2006; FAO, 2006; NEPAD, 2006; UNSTAT, 2006; FAO, 2007). Livestock contribute to nutritional security through the provision of meat, milk and eggs and provide important farm inputs such as draught power and manure to sustain crop production for food and feed. Animals also serve as investment sinks and sources of cash income in times of need, as providers of transport for goods and services and are central to many socio-cultural events and ceremonies.

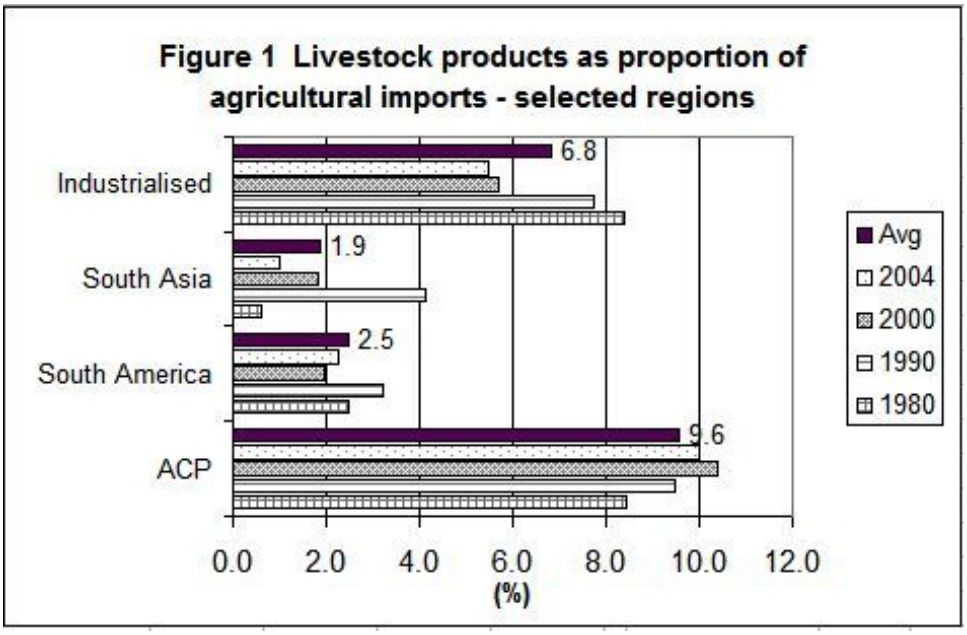
However, productivity is lower than other regions of the world although local production is estimated to satisfy between 58 – 106% of demand (**Table 1**). The deficit is made up by imports (**Figure 1**) at great cost to fragile economies, in total aggregate terms and per capita, especially for the Caribbean and Pacific states (**Table 2**). The deficit can be reduced and additional income earned in external markets by improving local production and marketing systems.

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

This policy brief outlines the major constraints to livestock development and identifies strategies for addressing them in ACP countries. It places emphasis on the need for national S&T capacity building and application of advances in ST&I to make meaningful progress in the livestock sector in ACP countries. There is dire need to review the processes involved in livestock policy formulation and implementation, in order to encourage investments.



Source: FAO 2007

WHAT ARE THE BINDING CONSTRAINTS?

