

*Be-troplive concept note on livestock development
 in developing countries*

December 2009

Table of contents

Table of contents	1
1 Introduction	3
2 Target groups	4
2.1 Small-scale farmers in areas with high or medium-high agricultural potential.....	4
2.2 Pastoralists.....	4
2.3 Urban and peri-urban livestock keepers	5
3 Principal guidelines for a community-led sustainable livestock development	5
3.1 Strengthening farmers and communities	5
3.2 Strengthening animal disease control.....	6
3.3 Strengthening livestock services delivery	7
3.4 Access to financial services (saving, credit, insurance).....	7
3.5 Access to market	8
4 Specific approaches for the different zones	9
4.1 Areas of high and medium-high agricultural potential (humid zone).....	9
4.2 Arid and semi-arid areas.....	10
4.3 Urban and peri-urban areas	10
5 Research for development	11
5.1 General principles of the research approach.....	11
5.2 Axes of priority research	11
6 Multi-actors exchange and knowledge management	13
Figure 1: Relationship between livestock production and public health	14
Figure 2: complete production and market chain for animals and animal products	15
Figure 3: Different Belgian actors in the field of tropical animal health and production	16

Introductory note

be-troplive (www.be-troplive.be) is a Belgian informal and multidisciplinary platform, which started in 2006. be-troplive is open to institutional and individual members involved in tropical animal health and production activities. It is sponsored by DGDC¹ through the DGDC-ITMA² frame Agreement 3 and aims to bring all Belgian actors and partners in the livestock sector together in order to stimulate synergy and coherence in the field.

This note on livestock development is a collaborative work of the members of the steering committee. It is based on the strategic note of 2002, the evaluation of the strategic note in 2009, the outcomes of the two symposia and the two workshops organised by be-troplive during the period 2006-2009, on the be-troplive research concept paper, and on the available literature.

The aim is to provide information that can be useful for the “*Plateforme Agriculture et Sécurité alimentaire - Platform landbouw en voedselzekerheid*” in updating the DGDC strategic note of May 2002.

¹ DGDC: Directorate-general for Development Cooperation, Federal Public Service Foreign Affairs, Foreign Trade and Development Cooperation, Belgium

² ITMA : Institute of Tropical Medicine Antwerp

1 Introduction

Since millennia the livestock sector contributed to human development and it currently accounts for 40 percent of the agricultural gross domestic product and employs 1.3 billion people in the world³. In addition, livestock is a key asset for poor households providing livelihoods for more than one billion people. Pastoralist populations are among the world's most vulnerable citizens. Indeed, two-third of the pastoralists are to be considered as poor.

Livestock contribute to the livelihood of the poor in different ways. It's often one of the important household cash income sources and represents one of the few natural capital assets owned by poor households. In mixed farming settings, livestock provide draught power and manure which in turn boosts the crop production. Other benefits from animals are fuel for cooking and heating, materials for house building ... Livestock can also be important for women by providing them their own source of income and independence.

Livestock are of great importance for low- and middle income countries in the context of food sovereignty, food security, and in the provision of quality protein food to the populations. Own production increases direct food consumption or reduces food expenditure by use of revenue from selling animals ("*socio-nutritional impact*"). Rising incomes and growing urban populations are also creating a strong demand for animal products: this is remarkably more pronounced in the South where livestock production and consumption increases, while it decreases in the North. This increasing demand not only poses challenges but also creates opportunities.

Currently the livestock sector as well as agriculture in general is undergoing far-reaching transformations in a global changing environment.

The main global challenges are:

- *demographic growth* (6.6 billions inhabitants in the world in 2008): 1° increases food demand 2° creates new interfaces which induce emergence or re-emergence of diseases transmitted to man by animals (zoonoses), and 3° increases pressure on the available rangeland;
- *increased urbanisation*: (In 2005, almost 43 % of the population in developing countries lived in urban settlements)⁴: induces intra-urban or peri-urban new and complex livestock production systems with increasing concentrations of animals in – and around cities, intensification of the production and growing importance of monogastric species (poultry, pigs);
- *climate changes*: induces 1° land degradation and related land use problems, 2° changes on the ecology and dispersion of vectors of diseases;
- *globalisation of the market*: more migration of animals and/or transport of animal products induces 1° import of new diseases (transboundary diseases) in countries that are not yet able to identify and control the spread of those pathogens, 2° increase the exposure of the local production systems to international competition (e.g. SPS standards felt as threat by developing countries) and 3° trends towards concentration of distribution channels, e.g. in order to reduce transactional costs.
- *world energy demand*: induces 1° an increasing competition for land and grain between animals and bio-fuel production, 2° a higher awareness for efficient energy use in animal production systems.

