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Report 745

Aid and Trade for Livestock Development and Food Security in West Africa

February 2014



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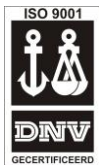
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Abstract

The central issue in this study is the search for
opportunities for livestock development to
enhance food security in West Africa through
aid and trade. The report discusses win-win and
trade-offs between aid and trade, reflecting a
rather traditional divide between development
aid and economic development. Nowadays the
notion public and private might replace that of
aid and trade.

Keywords

Animal production, livestock, food security, aid
and trade, growth opportunities, dairy, poultry,
pigs, Benin, Burkina Faso, Ghana, Mali, Nigeria

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Title

Aid and Trade for Livestock Development and
Food Security in West Africa

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Disclaimer

This report is the result of a quickscan. It cannot claim to be either comprehensive or correct on all counts in the time and resources allotted to do it. The authors did their best to quote references and sources in a proper way. Statements without reference are either on account of the authors or are common knowledge in the reference frame of one of the authors. Comments are invited in case of improper use of names and references.

Samenvatting

Veehouderij is in West Afrika van oudsher erg belangrijk. Het kent vele vormen en dient veel doelen, die vooral verschuiven van noord naar zuid. Deze analyse van de West Afrikaanse veehouderij is een quickscan geschreven door Wageningen UR Livestock Research en La Ventana consulting. Zij dient met name ter ondersteuning van beleidsdiscussies, en bevat tevens suggesties voor de private sector. Het rapport is geschreven voor het Ministerie van Buitenlandse Zaken (Directoraat-Generaal Internationale Samenwerking) en het Ministerie van Economische Zaken (Europees Landbouwbeleid en Voedselzekerheid).

Dit rapport is vooral een zoektocht naar kansen voor veehouderijontwikkeling in relatie tot grotere voedselzekerheid in West Afrika via hulp (aid) en handel (trade). Het rapport zoekt naar win-win situaties tussen hulp en handel, als afspiegeling van de traditionele scheiding tussen ontwikkelingssamenwerking en bedrijfsleven. Dit onderscheid vervaagd tegenwoordig langzamerhand dankzij de opkomst van publiek-private samenwerkingsverbanden.

Het rapport richt zich vooral op vijf landen in Sub-Sahara West Afrika (Nigeria, Ghana, Benin, Burkina Faso en Mali) maar beoogt te komen tot aanbevelingen die toepasbaar zijn voor (andere landen in) West Afrika. Het gebruikt ook ervaringen uit het verleden om naar de toekomst te kijken. De nadruk ligt op veehouderij voor voedselzekerheid vanwege:

- de centrale rol van veehouderij en haar producten in West Afrika,
- de toegenomen vraag naar dierlijke producten in groeiende steden en stedelijke bevolking, en
- de behoefte aan goede informatie over zaken rond hulp en handel in een snel veranderende regio.

Voor het samenstellen van deze quickscan zijn de volgende methoden gebruikt: expert sessies (bijeenkomsten, e-mail en interviews) gecombineerd met gegevens uit de literatuur en van het internet, en met ervaringen van de auteurs zelf. Tijd en middelen waren beperkt en daarom gebruikt deze quickscan hier en daar generalisaties, ook om het rapport leesbaar te houden.

Het rapport begint met een inleiding (hoofdstuk 1) en gaat daarna in op verschillen en overeenkomsten binnen West Afrika, vooral gebaseerd op het herkennen van agro-ecologische en sociaaleconomische *drivers* (hoofdstuk 2). Beter begrip van deze drivers geeft meer vat op ontwikkelingsprocessen en de keuzes daarin. Details worden gegeven van de veehouderij, zakenwereld en formele instituties in West Afrika als geheel (hoofdstuk 3) en in de geselecteerde landen in het bijzonder (hoofdstuk 4). Hoofdstuk 5 is een intermezzo over kansen, gevolgd door een discussie over trade-offs en beleidskeuzes (hoofdstuk 6) en over benadering voor de toekomst van hulp en handel (hoofdstuk 7). Hoofdstuk 8 geeft een slotbeschouwing en aanbevelingen.

Een aantal kernbegrippen verdienen nadere uitleg. *Drivers* zijn factoren zoals regen, bodemsoort, lokale waardes, bevolkingsdichtheid en prijzen. Comparatieve voordelen, sterke punten van een land in het produceren van een specifiek product zoals vlees, vis of melk, veranderen door de snelle ontwikkelingen in deze regio. De interpretatie van het begrip voedselzekerheid is niet voor iedereen hetzelfde, dit rapport gaat uit van de simpele definitie van genoeg voedsel voor alle mensen op elk moment. Dit betreft zowel verdeling als productie. Het begrip *trade-offs*, in het Nederlands zoiets als: elk voordeel heeft zijn nadeel, is een centraal punt in beleidskeuzes, omdat een keuze voor het één vaak ten koste gaat van het ander. Een voorbeeld dat in dit rapport wordt benadrukt is dat het op gang brengen van een voedselstroom van platteland naar stad (of naar exportmarkten) vroeger of later kan betekenen dat er (eenzijdig) waarde naar de stad kan gaan stromen, wat niet altijd gunstig is voor voedselzekerheid op het platteland. Adaptief gedrag, oftewel aanpassing van het gedrag aan de omstandigheden is een wezenlijk deel van de overlevingsstrategie van pastorale gemeenschappen.

Hoofdconclusies in dit rapport zijn:

- Veel is mogelijk voor hulp en handel in West-Afrika, bij een flexibele en creatieve aanpak.
- Veel is bekend in de regio van eerdere (Nederlands) werk aan technische, sociale en ecologische aspecten en afwegingen over veehouderijontwikkeling in West-Afrika, zoals beschreven in dit rapport; verdere herziening en actualisering wordt aanbevolen.

- Helder gebruik van basisdefinities en veelgebruikte concepten (zoals voedselzekerheid, open grenzen en illegale belastingen) bevordert de discussie.
- Statistieken zijn te onbetrouwbaar om nauwkeurige beschrijvingen toe te staan.
- Veel (sociaaleconomische en biofysische) *drivers* kunnen worden geïdentificeerd die de veranderingen in de veehouderijsystemen beïnvloeden.
- Vier grote productiesystemen worden herkend: a) pastoralisme, b) gemengde landbouw (binnen of over bedrijven heen), c) intensieve varkens-, pluimvee- en melkveehouderij, en last but not least d) erflandbouw. Daarnaast worden waardeketens gesegmenteerd in micro-, meso- en macro- schaal markten, wat een verandering behelst van informele naar formele markten en van lokaal naar (inter-)nationaal.
- Alle systemen zijn onderhevig aan verandering, zoals in de mate van integratie tussen akkerbouw en veeteelt, *Vergetreidung* (verschuiving van diëten van de armere groepen in de samenleving naar grotere afhankelijkheid van plantaardige producten) en de wens naar meer lokale inkoop.
- De grootste trade-offs zijn te verwachten bij beleidsbeslissingen in rond de behoefte om verwerking te decentraliseren en langere voedselketens te creëren, of met andere woorden, in relatieve prioriteit van lokale vs. (inter-)nationale markten.

De vele detailconclusies zijn vervat in vijf categorieën: context van de veehouderij; voornaamste productie sectoren; uitdagingen; kansen; en beleid en trade-offs. Dit rapport geeft aan dat voorzichtigheid is geboden, omdat bij de vele kansen voor het Nederlandse bedrijfsleven de win-win niet automatisch is. Creatieve wegen zijn nodig om de synergie tussen hulp en handel te bereiken; deze vragen voorbereidende studies en pilots. De auteurs denken dat e.e.a. eerder interessante mogelijkheden gaat bieden dan verborgen problemen.

Summary

Livestock keeping traditionally is very important in West Africa, occurring in many forms and fulfilling roles that change over time and from north to south. This report presents the results of a quickscan done by Wageningen UR Livestock Research and La Ventana consulting, mainly for policy discussions, but also giving suggestions for action by the private sector. The report is written for the Dutch Ministries of Economic Affairs (Department of European Agricultural Policy and Food Security, Directorate-General Agro) and Foreign Affairs (Directorate-General of International Cooperation).

The central issue in this study is the search for opportunities for livestock development to enhance food security in West Africa through aid and trade. The report discusses win-win and trade-offs between aid and trade, reflecting a rather traditional divide between development aid and economic development. Nowadays the notion public and private might replace that of aid and trade.

The study focuses on situations in five Sub-Saharan West African countries (Nigeria, Ghana, Benin, Burkina Faso and Mali) while extending those experiences to (other countries in) West Africa. It uses past experiences and experiences from elsewhere while envisaging future developments. The emphasis on livestock for food security is justified because of:

- the central role of livestock and its products in West Africa,
- the increasing demand for animal products by growing cities and their populations,
- the need for good documentation on issues of aid and trade in a rapidly changing West Africa.

The methodology followed in this quickscan consists of using expert sessions (meetings, mail contacts and interviews) combined with literature, web searches and experiences of the authors. As time and resources were limited, the quickscan in many cases has to remain rather general and make some significant simplifications.

The report starts with an introduction (chapter 1), followed by the identification of differences and similarities in West Africa livestock systems based on agro-ecological and socio-economic drivers (chapter 2). Better understanding drivers of change helps to grasp development processes and choices. Details of livestock development, businesses and institutions in West Africa as a whole (chapter 3) and of the selected countries (chapter 4) are given. Chapter 5 is an intermezzo on opportunities, followed by a discussion on trade-offs and policy choices (chapter 6) and on approaches for the future of aid and trade (chapter 7). Chapter 8 gives concluding remarks and recommendations.

Some key notions need further explanation. Drivers refer to factors that determine developments and form of function of livestock production systems and value chains, e.g. via rain, soil type, traditional values, population pressure and market relations. Comparative advantages are special advantages that a country, region or community has in e.g. the production of meat, crops or other products. Rapid change affects the comparative advantages of sectors like meat, milk, poultry, pig, or fish production. In other words, a comparative advantage today or in the past may not be a comparative advantage in the future. Typically traditional areas for livestock in the past may shift (and actually do shift) into systems that increasingly go for cropping. That process is called *Vergetreidung* in this report, denoting a move from low to higher calorie yields per area unit, whether sustainable or not. Food security is a contested concept; this report refers to the simple definition of enough food for all people at all times. It is an evolving notion, referring to issues of distribution rather than production of food. Notions of trade-offs are central to policy setting by public and private sectors, where a choice for one approach can go against a choice for another one. For example, long food chains tend to increase food supply to urban markets while shifting food and added value from rural areas. Adaptive behaviour, so typical for pastoral communities, implies that agents in varying conditions use flexible approaches over emphasis on fixed productivity targets. Some companies and aid programs in aid and trade have more success than others in this respect.

Main conclusions in this report are:

- Much is possible for aid and trade in West Africa, provided a flexible and creative approach is taken.
- Much is known in the region from earlier [Dutch] work on technical, social and ecological aspects and trade-offs in livestock development of West Africa, as described in this report, but further review and update is suggested.
- Basic definitions and commonly used concepts (e.g. on food security as well as quantitative notions of open borders and illegal taxes) should be used clearer to improve the discussions.
- Statistics are too unreliable to permit accurate descriptions.
- Many (socio-economic and biophysical) drivers can be identified that influence the changes in livestock production system in West Africa.
- Four major production systems are recognised: pastoral, mixed (off- and on-farm), intensive pigs, poultry and some dairy, and last but not least backyard farming. In addition, value chains are segmented into micro-, meso-, and macro-scale markets, implying a change from informal to formal markets, and from local to (inter) national.
- All systems are subject to change, examples are greater intensity of mixing, *Vergetreidung* (shift of diets of poorer sections of society to more dependency on products from plant origin), and a desire for more local sourcing (not easy for milk).
- The largest trade-offs for policy decisions are likely to occur in the need to decentralize processing and larger food chains, or in other words, in relative priority of local vs. (inter-) national markets.