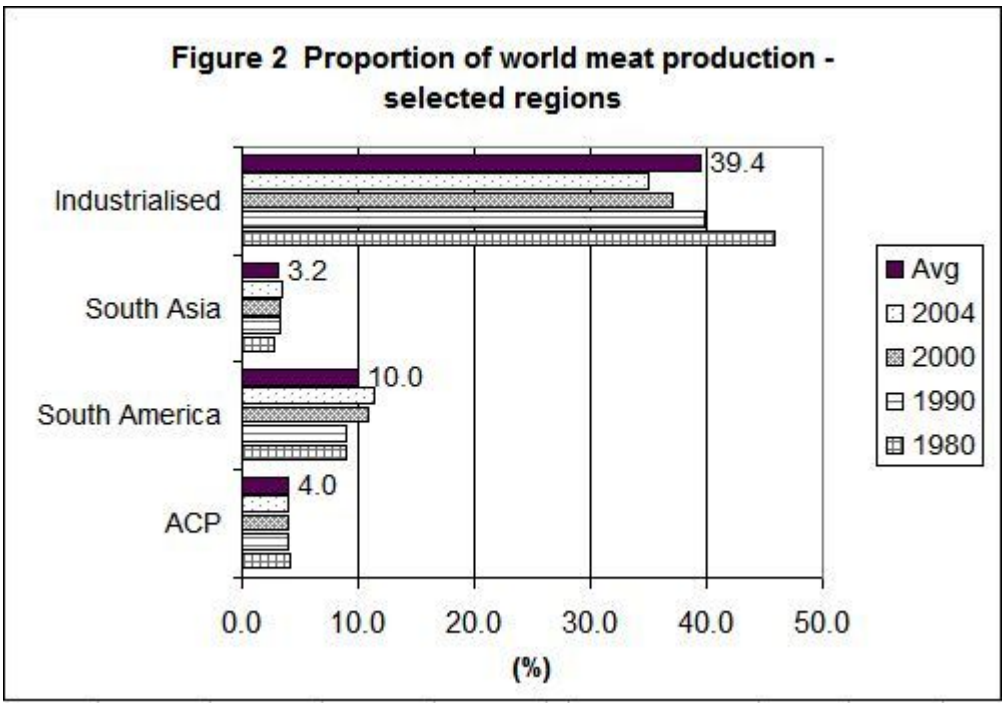
The current ACP production level of livestock products, especially meat, is low (4%) when compared to other regions of the world (see **Figure 2**). Low growth rates of livestock result in relatively small carcasses. For example, average carcass weights of cattle, sheep, goats and pigs in Africa is estimated 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 developing countries (FAO, 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: the nature of the production systems; biological (genetics, nutrition, disease), environmental, trade environment and institutional framework (limited S&T capacity and infrastructure and un- conducive ST&I policy environment).



Source: FAO, 2007

PRODUCTION SYSTEMS

Livestock are reared under a wide range of production systems in ACP countries which pose a problem as a uniform approach to improving productivity will not suffice. Sere and Steinfeld (1996) categorised production systems into six broad groups based on integration with crops, land size, agro-ecological zones and intensity of production (**Box 1**). These variations in management systems are important when identifying science, technology and innovation strategies as these must be stratified depending on the context. Inclusion of local and indigenous knowledge such as tracking of nutrients and water by herders and use of local strategic patch grazing resource areas in management systems (Scoones 1995) can contribute to success in improving livestock productivity. Intensive livestock production in mixed rainfed system would also increase productivity.

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.

BIOLOGICAL CONSTRAINTS

Genetics

The ACP region is endowed with a diversity of indigenous livestock genetic resources. Traditional breeding and selection tools were employed in the past to enhance their productivity. However, The ACP region is witnessing genetic erosion which can be linked to the limited human and technological capacity and enabling policies to manage genetic resources. Advances in biotechnology (genomics) can be used to map genetic stock to identify unique traits for improving livestock robustness and productivity (Makkar and Viljoen, 2005). South Africa is engaged in collaborative research work to map the genes of indigenous breeds. Recent advances in endocrinology and *in vitro* fertilization techniques make it possible to increase the reproductive rates of animals through synchronization and artificial insemination. In the Caribbean, Cuba is a leader in the development and use of these technologies. Cloning is also an emerging issue in livestock breeding and evidence based strategies for safeguarding indigenous genetic resources should be explored by ACP countries.

Nutrition and feeding

Fluctuations in feed quality and quantity compromise nutritional quality (Owen et al., 2005). The main limiting nutrient in animal feeds is protein (Rufino et al., 2006) and recent developments in optimizing the use of legumes, shrubs and trees for feedstock and propagating them in all agro-ecological zones ranging from arid to wet areas would alleviate this constraint. The scarcity and poor quality of forages used as energy sources in the dry seasons is an additional constraint.

Improvements in microbial genomics and biotechnology have made it possible to increase the areas and feed resources available to ruminant animals through improvements in utilisation of forages (Makkar and Viljoen, 2005).

Disease

Control of animal diseases remains a critical factor influencing the production, productivity, trade and marketing. This is exacerbated in ACP countries as most of the livestock are reared under traditional pastoralist and subsistence methods. Varying climate, generally characterized by tropical humid climatic conditions give rise to a multitude of viral, bacterial, fungal, parasitic, nutritional and management related diseases. It has been estimated that in Sub-Saharan Africa alone animal diseases result in annual losses in excess of US$4 billion, which represent about one fourth of the total value of animal production (FAO, 2006).