Globally, it appears that livestock development has a dual role in addressing the increasing demand of an expanding global population for animal products, as well as in achieving the Millennium development goals of poverty reduction.

As there is an important expertise in animal health and production in Belgium, the Belgian Cooperation can contribute substantially and effectively to that sector. Aid should be in accordance

³ Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., and Courbois, C. (1999). *Livestock to 2020. The Next Food Revolution*. Washington, USA - Rome, Italy - Nairobi, Kenya: IFPRI - FAO – ILRI.

⁴ UNFPA (2007) State of world population 2007: Unleashing the Potential of Urban Growth. United Nations Population Fund, New York, USA

with the Declaration of Paris on aid efficiency and with the key-messages of the Accra High Level Forum⁵.

A prerequisite to invest in that sector in a given country is that the country pays enough attention to the sector, gives the necessary institutional support and allocates sufficient budget to it.

Finally, as livestock-related activities contribute to the ecological footprint, climate change, air and water pollution⁶, and transmission of disease to man⁷, mitigating those negative aspects should also be included as a key element in each intervention.

2 Target groups

Although large commercial farms are of importance to provide sufficient food to the growing cities and populations, the emphasis of the Belgian action should be on small-scale holders and resource-poor people, and to help them out of poverty by incomes generated by small scale livestock productions. Additionally it was stressed in the evaluation report of the previous strategic note⁸, that targeting of the poor zones and the vulnerable or marginalised groups was not systematic (conclusion 1 – C1) and these are often the zones where livestock keepers are still present.

Development support needs a human-centred approach. This means a better alignment (see Accra HLF key-messages) between local stakeholders. Therefore, a good comprehension of the decision-making mechanisms in various communities is therefore required, the main challenge being to harmonise a community-led approach with a commodity driven market for the benefit of poor populations (*from commodity to community concept*).

Among those smallholders and resource-poor people, three important groups can be identified:

2.1 Small-scale farmers in areas with high or medium-high agricultural potential

These farmers are most involved in the integration of livestock and agriculture. Mixed farming is one of the keys to mitigate environmental problems in the agro-pastoral zone and to switch from a pure self-consumption pattern to a partly or total market-oriented production (see below point 3.5.).

Small-scale livestock production and commercialisation is important for women with limited access to land. It plays a crucial role in securing households through saving by keeping animals as financial reserve on hoof. Securing livestock production in those areas and increasing its productivity will have a positive impact on the livelihood of vulnerable households.

2.2 Pastoralists

Pastoralists are mostly keeping livestock in arid and semi-arid (remote) areas. The livestock system is extensive and animals are moving from one place to another to optimise the use of this specific ecosystem, e.g. the scarce rangeland and water supply. These populations developed strategies to cope with these harsh conditions they live in.

The survival of this group is largely based on the management of the environment (grassland)⁹. They are valorising zones that are not or less suitable for agricultural production or non-ruminant livestock production.

⁵ Global Donor Platform for Rural Development (2008). Aid effectiveness in agriculture after the Accra HLF – A Platform Discussion Paper.

⁶ Steinfeld H., Gerber P., Wassenaar T., Castel V., Rosales (M.) (2007). *Livestock's long shadow, environmental issues and options*. FAO; Rome

⁷ Hawkes C., Ruel M. (2006). The link between agriculture and health: an intersectoral opportunity to improve the health and livelihood of the poor. *Bulletin of the World Health Organization*, 84 (12) : 984-989

⁸ ADE-IDIS (2009). Evaluation of the Belgian Cooperation « agriculture and Food Security » Strategy Paper Final Report.

⁹ Which is known to be a good carbon sink (cf Conant, R. T., Paustian, K., & Elliott E. T.. (2001). Grassland management and conversion into grassland: Effects on soil carbon. *Ecological Applications*, 11:343-355.)

2.3 Urban and peri-urban livestock keepers

As already highlighted, the increased urbanisation induces intra-urban or peri-urban new and complex livestock production. Besides more commercial intensive farms, urban dwellers are practising urban agriculture and are keeping livestock at household level. Food is indeed very expensive in town (up to 80 % of the revenues according to Maxwell et al.¹⁰) and poor households raise livestock as one of the many survival strategies for income generation and/or own consumption¹¹. Urban livestock has a clear *socio-nutritional impact* in town.

For a long time, poverty was considered as a rural problem, but now more decision makers and scientists are convinced that urban poverty is important too¹². Moreover, slums in cities are steadily growing and are considered as a strong indicator for increasing poverty by UN-HABITAT¹³.

Raising animals in town is a reality and various systems co-exist¹⁴. This is mostly an informal sector that has to be dealt with as linked to environmental and health issues, such as waste management and zoonosis. Vulnerable groups like women and children are also often involved in urban small stock keeping.