More detailed conclusions and recommendations are presented in five categories: context of livestock production; main animal production sectors; challenges; opportunities; and policy choices and trade-offs. Overall the report strikes a cautious note, because of difficulties for trade, but more due to the challenge in finding a balance between aid and trade. The proper balance deserves more attention, rather than assuming a straightforward win-win. The authors think that further work in this field will find more creative opportunities rather than hidden problems.

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APPENDICES

Appendix I: Infographics of agriculture related statistics per country

Appendix II: A quick look at the Netherlands

Appendix III: Agencies, private groups and NGOs involved in Western Africa

Appendix IV: Consulted persons

List of acronyms and abbreviations

ACIAR	Australian Centre for International Agricultural Research
ASF	African swine fever
CPP	contagious pleuro-pneumonia
CSR	corporate social responsibility
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organisation of the United Nations
FMD	foot and mouth disease
GDP	gross domestic product
GHG	greenhouse gas
HPAI	highly pathogenic avian influenza
NCD	Newcastle disease
NGO	non-governmental organisation
OIE	World Organisation for Animal Health
PACE	Pan-African Programme for the Control of Epizootics
PPP	people, profit, planet or public private partnership
PPR	peste des petits ruminants
SME	small and/or medium size enterprises (in Dutch; MKB = midden- en kleinbedrijf)
SPS	sanitary and phytosanitary standards
TSV	thermostable vaccine

1. Introduction

People and economies in West Africa traditionally depend on livestock, in many different ways. Animals are kept for their meat, hides and milk, but also as a source of traction or as a means of saving. Livestock are a vital part of people's livelihood. The trade in livestock products forms an important economic driver, especially in urbanising societies. Despite the traditional presence of livestock in the West Africa, average consumption of animal protein is low and food security remains an issue (FAO, 2013b). This is due to unequal access to animal proteins (skewed income distribution and poverty) and overall shortage of supply due to low production and trade.

Supporting livestock development offers a way to reduce poverty and increase food security. This topic has traditionally been the field of development cooperation. Recently, the Dutch government revised its policy regarding development cooperation, bringing closely together the fields of aid and trade. Ambitions are to eradicate extreme poverty, by promoting sustainable and inclusive growth, while facilitating success for Dutch companies doing business abroad (Ministry of Foreign Affairs of the Netherlands, 2013).

West Africa is one of the focus areas for the new aid and trade policy of the Netherlands. This quickscan examines the opportunities and constraints for aid and trade in West Africa and the implications for stakeholders concerned with food security and poverty reduction. The animal production systems in five countries - Benin, Burkina Faso, Ghana, Mali and Nigeria - are reviewed, thereby focusing on species of which imports and regional trade are important, like large and small ruminants, pigs and poultry (SWAC-OECD/ECOWAS, 2008), with mention of minor species such as fish, camels or cane-rats. In addition, the comparative advantages of countries and agro-ecological zones across West Africa are explored.

At present, Mali and Benin are Dutch aid countries and Ghana is a transition country. This means they have access to various funding instruments that are part of Dutch policy. The Netherlands has a trade relationship with Burkina Faso and Nigeria. All five selected countries have been recipient of Dutch bilateral aid in the past. Nigeria was the first to be dropped from the list, Ghana was second when GDP/head grew above the set limit. Mali and Benin continue as so-called concentration countries. The five countries in this study are member of the Economic Community of West African States (ECOWAS), which covers more than these five countries. Several instruments are available to facilitate relationships between the countries of West Africa and the Dutch government, including the very recent Good Growth Fund.

This quickscan is written on request of the Dutch Ministries of Economic Affairs (Department of European Agricultural Policy and Food Security, Directorate-General Agro) and Foreign Affairs (Directorate-General of International Cooperation). It is primarily intended for policymakers and embassy staff, but it is also expected to be useful for people directly involved in trade or aid as well.

This study partly follows the approach of Van der Lee *et al.* (2013) in a similar study focussing on a selection of nine countries across the globe. However, some differences worth mentioning include:

- The total area of the six West African countries together is smaller than that of China alone (one of the countries in that study), and between them the West African countries have many similarities. Hence, much attention is given in this report to the similarities between countries by also looking at (agro-ecological and socio-economic) zones. Interrelations of different agro-activities are one important reason to embed the country-approach in one that spans West Africa as a whole.
- The livestock industry in West African countries is less standardised and less commercialised than in countries like China and Russia in the study by Van Der Lee *et al.* (2013). Hence, there is more focus on variation, within and between countries.

Information in this report is collected from literature and internet, and from consultations with a broad range of experts from Dutch business, NGOs, Dutch and international development agencies, Dutch embassies, freelance consultants in Europe and abroad, and academic staff and students from Wageningen UR (appendix IV). As this study is a quickscan, it aims to provide an overview of challenges and opportunities without trying to be comprehensive. Not all can be elaborated and a few caveats on work and results of this quickscan are given in box 1.

The report starts with this introduction (chapter 1), followed by identification of differences and similarities between West African livestock systems based on agro-ecological and socio-economic drivers (chapter 2). Better understanding the drivers of change helps to grasp development processes and choices. Details of livestock development, businesses and institutions are given for West Africa as a whole in chapter 3 and for the selected countries in chapter 4. Chapter 5 is an intermezzo on challenges and opportunities, followed by a discussion on trade-offs and policy choices (chapter 6) and on approaches for the future of aid and trade (chapter 7). In that way the part up to chapter 5 gives rather factual information, on face value, challenges and opportunities. The second part starting with chapter 6 goes bit deeper into indulging issues/choices concerning aid and trade. Chapter 8 gives concluding remarks and recommendations.

Some key notions used throughout the report need further explanation. Drivers refers to factors that determine developments and form or function of livestock production systems and value chains, e.g. via rain, soil type, traditional values, population pressure, politics, and market relations. Comparative advantages are special advantages that a country, region or community has in e.g. the production of meat, crops or other products. Rapid change affects the comparative advantages of sectors like meat, milk, poultry, pig, or fish production. In other words, a comparative advantage today or in the past may not be a comparative advantage in the future. Typically traditional areas for livestock in the past may shift (and actually do shift) into use of agricultural systems that increasingly go for cropping. That process is, among others, called *Vergetreidung* in this report, denoting a move from low to higher calorie yields per area unit, whether sustainable or not. Food security is a contested concept; this report refers to the simple definition of enough food for all people at all times. It is an evolving notion, referring to issues of distribution rather than production of food. Notions of trade-offs are central to policy setting by public and private sectors, where a choice for one approach can go against a choice for another one, where well-intended actions can be counterproductive. For example, long food chains tend to increase food supply to urban markets while shifting food and added value from rural areas. Adaptive behaviour, so typical for pastoral communities, implies that agents in varying conditions use flexible approaches over emphasis on fixed productivity targets.

This report suggests that long term involvement in West Africa will need aid and trade that increasingly look at what is needed, rather than to focus on what is available on the shelf.

Box 1: Some caveats on the work and results of this quickscan.

A quickscan by definition can be neither comprehensive nor correct on all details. Some issues might have been elaborated more and they are mentioned here, only briefly, being too important to be left out altogether and deserving further attention:

- Quality and availability of agricultural statistics are notoriously poor around the world, also in West Africa. Two problems are that a) statistics ignore entire sections such as relevance of the informal sector for food security and b) the data are often made up or extrapolated from much older trends or plans. FAO is actively trying to improve on this issue. This report opted to show rather than to hide conflicting data, leaving it up to the readers to choose whatever suits them best.
- During writing the role of goats and sheep has not gotten the attention that it deserves, especially in terms of supplying meat to more localised markets. We also would have liked to give more attention to the review of trends like water use and availability, CO2 emission and sequestration, demographics, politics and so on. But choices had to be made, a quick scan is a quick scan!
- The definition of food security is not elaborated but the use of food security notions stresses access to enough food over production of enough food. Off and on the text specifies differences such as food security for rural vs. urban consumers, for staples and/or luxury goods. Without such distinction any discussion is too superficial to be useful and may even be misleading.
- The term technology is used throughout this report, sometimes alternated with terms like interventions, innovations and/or options. In all cases these terms, unless otherwise clear from the text, refer to technology in a broad sense, incl. aspects like skills, know-how, machines, inputs, capital at all levels (farm, region, country and so on) embedded in a layer context, with and/or without support systems.
- As work on this report went on, it become increasingly clear that trade does not automatically ensure food security, the opposite can even be true, i.e. where trade goes at the expense of food security
- As reporting neared final stages there were ever more people giving suggestions, comments and more literature. Some of that is been included in suggested reading, being too important to be missed.
- Aspects of PPP from Europe may get different priorities and interpretations in Africa. For example, in case of animal welfare, on the hoof animals may suffer more from transport in trucks than from walking. Another example with diverging priorities in PPP concerns the issue of greenhouse gas (GHG) emissions, highly relevant but different in Africa than in Europe. Conversely, issues of scale in trade (value chains) might for the time being more affect food security and allocation of resources in Africa than in Europe. The latter have thus received greater attention.

2. Drivers of agricultural organisation and change

Livestock keeping systems show great variation and similarity throughout West Africa. Many differences are seen from north to south and many similarities from east to west. These differences and similarities find their origin in so-called drivers, which affect the choice and functioning of technologies, management- and farming systems, thereby shaping livestock systems and their potential development paths.

Understanding these drivers helps to better comprehend the variation of livestock systems and the ensuing opportunities and challenges for aid and trade policies. It also makes it possible to draw analogies, rather than to focus on individual countries. In this study, two groups of drivers are distinguished; agro-ecological and socio-economic drivers:

- Agro-ecological drivers are natural characteristics such as climate (variability), soil type and fertility, population pressure, and topography
- Socio-economic drivers are social characteristics such as distance to the city (market), urbanisation, culture, prices, attitude to farming and ecology, political stability, policies, and politics.

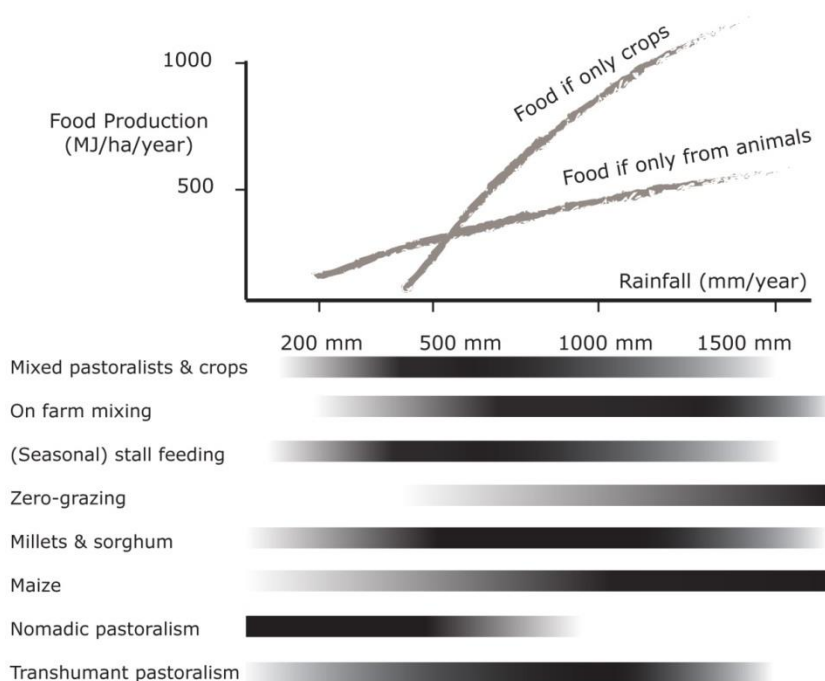


Figure 1: The effect of the driver rainfall on several production aspects and challenges and opportunities for development. This notion guides development options (based on Jahnke, 1982 and Spedding, 1979).