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). Other diseases such as trypanosomiasis also pose a significant threat to livestock. They spread very fast across boarders, hence are classified as Trans-boundary Animal Diseases (TADs) and can decimate livestock populations, livelihoods and economies in entire regions (FAOSTAT, 2006). Control is usually very difficult and expensive; requiring costly vaccines or eradication programmes, highly trained quality technical capacity and access to adequate funding especially in emergencies.

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

The current global scenario regarding livestock diseases is focused 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 not only to livestock trade, but also to humans because they are zoonotic in nature and can cross the species barrier from livestock to infect man (WHO/FAO/OIE, 2004). Several ACP countries are favoured tourist destinations and because of limited technical capability at borders, are vulnerable in this respect. There is some new thinking on the issue of disease containment in the context of international trade, leading to proposals for the use of detection, identification and monitoring (DIM) of ‘hot spots’ (Woolhouse, 2006; 2008; Woolhouse et al., 2005).

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

The veterinary service delivery and control systems in most ACP countries, including well equipped veterinary laboratories, are inadequate and in selected cases, almost non existent (OIE, 2007). 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. Well equipped veterinary laboratories which are suitably staffed and able to carry out rapid confirmatory diagnosis or cutting edge research are needed. Such infrastructure is expensive to maintain and the efficacy of control systems is compromised as funding for their upkeep 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.

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 are taking place. For example, a compilation by FAO (1985) on integrating crops and livestock in West Africa refers to a number of observations on the increases in cattle numbers in the sub-humid zone of West Africa. The increases were attributable to the spread of pastoral communities and arable farming groups into the sub-humid zone. The result is an over concentration of livestock in the sub-humid zone where human population is concentrated and productivity of both ruminants and non-ruminants is negatively impacted. This demographic change and the increase in demand for livestock products in urban centres are also creating conflict especially between pastoralists and governments as access to land for grazing animals decreases. Governments, usually controlled by representatives of the settled agricultural populations, often categorise pastoral nomads as destructive, evasive (in terms of tax), and recalcitrant (often believed to be behind insurgency) (Blench and Marriage, 1999).

This movement of animals from one agro–ecological zone to another is being associated with diseases such as ticks and trypanosomiasis which were not known to exist previously in many African countries. In addition, indigenous genetic stock is lost due to the uncontrolled interbreeding.

The emerging scenario is worrying as environmentalists and conservationists blame environmental degradation (deforestation, soil degradation, overgrazing, biodiversity change, green house gases, etc.) on livestock. But it is not all negative, since de Haan et al. (1996) confirmed that livestock-environment interaction is a complex issue (**Box 2**). Livestock contribute considerable amounts of farmyard manure, a natural fertiliser that reduces the pressure on farmers to use limited financial resources for purchasing inputs. Proper dialogue among all stakeholders and enactment and implementation of policies that address the underlying causes of environmental degradation instead of the symptoms would be a more effective way of dealing with this problem.

TRADE IN LIVESTOCK AND LIVESTOCK PRODUCTS

One of the central pillars for the off take of the "livestock revolution" in ACP countries is the growing local and regional demand for meat and other livestock products from relatively well-off urban consumers and the limited supply by small scale producers (Perry et al., 2005). There is the danger that informal and illegal trans-border trade in livestock which abound in some countries could derail the revolution (Scoones and Wolmer, 2006). However, it is in the international arena that the uncompetitiveness of the ACP livestock trade is very much exposed.

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.

Since livestock production in most ACP states is dominated by small producers, achieving economies of scale, compared to other regions (e.g. Europe, North America, Brazil and Argentina), is a major limiting factor (Scoones and Wolmer, 2006). The greatest limitation, though, is the inability of many ACP states to meet international standards and effectively respond to non-tariff barriers specifically Sanitary and Phyto-Sanitary (SPS) measures, principally in the areas of animal health and food safety. Stringent requirements to comply with technical standards and requirements, including certified abattoirs, residue analysis and traceability, as well as growing concerns about animal welfare and negative environmental impact including CO_2 emissions, need to be addressed. Countries like Botswana, Namibia and Swaziland have managed to comply with most of these requirements in order 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 capacity (human and infrastructure) to improve compliance with the requirements for trade.