3 Principal guidelines for a community-led sustainable livestock development

3.1 Strengthening farmers and communities

Farmers and communities should be strengthened in order to increase their ownership of the process and to improve the productivity of their livestock that is currently rated as low productive¹⁵. Traditional knowledge has to be valorised/capitalised and integrated with new “modern” insights. Interventions should be based on participation, multi-stakeholder processes and optimising local assets. External inputs should be only used if sustainable in all aspects: economical, local access and appropriateness, environmentally, and off course socially.

Community associations of producers should be created and strengthened in the delivery of services for their members.

Key elements of action at this level are

3.1.1 Education and information dissemination

- better education and information about market access, good animal husbandry, basic animal health and hygiene, use the “master trainer” method where a person selected by the community trains the other producers
- Sellers or collectors to be trained in negotiation skills
- Training in all aspects of mitigating effects on the environment is very important (i.a. soil -, waste - and water management).
- Always improve communication and information about current prices and movements using all types of media (leaflets, radio ...).

¹⁰ Maxwell, D.G., Levin, C., Armar-Klimesu, M., Morris, S. & Ahiadeke, C. 2000. *Urban livelihoods and food and nutrition security in Greater Accra, Ghana*. Research Report 112. – IFPRI, Washington DC.

¹¹ Thys, E. (2006). *Role of Urban and Peri-Urban Livestock Production in Poverty Alleviation and Food Security in Africa*. Royal Academy of Overseas Sciences, Brussels, Belgium

¹² Haddad, L., Ruel, M.T., & Garrett, J.L. (1999) Are Urban Poverty and Undernutrition Growing? Some Newly Assembled Evidence. International Food Policy Research Institute, Washington D.C., USA

¹³ UN-HABITAT (2004). *The state of the world cities 2004/2005: globalization and urban culture*. Earthscan Publications Ltd, London, UK

¹⁴ Schiere, H., & Van der Hoek, R. (2001) *Livestock keeping in urban areas: a review of traditional technologies based on literature and field experiences*. FAO - La Ventana Agricultural Systems, Rome, Italy – Wageningen, The Netherlands

¹⁵ EC (2009). *Towards an EU policy framework to assist developing countries addressing agriculture and food security challenges (working title)*. Issue paper

3.1.2 Gender issues

The evaluation of the previous strategic note underlines (C12) that gender was considered in the Belgian interventions but has to be strengthened in the future.

Gaining knowledge on the task repartition among household members is an important prerequisite. Indeed, due to cultural factors and habits, there is a wide range of distributions. The person who takes care of the animals is not always the person who decides on the allocation of the revenue.

- Promote livestock activities for women where they can decide themselves on the use of revenues (poultry, small ruminants ...)
- Identify the best channel to inform and educate women
- Promote a better representation of women in the steering committees of local associations
- Allow women to have equitable access to land and credit

3.2 Strengthening animal disease control

Several reasons urge to invest in animal disease control:

- there are still important diseases threatening livestock production in tropical countries : tick-borne diseases, sleeping sickness (Trypanosomosis), viral and bacterial diseases
- Vaccination is not yet available for every disease, e.g. swine fever
- Animals are in contact with wildlife that act as reservoir (animal – human – wildlife interface)
- There are various diseases transmittable to man (brucellosis, tuberculosis, tapeworms ...). They are more prevalent in poor households in developing countries, where there is close contact between animals and men, but may also be transmitted to consumers (food-borne disease) (see figure 1).

Strengthening the delivery of veterinary services is very important to secure livestock production. Indeed, it helps smallholders to be protected and to up-scale with limited risks.

This can be done with trained community animal health workers which can act as members of a surveillance, prevention, extension and primary animal health care networks.

3.2.1 Veterinary Public Health

Animals always played an important role in the transmission of diseases to man, whether directly or as intermediate host of parasites¹⁶. However the last years important outbreaks of transmittable diseases, like avian and Mexican flu, increased the awareness of this phenomenon and the need for stringent food safety requirements. The threat however is not only coming from those epidemics but also from classical endemic diseases, like tuberculosis and brucellosis which should not be neglected.

The role of the veterinary services within the framework of Veterinary Public Health is becoming more and more important and strengthening the veterinary services¹⁷ (community based, private or otherwise) in order to control animal disease is widely accepted as a global public good (see Intra ACP-EU Multi-annual indicative programme¹⁸, OIE veterinary governance). Joint actions of veterinarians and physicians should be promoted.

Finally, improving health and nutrition increases the availability of workforce for agricultural production.