An example of how drivers can be used to understand options for development is given in figure 1. It shows the effect of rainfall on the potential production of food from animal origin (shallow curve) and from plant sources (steep curve). Below the graph the effect of the amount of rainfall on several production aspects is given, thereby giving guidance to development options. For instance, opportunities for millet production are highest in medium-arid regions, while opportunities for maize production are highest in more humid regions.

2.1. Agro-ecological drivers

2.1.1. Rainfall

West Africa shows a large variety in agro-ecological zones, from deserts in the northern parts to humid regions in the south Walsh (figure 2). Rainfall patterns are one of the factors determining the

farming systems in these zones. Throughout West Africa, isohyet lines¹ run from east to west, meaning that variation in rainfall on this axis is low, while it is high from north to south. The average annual rainfall may decrease with up to 100 mm when travelling 100 km north (figure 2). In the north the mono-modal rainy season² is shorter than the long dry period. In the dry season the *Harmattan*, a dry wind from the north, blows with varying strength, sometimes carrying dust into the humid zone. The humid zone has a bimodal rainfall pattern.

Generally speaking, pastoral systems are found in the dryer areas in the north, and mixed systems, pure cropping- and tree systems in the more humid south. Tall natural grasses with higher growth rates are found in the humid zones in the south. Their nutritional quality is lower than of the natural grasses in the dryer areas. In addition to disease patterns, this makes these zones unfavourable for keeping of large ruminants, if based on natural grasslands. The northern semi-arid regions are ideal for pastoral livestock keeping, as the shorter and sparser Sahel grasses allow for higher than maintenance level intake and survival of the stock, even in the dry season (Breman & De Wit, 1983).

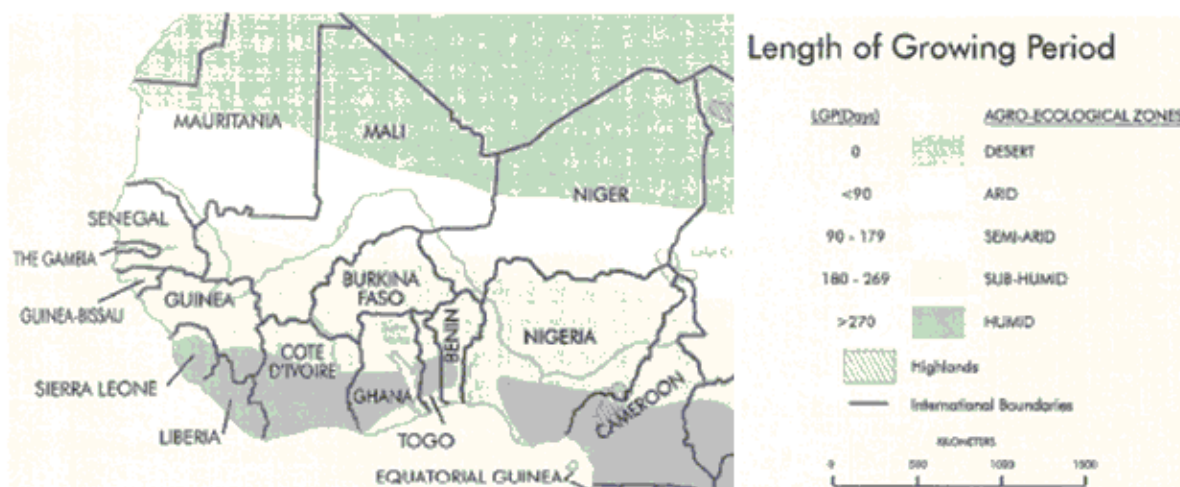


Figure 2: Climate zones of sub-Saharan Africa with isohyets from east to west (based on Walsh *et al.*, 1991).

Box 2: Mobility and pastoralism (SNV, 2012).

The border areas of south Mali and west Burkina Faso contain rangelands in a large cotton belt. Besides providing pasture for herds of cotton producers and (agro-)pastoralists, they serve as corridors for transhumance between the northern Sahel and southern Ivory Coast. Sustainable management of this agro-ecosystem is threatened by rising population and competing claims to land. Since 2006, SNV provides support to 16 district councils, facilitating consultations on equitable sharing of natural resources, leading to the establishment of local management committees in both countries. Building on shared area mapping exercises, the committees have demarcated rangelands and corridors and put in place rules to govern the exploitation of common pool resources. Resource-based conflicts have diminished in many areas and the credibility of the community platforms has been enhanced by successful enforcement. At present these projects are spreading to other border areas in the region, an example of adjusting to local conditions and making best use of local resources.

2.1.2. Rainfall patterns

Mono-modal rainfall patterns in the (semi-)arid areas are the basis for annual price fluctuations for animals and most food crops. Mobility enables herders to avoid local and regional consequences of droughts, and hence is crucial in the management of their ecosystem (box 2). If rainfall is good, animals grow well and can survive the dry season, food prices stay acceptable and sales of animals remain low. More general, droughts drive up grain prices and may lead to emergency selling of all species of livestock and to very low prices in particular for cattle and camels. After a long period of good rainfall and less generalised droughts, the Sahel was struck by years of generalised drought in 1970, 1973, 1983, and 1984.

¹ Isohyetal lines are lines that connect points on a map that have the same amount of precipitation

² A mono-modal rain pattern shows one rain peak per year

The drought of 1970 occurred after a long period without generalised droughts, resulting in high stocking rates and overexploitation of the pastures. The drought caused further degradation when desperate herders cut trees to feed the leaves to their starving livestock. This first drought led to seasonal movements further south, to use the standing harvest residues. The later droughts led to permanent settlements of pastoralists in the sub-humid zone. This process was eased by the eradication of the human river-blindness in the 1970ies in all West African countries by a project of the World Health Organisation of the United Nations. Permanent settlement of pastoralists in more humid areas however brought threats to livestock production, due to the higher frequency of certain livestock diseases in the humid southern zones, including trypanosomiasis (sleeping sickness) and a range of tick-borne diseases. During the droughts, part of the animals was sold by desperate pastoralists to investors, who then hired caretakers to manage the herds. This change in ownership resulted in changes of traditional grazing practices. Nevertheless, migration continues to be essential to maintain productivity of pastoralist systems, leading to new challenges and opportunities for pastoralist re-organisation (box 2).

2.1.3. Topography

At local level, larger differences in agro-ecology and in the associated production systems may be observed. As villages are mostly located on slopes, neither too far nor too distant from the river, village transects show a typical toposequence (figure 3). Crops are grown on the better soils in the river beds. Stony and eroded plateaus usually form rangelands for grazers as soil quality is low. If demographic pressure is low, as in the past, then fallow land on the plateau provides pasture for village ruminants and wildlife. Growing populations lead to more frequent use of fragile soils for crops and to tensions about user rights.

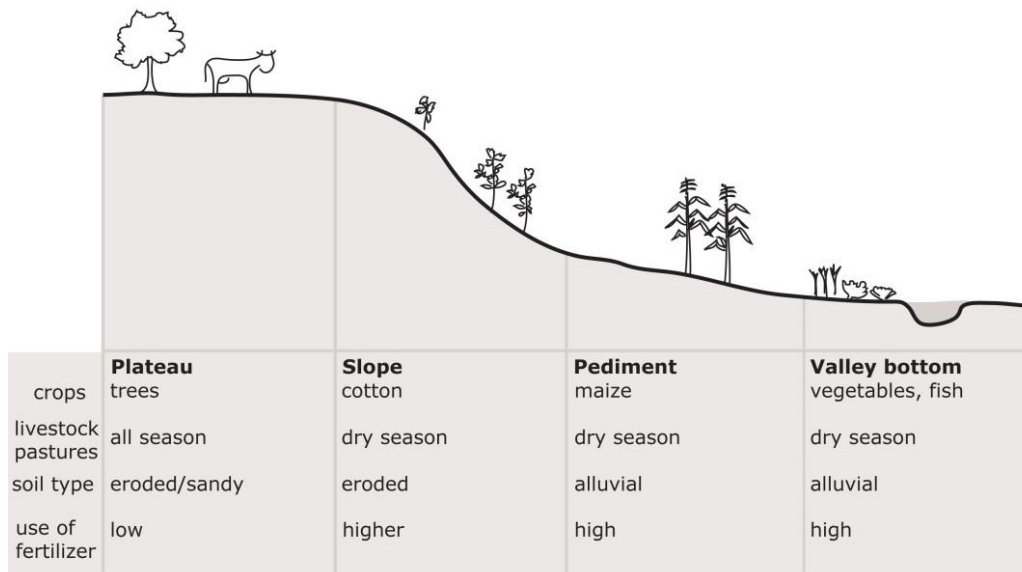


Figure 3: A typical transect along a toposequence for sub-humid and semi-arid West Africa.

2.2. Socio-economic drivers

2.2.1. Population growth, proximity to cities and imports

Population growth is a major driver of change, leading among others to urbanisation. Urban centres depend on markets for their food security, while agriculture on city fringes can provide only limited quantities of animal protein. Rings can be identified, based on distance from the city centre, that drive the shape and function of (peri-urban) livestock system (see figure 4).

Production of animal based foods in urban areas tends to focus on products like milk and fish. Eggs and pork may come from intensive farms in the urban-rural interface, or are imported from abroad. Eggs and other poultry products from backyards or urban agriculture may command special prices. Beef, mutton and bush meat tends to come from rural areas. Poor management of specialised farms in or around cities may lead to pollution of groundwater and to public health hazards, e.g. waste of animal- and slaughterhouse. Such problems are existent but less in (urban) backyard livestock keeping than in larger specialised systems.

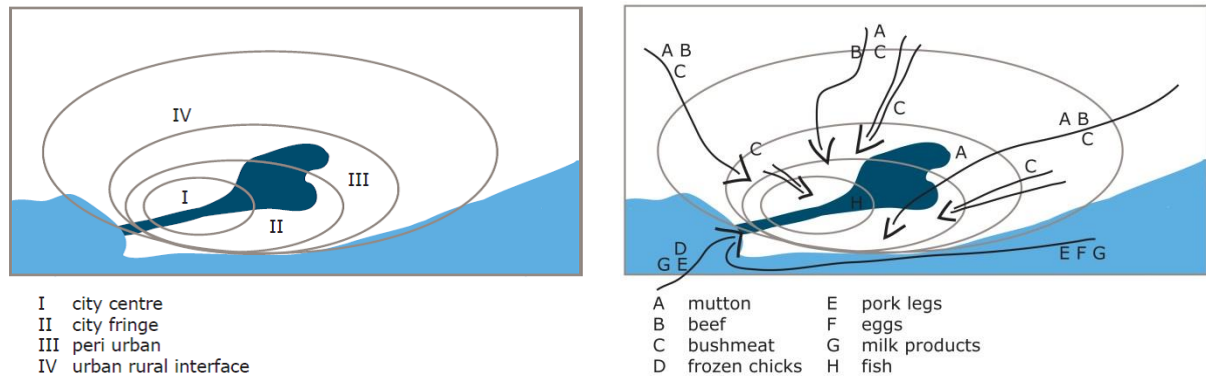


Figure 4: Food supply and (peri) urban rings in Monrovia, a coastal city in Liberia, West Africa (Schiere, 2010).