ACP countries must also employ similar mechanisms to protect their local markets and the health of their citizens. They should ensure that their standards for meat, milk and egg products and facility designs are in place and properly regulated to safeguard the health of their people.

The next challenge on the horizon is the possibility of meat and other products from cloned animals entering the domestic markets. After years of analysis, in 2008, the Food and Drug Administration of the United States concluded that animal clones and their products are safe for human consumption. Besides the years of investment in time and financial resources that it takes to create such animals for breeding purposes and the limited knowledge of acceptance of cloned meats by consumers, ACP states need to start addressing this issue regarding policies on market access, public health and food safety and S&T capacity. At present the ACP capacity to challenge these issues is limited but open mindedness and a willingness to invest in biotechnology and safeguard genetic resources should guide the region (refer ACP Policy Briefs 1 & 2 on biotechnology and biodiversity available on http://knowledge.cta.int/).

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 practiced, 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: Perry et al., 2003 as cited in Koroma and Deep Ford, 2006

INSTITUTIONAL CONSTRAINTS

Animal research and development programmes in the ACP Group of States are primarily based on the systems that were set up during colonization. Inherently livestock research was relegated to a proportionally smaller area when compared to plantation crops. Currently, in national agricultural research systems (NARS) the budget allocated to livestock is low compared to other commodities, especially crops. This has led to poor development of capacity in livestock research, a scenario which is still evident in most ACP countries. Observations of the FAO Council on capacity deficiencies in Small Island Developing States (FAO 1999, **Box 4**) are equally applicable to all ACP states.

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

ACP states are not entirely without institutional capacity in livestock research and development but the number of trained livestock specialists has declined over the years (**Box 5**). ST&I capacity in genetics, breeding and reproductive science, nutrition and feeding and production and management systems exists but this is limited and scattered and more needs to be done to build capacity and provide avenues for collaboration.

(a) (b) (c)

Figure 3: Photo Collage - ACP institutions' capacity in (a) genetics and reproductive science, (b) nutrition and feeding (c) and production and management systems
Photos courtesy Ministry of Agriculture and Rural Development, Barbados (a); Jose Morales, IGAT, Cuba, (b) and CARDI (c)

Additionally, there has been profound technological innovation in livestock production in China, India and Brazil that could be available through South-South cooperation. Advances in ICTs can enhance information and knowledge flows and overall ST&I capacity building in livestock science from production to processing and marketing in ACP countries.

The attainment of the full socio-economic potential of the livestock industry in the ACP countries is highly dependent on the consistent use of scientific evidence in all spheres including

compliance with health and food safety standards across the production to consumption chain. Importation of low quality livestock and livestock products to meet national demand should be avoided.

The limited availability of scientific data and access to scientific evidence restricts policy formulation and implementation further contributing low productivity and sale of livestock products. In some ways this can be attributed to low investments in animal science, research, education and training as is illustrated for the Caribbean (**Box 5**). Only two of the twenty-two post secondary institutions in the Caribbean have dedicated Animal Science Departments in the agriculture programme. Likewise, only nine per cent of total research undertaken was on livestock. Similarly in the Pacific, the only institutions currently undertaking research are the Ministry of Agricultures in Fiji and Samoa and the University of the South Pacific School of Agriculture and Food Technology. Although these institutions undertake research and training, only 15% is on livestock while the remainder is on horticulture.

Box 5 Institutional programmes, student enrolment and livestock research capacity in the English-speaking Caribbean

Course profile of 22 post-secondary institutions in the English-speaking Caribbean	
Agriculture/Forestry	7*
Arts/Humanities	18
Education	10
Engineering	3
Law	3
Life/Natural Science	15
Medicine/Veterinary/Health Science	8
Social Sciences/Management	13
Computer/IT	7
Theology	2

*only 2 institutions have an Animal Science Dept

2004/05 student enrolment at University of West Indies (UWI), St Augustine Campus	
Agriculture/Forestry	714 (6%)
Arts/Humanities	1,784 (14%)
Education	1,224 (10%)
Engineering	1,513 (12%)
Law	59 (0.4%)
Life/Natural Science	1,850 (15%)
Medicine/Veterinary/Health Science	1,184 (9%)
Social Sciences/Management	4,276 (33.6%)

Number of researchers in selected Ministries of Agriculture and CARDI		
	Total	**Livestock**
Barbados	20	2 (10%)
Jamaica	75	6 (8%)
Trinidad and Tobago	133	21 (16%)
CARDI	25	4 (16%)

Source: Asiedu, F. 2007 Paper presented at CTA-ACP Policy Briefs on Fisheries, Livestock and Biofuels Workshop, May 28-June 01, 2007

A further reflection of the current status of research and training in livestock production and health and safety in the ACP region is the absence of adequate budgetary provisions in government allocations. A noted constraint with regards to improving the livestock policy environment and education, research and training is the lack or absence of networking and communication amongst stakeholders within countries and amongst regional members.