¹⁶ Acha, P.N., & Scyres, B. (1982). *Zoonoses et maladies transmissibles communes à l'homme et aux animaux*. OIE, Paris.

¹⁷ Van den Bossche P., Thys E., Elyn R., Marcotty T., Geerts S. (2004). The provision of animal health care to African smallholders. An analytic approach. *Rev. sci. tech. Off. Int. Epiz.*, 23 (3), 851-861.

¹⁸ Intra ACP-EU Multi-annual indicative programme 2008-2013
(http://ec.europa.eu/development/icenter/repository/strategy_paper_intra_acp_edf10_en.pdf)

3.2.2 Delivery of veterinary services

Privatisation of veterinary services and full-cost recovery result in producers having to decide themselves on the allocation of their means. Therefore, the study of decision-making by smallholders in animal health management becomes also more and more crucial.

Additionally the increasing threat of transboundary diseases and the implementation of SPS standards for exporting countries requires adopting a more regional or global approach.

At the level of the communities, Community Animal Health Workers (CAHW's) should be trained and the opportunity to double them with Human Health workers should be studied.

3.3 Strengthening livestock services delivery

Delivery services can be private or public, but in fact have the same goal. However in remote areas, the long distances could demotivate private practitioners. Therefore state services, supported by CAHW's, should be more active in those zones.

To increase the productivity following actions should be taken:

- Develop strong extension services in order to train farmers and communities
- Systematically integrate environmental issues in the analysis and implementation of new techniques or improvement of production systems
- Promote private extension initiatives where possible (increased ownership)
- Organise and control the delivery of inputs for animal disease control (vaccines and vaccination campaigns, drugs, ...)
- Deliver adapted inputs for animal husbandry

More technical points to consider are:

- Dairy products will remain important as human beings are mammals ("if you want milk, you need a cow or a goat or a ewe"). Even for vegetarians milk is important.
- As cross-breeding is not always beneficial (exotic animals are more sensitive to harsh conditions).
- Promotion of local breeds linked to improved husbandry techniques (selection, nutrition ...) can be a more sustainable solution and allows preservation of bio-diversity.
- Promote small species (poultry, pigs, minilivestock and non conventional breeds¹⁹) to help women to become autonomous.
- Water supply/management will be more and more a crucial point and a holistic approach is required on this point.

3.4 Access to financial services (saving, credit, insurance)

The livestock sector is often considered less reliable regarding credit recovery. In a market-oriented approach, trust can increase among moneylenders.

Actions are:

- Increase the visibility of the production (from informal to formal)
- If possible, allow perpetuating traditional systems of solidarity and money lending, i.a. "tontines". This is the application of the principle of "warm" money (coming from the community) *versus* "cold" money (coming from outside)
- Promote alternative mechanisms of protection (insurance, ...)
- Promote alternative systems of savings for pastoralists in order to facilitate destocking of supernumerary animals

¹⁹ NB: non-conventional breeds are small species like guinea pigs, rabbits, cane or bush rats, ...

3.5 Access to market

Livestock is an important component of small-scale agriculture as a source of food. Economic growth however is more and more recognised as the way out of poverty. Agriculture and livestock production play an important keyrole²⁰ in providing opportunities to smallholders aiming to generate revenues.

In order to help those smallholders to access the market, different tools have to be provided (educational, technical as well as institutional). The approach needs to be adapted to the various settings. Indeed, market chains are sometimes very informal and in each setting influenced by what is called “informal” and “formal” institutions. Figure 2 shows the complexity of the livestock production chain and its interfaces.

For a better understanding of the marketing of animals and animal products two approaches should be combined:

- the value chain approach which is implemented by several actors in development²¹ and aims at ensuring that the poor are not left out of economic growth strategies by linking micro and small enterprises to larger firms (e.g. dairy factory)
- the New Institutional Economic approaches which consider the (formal and informal) institutional embedding. Some examples of those approaches are: the nested market model²², the study of buying processes and the decision making process of small farmers, ...

Important aspects to take into consideration in this framework are:

- The input suppliers: often inputs for livestock keepers are provided by only a few providers, having a monopoly. Producers are kept away from information on price and quality is available to the producers and their choices are limited. One of the conditions of a well-functioning chain is to avoid that di-symmetric information flow and monopolistic input supply.
- Job creation: every human activity is creating new job opportunities. As an example livestock keeping in town induces work for grass-cutters, feed traders, wheelbarrow transporters ... This should also be taken in consideration when estimating the benefits of an intervention.
- Processing is important added value in the chain (e.g. mini-milk factories), but new standards regarding food safety have to be incorporated (see point 3.2.1).
- The market chain has different levels (proximity market, consumption market, export market). It is important to find out at which level the livestock farmer can best valorise his/her animals or animal products. Shortening the market chain can sometimes be benefiting the producer, e.g. designating an able “seller” or “collect-person” among them to represent the community at a higher level of the market chain.
- Middlemen are mostly considered as a threat for the small-scale producers, due to the information gap regarding costs, markets prices, etc. between the two groups. Producers also feel that they have a lack of confidence about negotiation ability and training should include this topic.
- It is obvious that in case of promoting access to the market for smallholders, decision makers should be aware that those small-scale producers are well-skilled and competitive enough.