2.2.2. National and local policies

Other drivers of change are policies of public and/or private actors on issues such as taxes, subsidies, or infrastructure. All five countries under study have incentive tax regimes for investments, providing tax reduction from three to ten years for new industrial investments. Ghana and Nigeria for example specified sectors in which entrepreneurs can receive tax holidays or a pioneer status. Specific agencies exist to assist investors. Each country sets special conditions for starting an enterprise; Environmental Impact Assessments may be one of those conditions.

As drivers for more intensive production systems, the countries often focus on new initiatives by investors when their own institutions are failing (FAO, 2011; Douthwaite *et al.*, 2003). In many instances the state agents are also unable to establish a good relation with traditional farmers or to perform good extension and training. Some countries support farmer organisations, others hardly allowed independent farmer movements until late last century. Last but not least in many cases, efforts are needed to ease formal border controls and informal (i.e. illegal) taxes. Both are an important focus of ECOWAS (paragraph 2.2.3).

Mind-sets of policy makers also are drivers of change, among others via the design of curricula and research programs that are either creative or just following mainstream, sometimes outmoded western thinking. For example, much livestock is kept in backyards and peri-urban conditions rather than only in industrial and commercial systems. Mainstream use of statistics and training programs may not stimulate policy makers and entrepreneurs to recognise the importance of those production systems for food security (Jerven, 2013; Schiere & van der Hoek, 2001). For example, potential of backyard and peri-urban livestock systems for food security can be large indeed. The FAO compared options to improve poultry, pigs, sheep, goat, and cattle in Burkina Faso (IEPC, 2005). Potential improvement of gross margin per productive female was largest for poultry village systems producing meat (258%). Village egg production could increase 60%, while semi-intensive systems of layer hens had no significant potential for improvement due to use of the Isabrown breed, which is sensitive to high temperatures. Output of village pig production could increase close to 120%. In sheep production the extensive system had most potential (35% to 40%), while sheep fattening could hardly be improved. Potential improvements in cattle and goat meat were 20-30%, and in milk production about 80%. Still, much of the mainstream attention tends to focus on development of large scale industrial farming.

2.2.3. *The role of ECOWAS*

Benin, Burkina Faso and Mali are Francophone, and Ghana and Nigeria are Anglophone. In addition each country has many local languages. This language divide is an implicit driver that is also reflected in a monetary union that unites most of the francophone countries in West Africa. ECOWAS (box 3) was created to overcome this divide, but the organisation and its policies are not really figuring in the public debate, very unlike the case of the European Union in Europe. Some reports express remarkable naiveté on the regulatory force that ECOWAS might exert in driving greater local trade, at least in the short term (Ofei & Plunkett, 2009; SWAC-OECD / ECOWAS, 2008).

Box 3: The Economic Community of West African States ECOWAS3.

The Economic Community of West African States (ECOWAS) has four institutions: the Commission, the Community Parliament, the Community Court of Justice, and the Bank for Investment and Development. The Commission and the Bank (more often called The Fund) are the two main institutions designed to implement policies and to carry out development projects in Member States. Such projects include intra-community road construction and telecommunications; agricultural, energy, and water resources development. ECOWAS has a Directorate of Agriculture that aims to harmonise policies. This directorate prepares the programs for the Parliament; afterwards they are proposed to the national parliaments for implementation. At present the Directorate of Agriculture works on consolidation the Regional Program of Investments in Agriculture, activities of interest for the animal production sector are to define:

- a Program on Biotechnologies and Biosecurity
- a Program on Maritime and Continental Fisheries and on Aquaculture
- a Strategic Action Plans for the Development and Transformation of Livestock production
- joint execution in the CEDEAO/CILSS/UEMOA framework to harmonise rural land tenure

Box 4: Make people responsible: not livestock but poor governance causes desertification.

Google-maps shows the difference in vegetation cover north and south of the border between Niger and Nigeria, having similar demographic and animal density. Niger is greener and has more trees, which is remarkable since it has less rain compared to Nigeria. This is achieved by making people responsible: the tasks and rights of the Forestry services have been reduced while organised and trained villagers take care of: a) temporary protection of restoration zones and subsequently of intermittent heavy grazing; b) the choice of trees that are trimmed to become trees instead of bushes and; c) the decision on the cutting of the trees. In a few years the forestry and pasture production recover and the crop harvests doubled (Reij, Tappan & Smale, 2009)⁴.

Until recently, even scientists believed that desertification in semi-arid and arid zones would stop when livestock would not graze anymore and when forestry services could manage the area without animals being there. Such hypotheses of the colonial and post-colonial institutions have been contested, however, an example of the need to change and update curricula. In fact forbidding access to livestock may accelerate rather than reduce desertification (Savory, 1983). So called holistic management of natural rangelands using short heavy grazing regimes by large herds is in that sense suggested to restore rather than destroy the forest and pasture production⁵. Degraded soils in semi-arid and arid zones that are eroded have developed a hard crust in which no water penetrates. Degradation can be restored with a good mix of participation, technology and participatory holistic management (CILSS, 2010).

Since 2005, ECOWAS strives to streamline regional livestock policies that hamper production and trade (ECOWAS, 2010). In February 2009, the ministers in charge of livestock farming, trade, and security in the ECOWAS region approved a plan to develop livestock farming. The regional vision for livestock farming is summed up in eight recommendations. Those were translated in an action plan that converges with the ECOWAS agricultural policy as an instrument to implement a single framework for interventions in the agricultural sector. The resulting regional agricultural investment plan for 2010-2015 focusses on promotion of strategic products for food security and self-sufficiency, and on promotion of a globally favourable environment for development of agriculture in the region.

³ http://www.comm.ecowas.int/sec/index.php?id=about_a&lang=en; accessed on 13-10-2013

⁴ See also a YouTube video on this: <http://youtu.be/t6iEcDA-Dq4>; accessed on 13-10-2013

⁵ See also a YouTube video on this: <http://youtu.be/vpTHi7O66pI>; accessed on 13-10-2013

The Regional Livestock Action Plan has four major components, each with sub-components (ECOWAS, 2010):

- Promotion of the livestock, meat and dairy sector;
- Provision of security for transnational mobility and reduction of conflicts;
- Structuring of the animal production sector;
- Creation of a favourable environment to develop livestock, meat and dairy products.

The policy implication of one of these sub-components is pastoral reorganisation (which represents measures to protect grazing lands and corridors of transhumance and trading by harmonisation of pastoral conventions and agro-silvo-pastoral regulations). This re-organisation and harmonisation might be controversial to the best practice identified for (semi-)arid pasture management (box 4). Also economic feasibility of the following sub-components is questionable: a) improve the system of transporting fodder; b) guarantee sustainable exploitation through an insurance scheme; c) facilitate the setting up of regional insurance mechanisms; and d) provide income guarantees from livestock. Policy research on these four issues might provide alternatives to ECOWAS states. Trade-offs around such policy choices are further discussed in chapter 6 and 7.

Next to these opportunities for (Dutch) aid and trade supported policy research, other opportunities for work with ECOWAS can be identified. Based on a list of suggested actions in ECOWAS (2010) these opportunities include:

- *Veterinary aspects*: capacity building in diagnosis for a network of regional laboratories; production and control of veterinary inputs;
- *Animal genetics*: facilitation of the development of regional centres of excellence and genetic value addition to local breeds as well as capacity building;
- *Institution building*: structure the institutional framework of actors in the cattle, meat and dairy sector; promote partnership initiatives and outsourcing of the value chain in the cattle, meat and dairy sector; promote the gender approach through: (i) development of tools and relevant approaches regarding the gender dimension; and (ii) preferred funding for businesses (based on developed tools) for marginalised groups;
- *Training*: harmonised curriculum on veterinary training; promote networks of regional institutions for research and training in veterinary science and medicine;
- *Value chain development*: development of private regional initiatives and improvements in processing of animal products; support and strengthen product marketing strategies.

2.3. Livestock in a larger world: urbanisation, *Vergetreidung*, and food security

Urbanising societies with rising incomes tend to increase demand for animal products. This opportunity for the livestock sector is to be seen as a trend in which livestock keeping is increasingly part of a larger world. Emphasis on higher output per animal (efficiency) needs to be balanced by attention to the effect of livestock on the environment and human health. New animal production systems have to address issues of water use, greenhouse gas emissions, disease risks, equity, and poverty. Agriculture has to seek other ways of supplying proteins to growing populations. Sub-humid regions of West Africa move towards mixed farming, even where pastoralist traditions were very strong. Increase in cropping results in more crop residues – a potential win-win for crop and livestock. Also, people that used to have large animals may have to shift to small ruminants when land size decreases, often from cattle to goats and sheep. Milk can replace fish, a reason for Ghana farmers to start dairying. Cheese replaces meat in Benin. Soybean products also become more common as animal protein replacers in West Africa. This trend is known as *Vergetreidung* where food from plant origin (*Treide* = grain in German) replaces food from animal origin in the diets of poorer sections in the population, due to more difficult access to animal products (Bieleman, 2008). The process of *Vergetreidung* for food security is quite common, but it is hidden by the increasing demand for food from animal origin by wealthier classes. It might prove to be a good strategy to assure food security of the poor.

3. General aspects of livestock in West Africa

Before looking in detail at the specific situation in the five target countries in chapter 4, this chapter describes the general distribution of livestock systems across the agro-ecological and socio-economic zones, giving a general view on animal production systems and related value chains.

3.1. Distribution of livestock systems in agro-ecological zones

Generally, the distribution of agro-ecological zones follows from the understanding of drivers described in the previous chapter. figure 5 shows the agro-ecological map of West Africa, giving the distribution of major livestock and crop production systems; livestock is present in almost every zone. However, the types of livestock production vary per type of farming system as figure 6 exemplifies for the case of Nigeria. Figure 7 gives an overview of the major livestock species across West Africa. In the more arid northern regions, pastoralism prevails.