WHAT ARE THE SOLUTIONS PROPOSED?

General

The ACP states must be able to take advantage of advances in biotechnology, information and communication technology, animal biology, environmental and management sciences, and improved animal production techniques, to address some of the binding constraints. This adoption process requires competent and highly skilled human resource capacity, modern facilities – laboratories, abattoirs and factories and conducive policy environment to bring about the desired changes.

What are the responsibilities of ST&I organizations?

The ST & I organizations in the ACP region are critical in providing the skilled human resource and undertaking the cutting-edge research and outreach needed for improving the performance and competitiveness of the livestock industry. Research and academic excellence and science based policy advice should underpin policies for improving livestock production, processing, marketing and trade in the ACP. ST&I organizations must be able to train livestock scientists and veterinarians who can address multiple problems. Their research should include work on indigenous breeds as a source of genetic material for enhancing productivity and disease resistance, and on traditional medicines for disease management. Other key topics for research include improving feed quality and forage optimization, environmental impact and animal welfare which integrate and build on indigenous knowledge of local communities. Public-private partnerships are important for mobilizing much needed funding.

What are the responsibilities of regional policy makers?

Regional policy networks, such as 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 experts and international partners, should address the related policy issues including the technical and non-technical barriers to markets and trade in animal and animal products. They need to monitor ACP imports of livestock products and propose strategies to protect markets and consumers especially with respect to dumping of animal products and enabling competitiveness. They need to sensitize member states to new threats e.g. impact of genetically modified stocks on indigenous wild life or domestic animals, emerging and existing international trade requirements and new products such as cloned livestock and their products, and their implications for trade in animal products. There is need to advocate for alternative disease-containment strategies for international trade based on commodity-based trade (Thomson et al., 2004; Scoones and Wolmer, 2006). 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 and this can be done in collaboration with the scientific community.

What are the responsibilities of national governments?

ACP governments must provide leadership, the enabling policy framework and adequate resources to build the ST&I capacity, increase local demand, identify export market opportunities and expand trade in livestock and livestock products. It is important that governments avail themselves of the scientific and technical expertise available and make use of the facilities negotiated under international trading regimes including the WTO agreements and EPAs. Given the various conflicting problems faced by the ACP region, governments are encouraged to immediately introduce and enact the relevant policies and legislation throughout the production-processing-consumption cycle to first, encourage high production, secondly, protect the health of livestock and citizens and thirdly, to maintain socio-economic stability of member countries. These in a nutshell require the utilisation of scientifically, economically and environmentally friendly methods, technologies and approaches for achieving sustainable optimal benefits. 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. This includes enhancing research capacity and access to technologies; training in policy formulation with due consideration to the poor; biosecurity control; promoting the use of agro-industrial products for livestock feed and alternative fuels (environmental impact); market-oriented training for farmers to appreciate competitiveness and the use of cost-effective production methods.

CONCLUSION

Constraints to livestock development in the ACP Group of States have been identified and policy actions suggested for mitigating these constraints. 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 capacity building in ST&I; new disease control systems such as DIM and trade facilitation initiatives such as commodity-based trade (CBT) and environmental mitigation. They are required to demonstrate their commitment to the international community to attract complementary 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 portal - http://knowledge.cta.int/

OIE website - www.oie.int/eng/session

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Reviewed by the Advisory Committee on S&T for ACP Agricultural and Rural Development at CTA Headquarters, Wageningen, The Netherlands. Approved – May 2009.

Publisher: CTA
Coordinating Editor: Judith Francis, CTA.
CTA is an institution of the ACP Group of States (Africa, Caribbean and Pacific) and the EU (European Union), in the framework of the Cotonou Agreement and is financed by the EU.

ACP policy brief
No 1/2009
ISSN: 1876-0953