²⁰ World Bank (2008). *The World development report 2008, Agriculture for development*. Washington, USA.

²¹ Merlin B. *The Value Chain Approach in Development Cooperation*. 2nd Edition. GTZ, Eschborn
<http://www2.gtz.de/dokumente/bib/05-1037.pdf> (

²² Kyeyamwa H. (2009). *the Market mechanism of livestock in tropical Africa: the case of Uganda* http://www.be-troplive.be/betroplive/pdf/20091127_348821444_herbert%20kyeyamwa_market%20mechanism%20of%20livestock%20in%20tropical%20africa.pdf

4 Specific approaches for the different zones

4.1 Areas of high and medium-high agricultural potential (humid zone)

Integrating livestock, mainly ruminants and other herbivorous species with the plant production system appears to be the optimal path to develop an environment friendly sustainable production.

Mixed farming or crop-livestock systems can be practised in a number of ways and often allow a better use of the available resources compared to specialized intensified systems, and on top of this it also reduces the total risk level taken by the producers. The other main benefits are 1° a significant improvement of the food quality for the farmers and their family, 2° a better management of the soil fertility, 3° a better valorisation of the vegetable produced via the animals, 4° the increased productivity of human labour due to animal traction, and 5° a more evenly spread of financial and food returns throughout the year.

However, a series of constraints must be overcome to fully develop the potentials of these systems. These are mainly 1° the increased risk of diseases transmitted by the animals, 2° overexploitation of the productive capacity of the environment, 3° the increased workload, and 4° conflicts in the rural communities due to increased competition between agricultural and pastoral activities for the available space.

Conditions to be met in order to optimize the potential benefits and to limit the constraints in the event of associating vegetable production and cattle breeding are:

- Securing land tenure to allow farmers to benefit in the long run from the investments in improving the soil productivity of their fields and in increasing the feed production for their cattle.
- Sufficient autonomy in farmer's decision-making related to the combination of inputs and the allocation of outputs. That implies, where existing, the abandonment or adaptation of the communal or familial property rights of the cattle.
- The existence and mastering of production practices on plant level as well as on animal production level.
- Access to agricultural equipment, to animal infrastructures, to inputs (seeds of adapted fodder plants, veterinary drugs, etc) and to services allowing simultaneous improvement of performance of livestock and plant production.
- The availability of sufficient labour force on the farm to ensure simultaneous and uninterrupted care for the animals and the crops. That also implies a will to devote the gains of the increased work productivity obtained from the use of animal force to a true intensification of the production and not to the improvement of the work comfort for the producers or to an increase in their leisure time.
- The existence of creditworthy market opportunities and remunerative prices for livestock and plant products (see 3.4).
- To take into account a broader scale than that of the farm only in order to improve integration between livestock and plant productions.

Other specific measures in this context are:

- Promotion of agrosylvopastoralism which can help to overcome temporal food shortages (and can be used as carbon sink)
- Find alternative feed solutions and range management methods to avoid deforestation
- Where possible promote integration of aquaculture, livestock and plant production
- Promote low-input backyard production (poultry, pigs, non-conventional breeds ...)

4.2 Arid and semi-arid areas

Herd or flock mobility in arid settings is the best way to guarantee the preservation and the valorisation of the environment. Indeed, past initiatives to promote settlement of the nomadic groups had a very negative impact on the ecology of the zone. Supporting the traditional livestock systems while adapting them to the new economical and ecological challenges sounds to be the most effective.