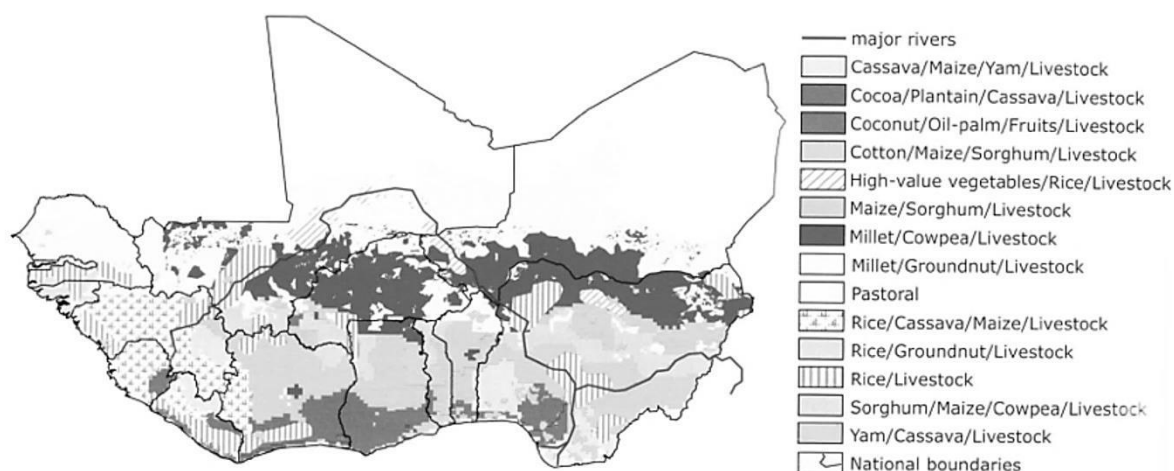


Figure 5: An agro-ecological map with the distribution of major livestock and crop production systems in West Africa (Fernandez Rivera *et al.* (2004) in Ly, Fall and Okike (2010)).

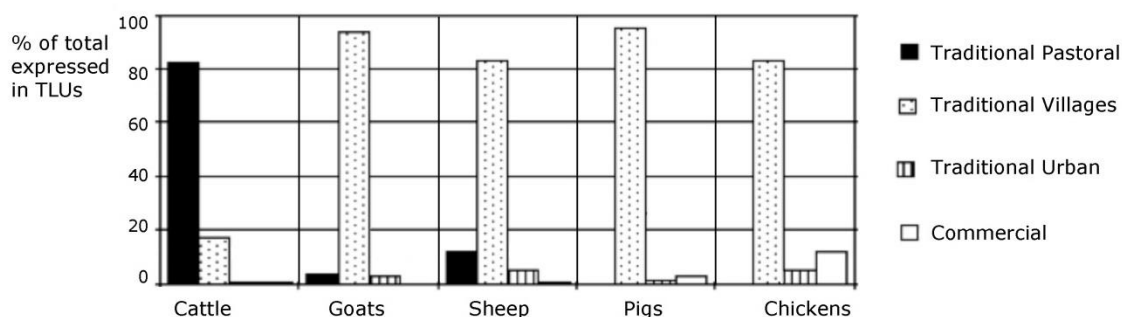
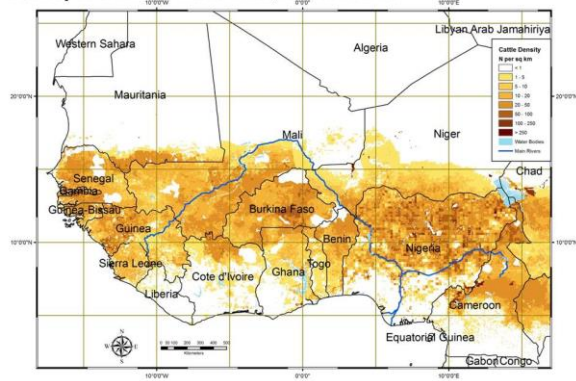
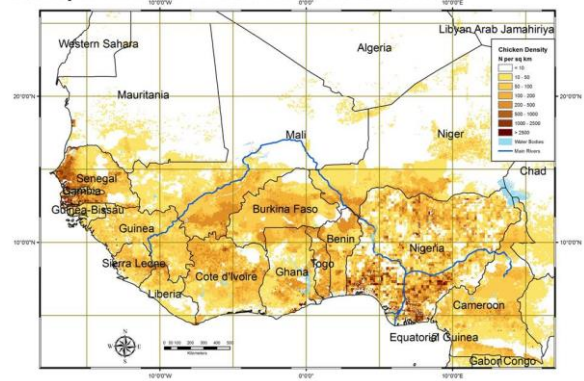


Figure 6: Differences due to husbandry systems shown from a livestock census in Nigeria, with distribution of livestock species over farming systems (as % of total livestock biomass), camels not included, illustrating the need to avoid use of overall averages (Based on Bourn *et al.*, 1992).

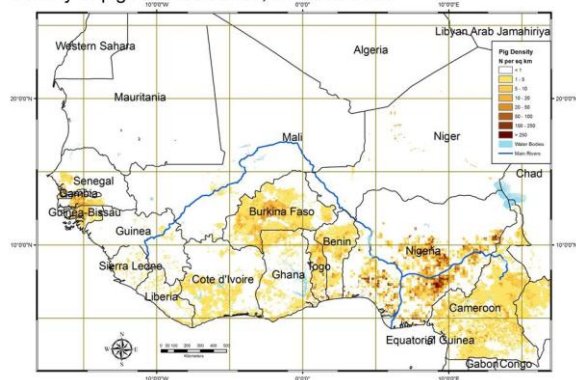
Density of cattle in West Africa, situation 2005



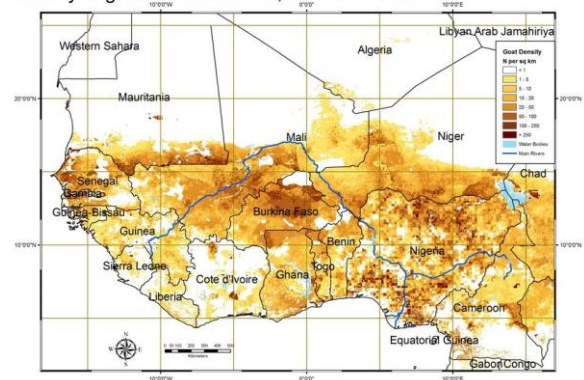
Density of chickens in West Africa, situation 2005



Density of pigs in West Africa, situation 2005



Density of goats in West Africa, situation 2005



Density of sheep in West Africa, situation 2005

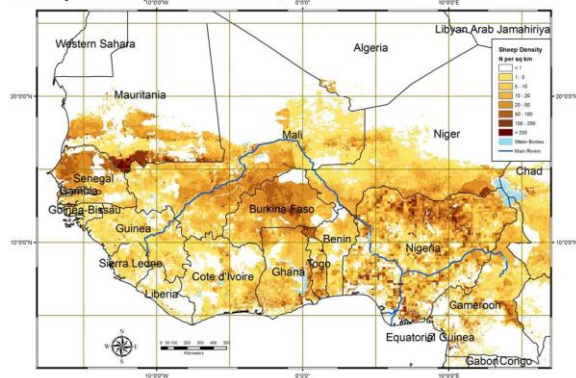


Figure 7: Densities of livestock in West Africa. Based on David Bourn and GLiPHa website⁶.

Exceptions to the rule of agro-climatic zones do exist, representing niche-opportunities for aid and trade, e.g.:

- Fisheries are important in the arid zone where crops and livestock may find it hard to survive. For example, fishery occurs in inland delta lakes of Mali between Tombouctou and Mopti, but also in newly created artificial lakes for irrigation and hydropower such as Lake Volta in Ghana.
- Proximity to cities offers opportunities for peri-urban livestock systems based on favourable price ratios of inputs and products in areas where generally speaking the prices are not favourable.

⁶ <http://kids.fao.org/glipha/>

- Organised informal markets exist, even if not visible for outsiders, e.g. middlemen can control flows of animals, at the same time serving as banks and sources of market information. Such informal systems exist alongside and are sometimes at odds with formal systems.
- Situations change, opening up opportunities for new technologies. For example air-transport of chilled meat products offers a way to avoid the risk of multiple delays during transportation, as well as offering opportunities for decentralised slaughter. New opportunities arise due to the rise of mobile phones and internet.
- The density of people and of grazing livestock remaining productive in Kano state invalidated two suppositions: the maximum livestock carrying capacity of rangelands and the area of rangeland needed to maintain cropland fertility both changed when integration intensified.

3.2. Livestock production systems and value chains

Meat comes from many types of animals - cattle, camels, sheep, goat, pigs, poultry, and some unconventional species. Notably, beef producing pastoralists do not much consume beef themselves. There is abundant trade of live cattle, sheep, goats, and meat (figure 8). Animals and products enter West Africa from coastal areas. Many investors are disappointed by the low margins of raising flocks of sheep or goats, since the cost of hiring a herdsman outweighs the income from sales if no specific intensification strategies are implemented.

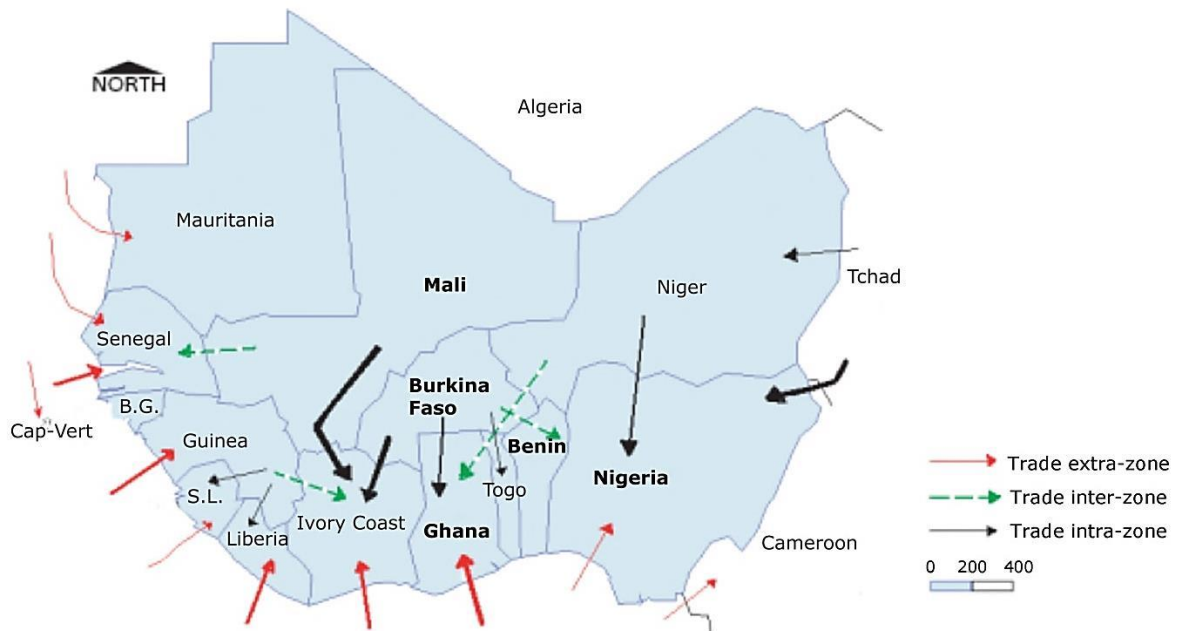


Figure 8: Live cattle and meat trade in West Africa. (Dieye *et al.*, 2007, based on CIRAD-EMUT, 1998).

3.2.1. Beef cattle

Beef cattle are major sources of meat. Throughout the pastoral areas, production of lean meat has a strong comparative advantage. Important for the success of fattening is the availability of high quality feed and the connection with a butcher. Chain organisation may appear to be absent but often is very strong, even if informal. Many projects were started to optimise use of by-products (bagasse, oil seed cake, grain, and milling of by-products) as well as to improve carcass quality of Zebu's arriving in the (sub-)humid zones, e.g. by starting feedlots. Such beef feedlot plans stand little chance of improving food security if financial returns cannot be well distributed, and thus, involve herd owners. Moreover, grain and oilseed by-products can generally better be fed to monogastrics (pigs and poultry). Also, fattened beef may be suitable for trade in more formalised markets with consumers with higher purchasing power, but might not necessarily improve food security for the extreme poor. In the Sahel, a bull grows from 3 to 6 year without much cost and risk while more than doubling in value for its owner. On mixed farms the bulls may be trained for draught purposes. Next to fattening, the farmer

uses his bulls on his own land or rents his bull to a crop farmer for draught purposes. Selling a bull to a feedlot for fattening does not seem to be a logical option, if the farmer loses both the bull's traction function and the increase in value. He has rather interest in doing this more frequently: sell his trained bull at 6-8 years instead of at more advanced age.