Specific measures:

- valorisation of traditional knowledge at all levels
- guaranteeing herd mobility
- promote destocking of old and unproductive animals or at the on-set of a dry period spell (announced by community based early warning systems)
- Provide alternative saving opportunities to the cattle bank
- development of sound specific commercial chains with an adequate control system
- Improvement of conflict management through increased dialogue among the actors. Pacification of those areas is a fundamental requirement to guarantee the viability of the system.
- development of innovative approaches helping to reach the pastoralists despite their mobility
- improving water access and management (wells committee, ...)
- taking livestock production into account in the various rural development policies
- A political consensus regarding pastoral development should be reached at regional level regarding

4.3 Urban and peri-urban areas

4.3.1 At smallholder level (urban household livestock production – UHLP)

- Stimulate recognition of this spontaneous trend by the urban authorities as this will increase its visibility and allows better control and guidance
- Create appropriate by- laws applicable to these circumstances
- Resolve the technical and commercial constraints (by result driven participatory approach through co-operatives - Urban Participatory Approach (UPA) - most important: feed supply, lack of space, theft, animal health ...)
- Promote small species or non-conventional breeds for intra-urban production and impose strict rules for large breeds (avoid roaming, ...)
- Promote integration aquaculture – livestock production in city fringes
- control trade flows (rural-urban continuum)
- Stimulate collection of unused animal waste and organic garbage : 1°use of manure for market gardening- use of organic waste as feed for animals, and 2° promote bio-gas production
- Organise capacity building of the producers (see point 3.1.1.)
- Extension of veterinary public health issues
- Involvement of all stakeholders (authorities, communities, vets - physicians ...) in discussion and policymaking in a participatory approach so that the real demand of the different population groups is taken into account

4.3.2 At the level of intensive systems (dairy, poultry, pigs ...)

- Improve waste management (cf UHLP)
- Control of feed and food safety
- improve the urban land management and urban planning
- improve husbandry techniques

5 Research for development

To support the above-mentioned actions in the field, generating new knowledge is important and research has to be implemented (see R7 of evaluation report) .

Following axes of priority research are listed according the spirit of the CGIAR systems priority 2005-2015, more specifically:

- Priority 1C: Promoting conservation of indigenous livestock
- Priority 3B: Increasing income from livestock²³
- Priority 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas

5.1 General principles of the research approach

A holistic and multidisciplinary approach, including sociological, anthropological, economical and other technical disciplines (forestry, rural and urban planners ..), is necessary to formulate adequate recommendations and to prioritise interventions.

Each study should associate all the stakeholders, e.g. pilot farms as meeting point for farmers and scientists.

The studies related to the market chain should include the study of sustainable technology for local transformation of the products and an effective cost and benefit analysis of transport/marketing *versus* local consumption.

5.2 Axes of priority research

5.2.1 Valorisation of local biodiversity in sustainable production systems

Inventory, selection, preservation and comparison of local species and breeds, including non conventional animals, must be implemented in order to identify feed – and water efficient animals for further development of sustainable production systems.

The genetic resistance to environmental conditions (climate, diseases, parasites, ...) in indigenous and improved breeds must be investigated.

Fodder plants and feed resources combining an acceptable nutritional value and a capacity to enhance the energy and water-use efficiency of the production systems must be selected.

New technologies allowing the use of non conventional feed resources would be worthwhile to be investigated or developed.

Animal feeding strategies, including range management, within a larger frame of climate changes and reduction of available range-land (e.g. re-use of water and organic solid waste as feed ...) must be developed.

New, cheap and effective drugs or treatment procedures for tropical diseases using local pharmacopoeia must be found.

5.2.2 Comprehension of the socio- economics of new livestock systems

Knowledge on the benefits and risks of various production systems (urban, periurban, rural) must be acquired with a holistic approach (cf. general principles of the research approach).

Market chains (animals on hoof and animal products) need to be properly investigated from producer to consumer, by means of tools like market chain analysis, new institutional economics ...

²³ **NB** : “net” income should be better than just “income”, as it is not the same as only increasing production and takes account of the price of inputs

Generate more knowledge about the “buying centre” (how people think about selling from their cultural background, how to overcome the risk aversion)

The livelihood at household level should also be analysed.

Finally, anthropological studies on farmers-pastoralists conflicts, land-use, psycho-cultural aspects of food choice, and psycho-social benefits of household production (e.g. urban) ... have to be carried out.

5.2.3 Development of efficient epidemiological tools and surveillance systems

Due to financial and managerial constraints in the developing countries, appropriate systems of epidemiovigilance and -surveillance should be developed in such a way that they are adapted to the local resources and specific regional needs.

They include up-to-date tools as participatory and cultural epidemiology, data management, risk analysis, geotemporal information systems and decision-making tools, but also the improvement of diagnostics tools and the appropriate statistical tools for interpreting the results.

5.2.4 Enhanced comprehension of transmission pathways, prevention and treatment of major animal diseases and zoonoses

Epidemiological studies on important endemic and epidemic animal diseases such as Foot-and Mouth disease, African Swine Fever, vector-borne diseases, Trypanosomosis, ... should be implemented.

Studies should also be carried on diseases transmitted from animals to man (zoonoses), e.g. tuberculosis, brucellosis, cysticercosis, Rift Valley fever, zoonoses in nonconventional species, ... This with emphasis on inter- and intraspecies transmission dynamics, risk factors, true impact of zoonotic diseases and comparison rural-urban settings, and dissemination to disease-free countries, also to non tropical regions. The game-livestock-man interface in transmission of disease should be investigated too.

Effective vaccines against tropical epidemic diseases and strategies to prevent resistance to utilised drugs must also be developed, while existing vaccines are to be improved (e.g. thermostability).

5.2.5 Studies on impact of climate change and world energy demand

Studies on impact of climate change on the ecology and dispersion of vectors must be mapped and forecasted, as well as on dispersion/distribution of vectors due to animal movement or changing of habitat.

The influence of bio-fuel making on the animal feed availability and land resources in developing countries should be properly assessed.

6 Multi-actors exchange and knowledge management

One of the observations made during the evaluation of the implementation of the current strategic note was that there were few synergies and complementarities between Belgian cooperation's intervention channels in the interventions (C10).

The Belgian Cooperation is funding research and development interventions through different channels. Other Belgian experts are involved in private initiatives or are acting in international bodies in the frame of projects funded by Belgium through direct funding or contribution to core budget (see figure 3 as example of diverse interveners in the field of tropical animal health and production).

Often actors do not know about each other and knowledge is not shared.

For a better synergy and coherence in the field, following actions can be undertaken:

- Promote platforms in the different disciplines related to rural development *sensu lato*
- Stimulate links between Belgian actors and the alumni of the different Belgian specialised courses
- Create a central DGDC database where all interventions supported by Belgium in rural development are listed using key-words that allow efficient search operations. This is certainly important in case of multisectoral or integrated projects where all components are not explicit in the title²⁴.
- Make this database available online for Belgian actors and partners, ideally through a website
- Stimulate knowledge management for the benefit of the actors and partners
- Sponsor the presence of Belgian experts in international fora to increase the visibility of the Belgian expertise

²⁴ Thys E., Berkvens D., Geerts S., Simons P. (2002). Intervention de la Coopération Belge dans le développement du secteur des productions animales dans les pays en développement. *Tropicultura*, 20 (1) : 37-43.