3.2.2. *Sheep*

Mutton plays an important role in the two annual religious celebrations of Muslims, leading to peaks in demand and prices. The mutton is eaten in its lean form. The value chain focuses on small scale fattening at household level, by individuals or by groups. In Burkina Faso for example, fattening is an important activity of women groups. Periodically, sheep are transported alive by plane to Gulf states. Throughout the year, lean mutton is one of the favourite meats on grills. Just like beef, sheep's reproduction and growth suffer from the fluctuating feed supply. However, due to the smaller size sheep can overcome feed shortages better than cattle. Also, the grazing behaviour of these animals supplements that of the larger ruminants. Offering some quality feed from local sources seasonally and strategically can significantly increase reproduction performance, as well as survival and growth rate of the lambs (Bosma *et al.*, 1999a).

3.2.3. *Goats*

Goats have an important function in the traditional extended family practices. Goats deliver twins more frequently than sheep. Moreover, due to their habit of browsing leaves and fruits from trees and shrubs, the goats reproduce and grow better throughout the year. After poultry and pigs, the goat is a preferred back-yard animal. Much work has been done on development of dwarf goats for backyard conditions in the more humid areas (Smith & Bosman, 1987; Bosman, 1995). Good housing can reduce disease impact and improve margins if feeding is done well (Bosma *et al.*, 1996). Goats are mostly slaughtered locally and in the main urban slaughterhouses. Goat is consumed more regularly in rural areas, as its meat is relatively affordable and preferred as compared to sheep. Soup of goat head is a dish that unites friends in the weekend in urban areas.

3.2.4. *Dairy Production*

Dairy development in semi-arid and sub-humid zones may use two milk-flows: a) from crop farmers intensifying their cattle keeping, and b) from pastoralists turning to agro-pastoralism. In crop farmer societies, the ownership of cattle has spread beyond the chiefs after introduction of animal traction, often related to industrial development of cotton or peanuts. All pastoralist people in the arid zones have a dairy tradition, including the use of ghee (butter oil), various types of white cheese, and sour milk. Among the most represented pastoralist people (Fulani) the herd is composed of the man's heritage and the woman's dowry. In case of divorce the woman leaves with her share. Fulani men manage and benefit from the animals while women market surplus milk to cover expenses for them and their children. A common mistake of dairy projects is to focus on working with the men, who benefit from an increased income, while the women loose power (e.g. Doufils, 2010).

Given high temperatures and humidity in the southern coastal areas and high temperatures in the north, a high estimate for the physical maximum production of large dairy cows is some 10-15 kg/day average over one lactation. Higher productions threaten the welfare of the cow under these environmental conditions, implying that most imported pure- and crossbred taurine cattle will not perform well, in spite of large investments in housing, feeding and so on. The choice for importing Zebu dairy cattle, as practiced in some places, makes more sense, but even such herds are costly. Moreover, the quality of fodder tends to be low throughout West Africa and feed supply is highly seasonal. In the humid zone, trypanosomiasis generally leaves only the N'dama-Jersey crossbreds from Bouake, Ivory Coast as an alternative (assuming that the nucleus herd survived the civil war).

Processing and marketing of milk occurs in various forms and largely via informal channels. Small restaurants often use milk powder to prepare yoghurt and local mixtures of cereals and milk. Each country also has one or more companies (SME or larger) transforming imported milk powder in yoghurt and pasteurised milk. Some of these companies also invest in processing of fresh milk collected from peri-urban farms to produce quark, fresh cheese and yoghurt. In many cases the milk production stops completely in the dry season, causing problems for local processing plants, but

providing an opportunity for the use of milk powder. In Mali the products from fresh milk deliver good margins (Corniaux *et al.*, 2010). Competition among the reconstitutors of milk powder is fierce, and the proportion of people with sufficient buying power is small. Most households do not have a fridge and rely on milk powder and sugared milk; as is the case with many restaurants and hotels. In other words, there is and there will be a good market for powder based production of local, fresh milk has limited comparative advantage.

Various NGO initiatives in West Africa started small dairy processing of fresh milk some 20 to 40 year ago. Very basic equipment was used for quality control, such as a densimeters and alcohol tests. Farmers, SMEs, co-operatives, and state plants (with more advanced equipment) process from 20 to 2000 kg/day into pasteurised milk and yoghurt. In Benin the processing of the Fulani cheese was improved by a Swiss NGO, using the extract of leaves and stalks from *Calotropis procera*. Production and consumption of this cheese did not spread widely cross the other countries of West Africa. In general the local production of cheese, butter and other products that cannot be produced from reconstituted milk is limited. Dairy plants initiated and managed by West African governments and mostly funded by donors generally have failed, though most transfer skills and knowledge. Cooperative dairies such as from Ouahigouya in Burkina Faso, and Kassela and Sinzana in Mali generate income for many families. They also empower civil societies, in particular if they organise training and workshops themselves. A Dutch NGO (Heifer-Nederland) has done similar work in Ghana (box 10).

Intensification of dairy production focusses on milk from cattle, but local niche markets for goat, camel and sheep may be attractive. The first value chains for camel milk were described for East Africa (box 5). At least one farm in Burkina Faso markets goat milk and cheese.

3.2.5. Pigs

Like in other places, in West Africa the pig is the classical backyard waste converters, next to poultry. Concentrated feeds are often scarce; therefore, pigs are also fed on fodder. Strategic improvement of feeding can improve reproduction of sows and growth rate of the piglets (Bosma *et al.*, 2004). Good housing and use of clean feeding troughs are often neglected. Both small and large scale intensification is frequent around urban areas in semi-arid, sub-humid and humid zones. Existence of industrial pig production systems should not that backyard pig production is still important for local food security of poorer sections of society.

3.2.6. Poultry

Production of poultry meat and eggs occurs in many forms. Poultry is kept in smallholder backyard systems, in intensive layer systems for eggs, and in the broiler industry. In backyard systems, chicken and guinea fowl are kept for meat and eggs; production is limited to about 80 and 40 eggs/yr., resp., if not managed well. Occasionally local ducks and turkeys are raised.

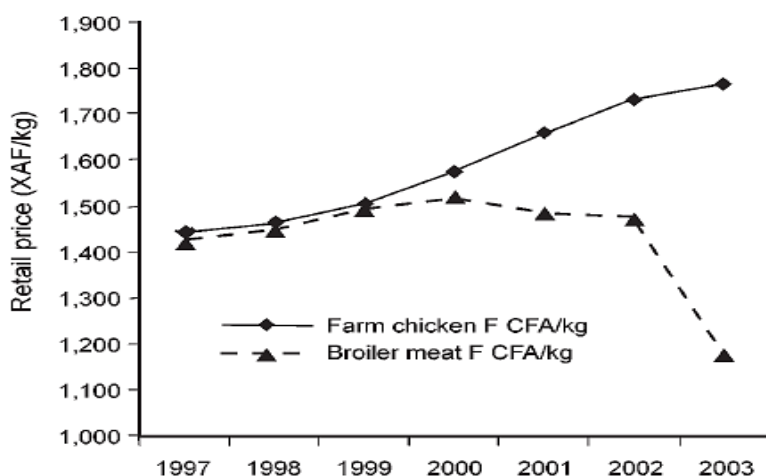


Figure 9: Retail prices of poultry meat in Dakar (Duteurtre *et al.*, 2004, cited by Dieye *et al.*, 2007).

Backyard poultry is mostly fed with locally produced grain and kitchen residues. In addition, poultry scavenges for food. Part of the inputs for the intensive systems are imported from outside West Africa, e.g. in coastal areas of Nigeria. In none of the West African countries small scale poultry production can satisfy demand, but due to its taste the meat of the so-called *poulet bicyclette* or farm chicken is preferred over commercial broilers. Prices for local and improved chickens can diverge considerably with prices paid for local chickens often being much higher. Cheap imports of poultry products do, therefore, not necessarily compete with production of local poultry due to the taste differences (figure 9). Because their meat is chewy the culled layers of intensive egg systems have a good market too. However, imports of deep-frozen chicken (parts) from EU and Brazil compete with local broiler industries, mainly in coastal countries (Dieye *et al.*, 2007).

3.2.7. Aquaculture

Aquaculture only took off by the beginning of this century (Brummett & Jamu, 2011). Donor supported projects in all concerned countries could not make this happen, but in recent years many critical factors were overcome: increased market demand due to increased population and decreased landings of inland and marine fisheries, availability of quality brood-stock, fingerlings and special aqua-feeds, and a broader knowledge base (Miller, 2011). Dutch companies got involved in Benin, Mali, and Nigeria. Use of quality fingerlings and quality feed is crucial for a successful business. Quality fingerlings of African catfish come mostly from the Netherlands and quality Genetically Improved Farmed Tilapia from the United Kingdom and the Netherlands, among others. Several local hatcheries (producing seed) and nurseries (raising seed to fingerlings) started to reproduce the improved local tilapia from Akosombo, Ghana (box 6).

Growing-out of fingerlings to marketable size fish can be done in ponds, cages or tanks. Ponds are used where water is easily available and soil type is good. Floating cages are used in large water bodies; regulations are needed to prevent overcrowding and pollution. Aquaculture in tanks using water recirculation is spreading in all countries.

So far, South-east Asia and China have a comparative advantage for almost all aspects of the fish value chain: from bulk feed to cheap labour in processing plants. Still the sector is growing in Africa. Even shrimp farming is considered on large scale. On a favourable location and with good partners, the chances for success are high. Best opportunities are in local consumer preferred species that can be marketed fresh very regularly. Some ethnic groups of West Africa don't eat catfish, but in general the demand for the local species is high, and consumers are willing to pay a good price. Domestication and breeding still need to start for most local species.

3.2.8. 'Unconventional' other species

Meat from camels, donkeys, horses, and dogs is commonly consumed. Dog meat is considered a delicacy and some communities are even specialised in raising dogs for meat. Rabbits have been imported but their husbandry is more problematic than the cane-rat domesticated by scientists from Benin and Ivory coast (figure 10). The cane-rat, also called grass-cutter (*Thryonomys swinderianus* or *gregorianus*), is raised and consumed in humid and sub-humid zones of all West African countries. It is often sold grilled along the main roads. Various local governments support rearing of this non-conventional animal as an alternative source of food and income.



Figure 10: Camels, goats, and a cane-rat, some of the species frequently kept in West Africa.

Unconventional animals could present an opportunity, especially in terms of improving food security for the poor. One case of work with camels is the work on camels by SNV in Kenya (SNV, 2012, box 5). The notion of being unconventional is context-specific; one may even say that dairy goats are unconventional animals for large cattle keepers, but when land size or feed resources decrease farmer may be inclined to turn to goats. Cases are known in West Africa, e.g. in Senegal, where Fulani herders settled to start dairy goat farming for a more secure future than to adhere to tradition, shifting from grazing to stall-feeding based on cultivation of fodder grasses and trees (Remy Schiffeleers, personal communication, 2005).

Box 5: Camel milk in Kenya (SNV, 2012)

The 15 million camels in Africa are mostly found in the more arid parts of the continent. They survive in a harsh environment and they are reliable milk producers during dry seasons and drought years when milk from cattle, sheep and goats is scarce. Most of the camels are kept by pastoralists in subsistence production systems. The influx of Somalis in Nairobi following the fall of the Somali government in 1991 has contributed to a rising demand for camel milk, which is common in Somalia, but not among Kenya's pastoralist communities. This led to a new market in the capital for camel herders in Isiolo district in North-Eastern Kenya. SNV supported pastoralist women from Isiolo to set up a cooperative society to better access the market. Improvements have included negotiation on transport of approximately 5,000 litre/day, better hygiene, a safer payment system by using banking by mobile phone, and identification of new markets (including a potential link to a processor). By this intervention 100 pastoralist households attained a sustainable income of 75 USD/ month throughout the year (irrespective of season) and an initial entry into the camel milk market.

Unconventional but relevant animal production systems are urban livestock, backyard farms, or even game farming. Urban livestock systems will never feed an entire urban population, but they have competitive advantages, e.g. in re-use of waste and in serving as petty cash or as educational tools (Van Veenhuizen *et al*, 2006; Schiere & Van der Hoek, 2001). Wildlife management through game farming is done on at least one ranch in Burkina Faso. Wildlife ranching is ideally a way to reduce illegal hunting, which threatens biodiversity. Ironically, it can also be a way to channel official hunting, which is now often done with illegal authorisations for well-paying tourists in wildlife reserves, targeting the (close to eliminated) giraffe and ostrich populations in northeast Burkina Faso, eastern Mali, and Niger. This service market is now shifting to the fragile states of East Africa.

3.3. Other aspects of livestock value chains

3.3.1. Hides and skins

Hides and skins are important money earners, coming primarily from herds of both large and small ruminants that produce meat. All over West Africa, skin of cattle and pigs can be cooked and consumed directly. In Ghana, cattle skin is processed into a product called 'wale' which is widely consumed as a meat substitute in local dishes.

Nigeria, Burkina Faso and Ghana have industrial tanneries, next to many local tanneries. Leather products from Burkina Faso and Niger are internationally known. In those countries no industrial upgrading is done locally, but local handicraft products are in demand. Handicraft makers often use skins of small ruminants or leather that was not accepted for export. Handicraft products are traded in West Africa or exported through Fair Trade channels. The quality of these products can be excellent. Local processing is mostly related to handicraft of bags and shoes. Trade in hides and skins is organised and formal, both regional and international. Raw or tanned products may go to Germany, Italy, and the USA (SWAC-OECD/ECOWAS, 2008). Low grade leather goes mostly to Asia. The state of Kano (Nigeria) has a regional concentration of tanning industries. Traders were stimulated to organise at national and regional level; the regional organisation is called ASOAC. Due to political instability the central role of Kano in tanning but also as food marketing has gone down considerably.

A recent inventory in Burkina Faso, Mali, Niger and Senegal showed that 40% of small ruminant skins are damaged; 75% of the leather having holes. Regularly, projects are implemented to improve quality and trade of hides, skins and leather (also from small ruminants), e.g. by the United Nations Industrial Development Organisation, the Food and Agriculture Organisation of the United Nations, and the Common Fund for Commodities. Much can be gained by providing information to owners and

herders via appropriate channels, including butchers and traders, but also via veterinarians giving alternatives for the traditional treatment of some diseases through skin lesions.

3.3.2. Slaughter houses

In most cases the grazing livestock walk to the market and slaughter houses on the hoof. As these animals are used to walk this tends (in that context) to be more animal friendly than transport by trucks, provided that the animals have regular opportunities to drink. Indeed, regular feeding and drinking, as well as high temperatures are a constraint during transport. Most rural slaughter facilities are very simple and open. Only the larger cities have closed abattoirs, only rarely with a cold storage. In the past, all slaughter houses were public, but larger slaughter houses are increasingly contracted by private companies or cooperatives of butchers. In rural abattoirs most waste is recovered. Larger abattoirs often have no facilities for integral reuse of blood and gut content. A good look on options for decentralised slaughtering and food chains is worth an effort and may provide interesting options for aid and trade.

3.3.3. Feed & fodder

Many grazers use crop residues, left on the field after harvest. But increasingly the straw is collected. First of all, due to their higher nutritional value, farmers collect and store the above ground vegetation of peanuts, cowpea, and other beans,. More and more farmers also store the straw of cereals, thus reducing possibilities to benefit from transhumant herds using that straw and returning manure in exchange for crop residues and access to water. In fact the herds consume mainly the remaining leaves and the top, as digestibility and intake of the stem is low and quality poor. For the stem to be useful for an animal it can be chopped, supplemented, and treated (Bosma & Bengaly, 1996; Bosma & Bagayoko, 1996; Bengaly *et al.*, 1994). Choppers are widely available in West Africa, but availability of supplements (concentrates) is limited. Haymaking also becomes more common since a Dutch project developed a special packaging tool. Decentralised milling and oil seed processing is often always, against economic logic of trade. It offers a way to keep badly needed nutrients and added value in the country side.

Limited availability of concentrated feedstuffs (grains, by-products, oil seed cakes) is a constraint for production systems across the arid regions (Anonymous, 2012). The higher availability of concentrate feeds is a comparative advantage for humid regions. Availability of by-products is also related to human dietary habits and is still based on cereals that are milled locally, in particular in rural areas. The by-products are kept for the farmer's own animals. When feed ingredients are available, they are not always present in the proportions required for a balanced diet. More importantly, by-products from oil presses and rice-mills might provide enough feed for ruminants, but intensive pig and poultry production needs grains as well. The trade-off between use of grain for feed and for food is as relevant here for food security as it is in other parts of the world.

Only some cattle feedlots and pig and poultry farms in the humid and sub-humid zones produce maize and soybeans on integrated farms to benefit from the crop residues. These farmers also buy manufactured concentrates to compose affordable diets for their animals. This individual strategy is not yet supported by policy and not well understood by feed producers. Production of concentrated premix feed to complement locally available feedstuffs at farm level will enlarge their market, and eventually increase their marketed volume. At present feed mills focus on complete feeds, a small market due to the high feed / product cost ratio (Bosma *et al.*, 1996; Bosma *et al.*, 2004). Cost of manufacturing feed is high due to high energy and transportation cost. The transportation costs of feeds to the farm further increases cost prices.

Until recently the world market price for concentrated feed ingredients like soy and corn was too low to make this production in West-Africa attractive. However, rising demand for feeds has driven up prices. Thus production of these feedstuffs becomes an option for diversification by crop farmers, if soil fertility permits. Soils in West Africa have an inherently low nutrient content, which makes it crucial to better manage soil organic matter. When soil organic matter content is low, the use of fertiliser is inefficient (Bremen & Sissoko, 1998). The choice between crop residues for feed, fuel or fertiliser is central in maintaining soil fertility (Powell *et al.*, 1995; Schiere *et al.*, 2006).

Box 6: Better performing breeds, low performing farmers and aid and trade?

Many entrepreneurs and farmers think they need improved breeds such as Holstein-Frisian cows, Genetically Improved Farmed Tilapia⁷ or Pangasius from Vietnam, while their farm management is not necessarily well suited for varieties that require optimal conditions to be successful. In fish production for example, water quality is crucial. Efficient tilapia farming either needs a mono-sex male population, or a well-managed poly-culture with a predator like African catfish. If well-managed, the genetic improvement of local fish species can go fast and keep pace with the development of farmers' skills, even if that does not necessarily guarantee profitable business. The WorldFish centre developed fish selection schemes based upon over 40 strains of species. The Akosombo station in Ghana applied such a scheme and within eight years produced a 7th generation. Farms using this regional strain of tilapia can compete with the frozen imports from China (WorldFish, 2012). China uses Genetically Improved Farmed Tilapia, first bred in the Philippines using varieties from East Africa.

3.3.4. Breeds and productivity levels

Pastoralists improve their livestock using pedigree and assumed linkages between exterior and productivity. This selection includes breeding on the capacity to survive the long dry season, but also to provide milk for the family. In cropper societies selection was mostly negative as these farmers tend to sell the largest of their animals to satisfy short term cash needs. Various efforts to improve breeds have focussed on cattle, pigs, poultry, and more recently fish (box 6).

3.3.4.1. Cattle

In traditional dairy production systems, individual cows are said to produce some 0.7 - 1.5 litres of milk per day with a drop to 0.5 litres in the dry season (Annette *et al.*, 2012). Improved management and appropriate selection can increase milk yield significantly; a limited gift of supplements like cotton seed cake can triple production (Lalba & Dickey, 1994). Higher productions have been reported of the *Zebu maure* and *Zebu azaouak* breeds. The story is familiar: when selected for higher yields, local breeds can well outperform imported breeds.

Since the middle of the twentieth century cross breeding of local cattle with exotic dairy breeds started in Bouaké, Ivory Coast (N'dama x Jersey), in Sotuba, Mali (Zebu x Red Steppe from Russia), and in Koubri, Burkina Faso (Zebu x Brown Swiss). The work of a Dutch company in Nigeria showed quite good yields from a local breed, but the average was limited to 2000 kg per lactation under favourable conditions (table 1 from HVA International, 1991). In Ivory Coast, the N'dama X Jersey breed evolved into a stable and documented cross: N'Damance (Yapi Gnaoré *et al.*, 1996, Letenneur, 1978). In Niger the local Zebu azaouak was selected for multiple purposes by Belgians. Its spread over Burkina Faso started from the USAID ranch in Markoye. Other cooperation projects support the spread of the Azaouak over Burkina Faso, Mali and Niger.

As of 1980, private entrepreneurs, projects, and state farms started to use crosses with Taurus from southern Africa, Europe, Cuba and South America. They imported live animals and semen. Some countries tried to regulate these imports without an alternative policy for investors who thus followed all kind of advices. Also, various breeds of Zebu crosses were introduced before awareness spread on the limits of using exotic breeds and crossbreds, especially among people who considered more than only the milk yield/cow. The Azaouak is now one of the main assets of Burkina Faso's dairy strategy, and hopefully the Zebu maure will follow in Mali.

Table 1: Cow and herd performance of Bunaji herd first lactation on WAMCO integrated dairy farm, Vom, Nigeria (Based on HVA International, 1991).

Parameter	Unit	Cow no. 176	Herd Average	St. Dev.
(Average) First 100 days production	Kg	1,170	912	154.7
(Average) Completed lactation yield	Kg	3,148	1,979	565.5
(Average) Lactation length	Days	345	284.1	30.6
Average production per lactation day	Kg/Day	9.1	7.0	1.4

⁷ A catfish from the Mekong river, of which one species (*Pangasinodon hypophthalmus*) is domesticated and farmed in Vietnam; filets are exported to all continents. Africa has its own well performing catfish, which was domesticated in the Netherlands, and now reproduced and farmed in many countries

Box 7: Biodiversity importance and threats.

Discussions on import of new species of cattle and fish may use non-valid arguments. The crucial reason for society to maintain local biodiversity is the potential adaptation of the various local species and related gene pools. If a species or variety is lost, these specific genes are probably lost irreversibly, while they could be crucial for human survival under changing conditions. Import of exotic breeds threatens endogenous breeds because the gene pool can disappear. For aquatic organisms such as fish, this is a greater threat than for land animals, as the last are easier to trace and restrict.