Figure 1: Relationship between livestock production and public health

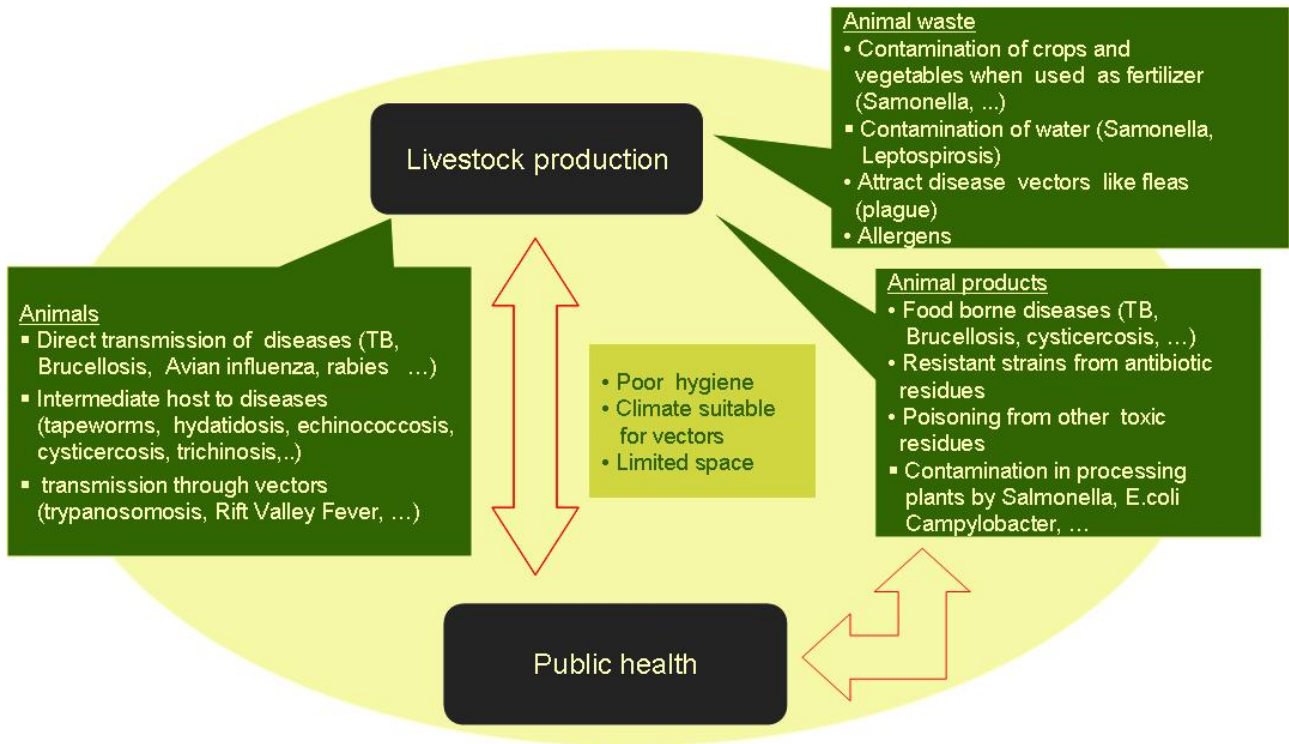


Figure 2: complete production and market chain for animals and animal products

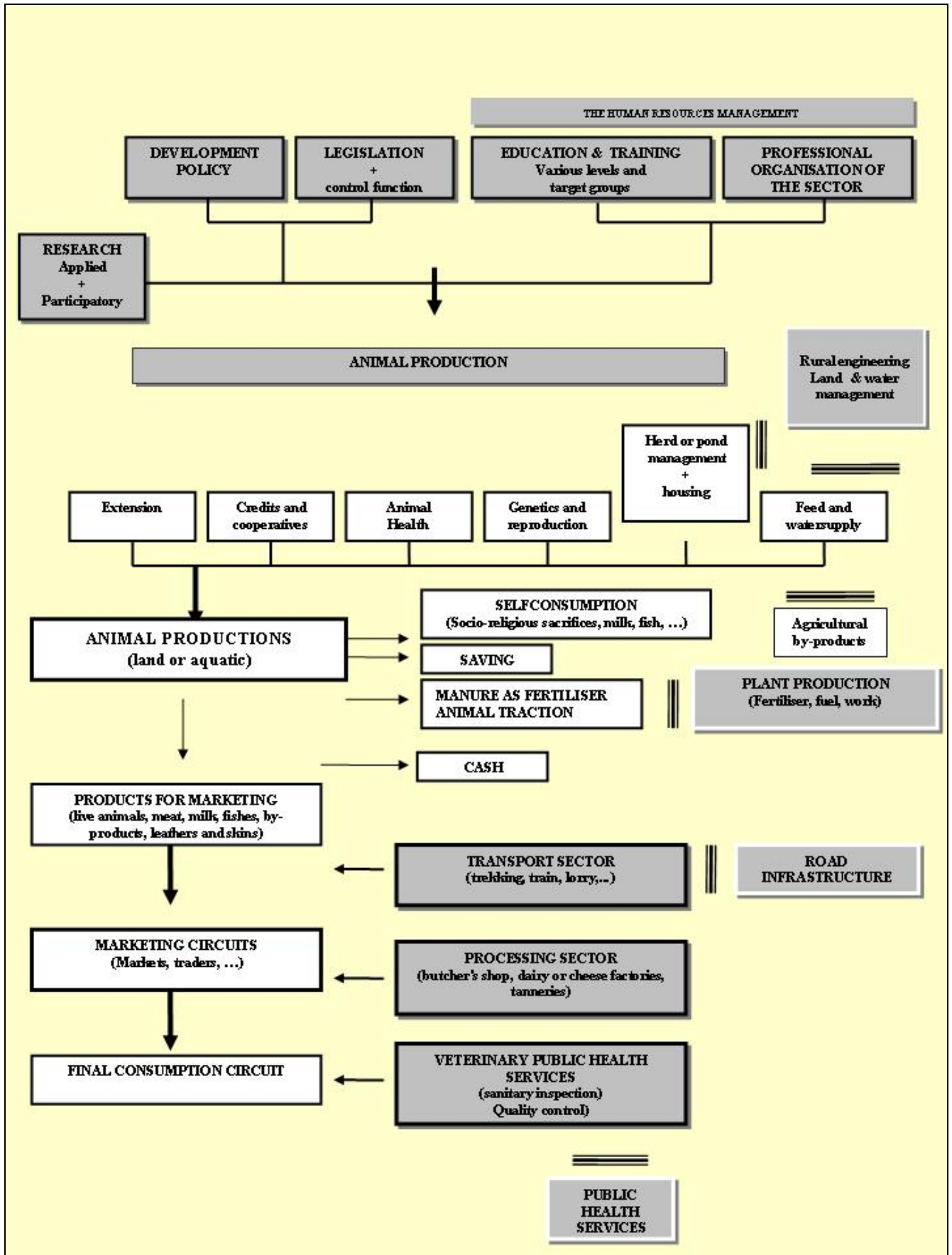


Figure 3: Different Belgian actors in the field of tropical animal health and production