Indeed, good breeding and selection programs can achieve progress in most local species at much lower cost than imports of purebreds, not only for cattle. In terms of local food security, aid might better focus on improvements of local breeds and use of crossbreds (see also box 7 for a discussion on importance of maintaining local biodiversity). Both approaches need strong institutions. It will be hard to turn the small trypano-tolerant purebred N'dama into a dairy cow, but it does have potential for beef. Many such decisions are a matter of mind-set; one does not need a large animal to be an efficient meat producer. Different conditions need other animals: keeping dairy cattle in air-conditioned stables may be lucrative to satisfy the demand for fresh milk of wealthy oil sheiks, but not to deliver affordable milk to the middle class in West Africa.

Policymakers now start to recognise that large variation in productivity of local animals gives scope for genetic improvements. Using the newest technology of genetic characterisation, the selection of bulls can go faster than in the past. Change can be achieved while keeping pace with the increase of knowledge and capital at farm level, e.g. where white farmers from southern Africa now start to farm in Nigeria.

3.3.4.2. Pigs

Upgrading of pigs started in the middle of the last century, among others in the north of Ivory Coast (Korhogo) and the south of Burkina Faso, using landrace and large whites. Though local breeds are still used, most of the gene-pool has traces of these imports. All intensive farms use crossbreds and upgraded boars, an opportunity for trade but a threat to biodiversity. Extension services stimulate use of upgraded boars at village level. The drawback in these plans is the focus on one improvement rather than to also value and promote use of local breeds for backyard conditions. This reduces the gene pool and local resilience.

3.3.4.3. Poultry

Local poultry also acquired genes from Europe through rooster introduction programs of governments and NGOs. Basically the roads to genetic change are similar to that of cattle, goats and pigs, though much quicker. However, local poultry remains better adapted to the climate and the traditional feeding regimes than the presently imported day-old-chicks from western breeds. The search continues for improved hens with the same meat characteristics as scavenging chicken, which produce with lower feed conversion ratio under the higher temperatures. The rustic and preferably scavenging guinea fowl is either very photosensitive or depending on specific nutrients and thus a seasonal layer and reproducer. According to local farmers the guinea fowl produces best when not housed.

3.3.5. Animal health, veterinary care, public health, and food safety issues

Issues of animal health, public health, animal production, farm economics, and food chain converge here in a discussion on veterinary care, (for more information see Holden *et al.* (1996)). Poor animal health may result from poor feed, poor management, lack of animal health service delivery, inability of import companies to supply the domestic market with medicines, or the perception among livestock producers that medicines are too costly. In addition, poor animal health on farms and poor hygiene at markets link the producer and the consumer. Segmentation of the sector (i.e. a distinction of farming systems combined with a segmentation of markets and value chains gives insight in relevance and viability of investments in veterinary care for aid and trade (figure 11).

Major health issues in West Africa include tick-borne diseases and trypanosomiasis for cattle. Others are African swine fever (ASF) for pigs, especially in intensive farms, and Newcastle Disease (NCD) and highly pathogenic Avian Influenza (HPAI) for poultry. Bovine Tuberculosis and Brucellosis

(*Brucella abortus* and *Brucella melitensis*) are prevalent (SWAC-OECD/ ECOWAS, 2008; Hestin, 2012). Cattle and other ruminants may be affected by a range of diseases such as contagious pleuropneumonia (CPP), pasteurellosis, foot and mouth disease (FMD) and anthrax (bacterial and symptomatic). Sheep and goat may suffer from *peste des petits ruminants* (PPR). Skin affections are frequent, such as caused by lumpy skin, dermatophilosis (*Dermatophilus congolense*) and also sheep and goat pox (Hestin, 2012). Permanent risk factors for their propagation include movement of animals within countries and across borders, and for some, existence of wild animals that harbour these diseases (CEDEAO, 2004).

Overall, much was achieved in West Africa on control of epizootics and zoonoses, among others by the national veterinary services, thanks to the Pan-African Programme for the Control of Epizootics (PACE). The vaccination program contributed to worldwide elimination of Rinderpest in 2011 (Roeder & Rich, 2009). Most countries in West Africa now have fairly effective sanitary corridors with control arrangements at border posts. Much remains to be done with regard to diseases like CPP, FMD, and PPR.

There to, according to SWAC-OECD / ECOWAS (2008), each West African country engaged itself to:

- Intensify monitoring, epidemic surveillance and eradication of livestock diseases to assure that animal products are free of disease, infections, and residual chemical waste, and to guarantee their sanitary security.
- Create adequate support policies, legislation on veterinary medicines and products, and reliable approval and certification systems for animal products.
- Refine diagnostic tools to distinguish vaccinated animals from infected ones.
- Participate in international forums to refine Sanitary and Phytosanitary Standards (SPS) measures, as agreed by the World Organisation of Animal Health (OIE), the WTO Statement on Technical Barriers to Trade, and the WTO Agreement on the Application of SPS.

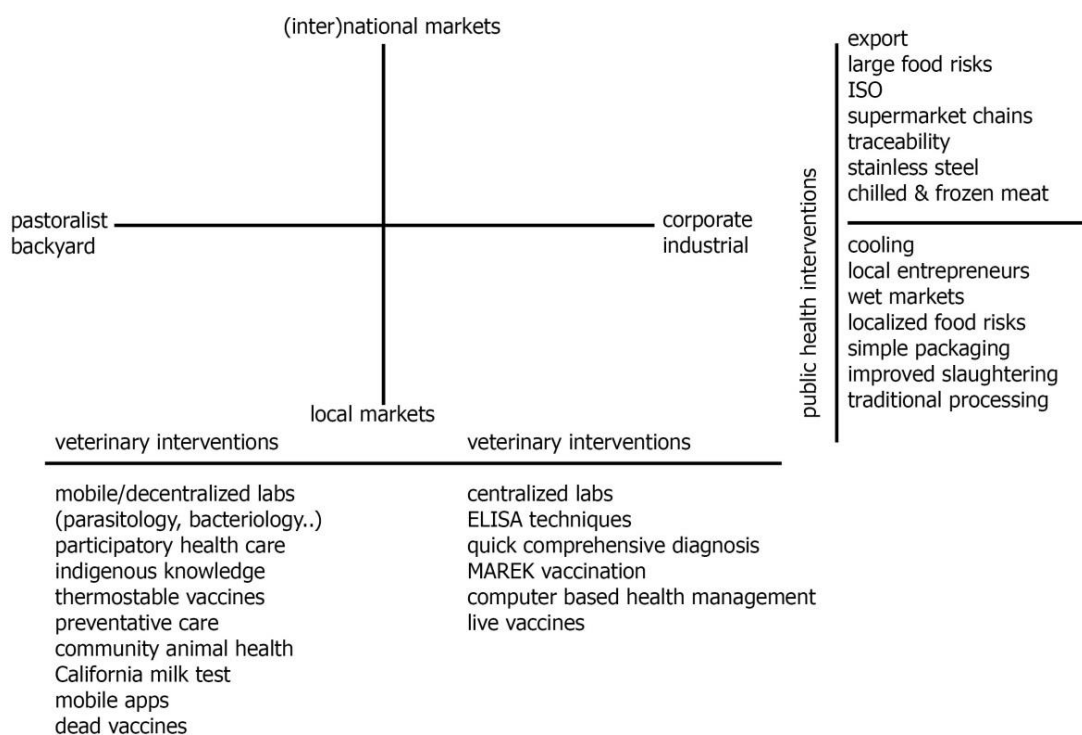


Figure 11: A sketch of veterinary and public health interventions segmented according to markets (upper and lower half) and farming systems (left and right).

Note: Technologies mentioned for the left hand of the quadrant (see bottom left) can to some extent also be useful in the right hand half of the quadrant. In that way, more overlay may also occur between the public health interventions on the upper and lower half. Overlap, however, does not in validate the basic notion that food security and local development for poorer sections is badly served by policies that give one sided attention to the right hand and upper half of the quadrant (thanks to suggestions by G. Wellenberg and A.Giani).

Box 8: Village veterinarians (community animal health care workers) and veterinary medicine.

By the end of the 1970s some French NGOs started training so-called voluntary village veterinarians (VVV) to improve access of small farmers to simple treatments and drugs to small farmers (left side of figure 11)). Veterinary care thus became more accessible and cheaper by reducing cost of transport. Calling a veterinarian for a chicken or a goat costs more than the animal's market value. Thus knife and cooking pot were the best solution. In other countries the VVV were known as community animal health care workers, and in Burkina Faso this approach was part of the Village Poultry Project funded by the French Cooperation. For poultry these VVV got the right to vaccinate against NCD. Problem here was that the available vaccine had to be stored at 4°C (box 20). The Village Poultry Project developed a vaccine that could be stored at a temperature in reach of the local cooling system: a clay pot standing in wet sand in a well-ventilated hut/house. In this way vaccinating the poultry flock became in reach of farmers. The affordable drug (a pill) that the project developed against the infectious bursal disease Gumboro caused by a virus, was also effective in guinea fowl. Use of large business approaches or approaches such as VVV imply choices for aid and trade, especially in term of food security for rural areas.

One obstacle to trade with the rest of the world is the need to comply to the SPS established by the OIE as guarantor of animal health and human food safety norms. Due to these norms, it is hard to trade some animal products from West Africa on the world market, despite their competitive prices. In addition, some developed countries such as the United States, the European Union and Japan introduced even more stringent legislation dealing with traceability of products, in addition to the already existent regulations.

Since the early 1990s all PACE countries aim to separate policy, food safety, and support tasks of government services from the veterinary health task (Niang, 2004; Gary *et al.*, 2010). The change became effective when institutions like the World Bank enforced structural adjustments, a move in line with local initiatives to make veterinary services more accessible and efficient. In most locations, private veterinarians are now authorised to do preventive and curative treatments. The veterinary state institutions are more and more restricted to inspection and control. Vaccination programs are mostly done by contract, but in provinces with low population densities the role of the state agents may remain. Division and sharing of these tasks over aid and trade is shown in figure 11, leaving important challenges for aid and trade, an issue also discussed in Halajkann & Boutier (1996). Alternatives to cover remote areas are community based animal health care workers (Bosma, 1986; Niang, 2004); sometimes traditional healers are integrated in such community based approaches (Mathias & McCorckle, 2004).

In most countries, state intervention on compulsory vaccinations with live vaccines continues for CPP and anthrax. Other veterinary drugs like vaccines for pasteurellosis and NCD are traded by private entrepreneurs. In general, availability of drugs improved, but counterfeiting and use of unauthorised drugs is a threat (FAO, 2012; Gary *et al.*, 2010). In most production systems, the cost of veterinary treatment other than vaccinations is high compared to the market value of the animals (Doko *et al.*, 2012). Farmers often use traditional treatments, an area of work with much potential as well as myth. In addition, also other aspects of costs and benefits through various forms of veterinary care require attention for better policy setting. For example, a recent study quantified benefits of a prevention program for contagious PPR, CPP, trypanosomiasis, NCD, and ASF in Nigeria (Fadiga *et al.*, 2013). Half of the additional benefits will accrue from NCD control. Vaccines (eye-drop vaccination) can be administered by poultry keepers themselves (box 20). PPR vaccination itself showed good benefits and can be done by village animal health workers. Thus a potentially sustainable animal health delivery system can be supported (box 8).

4. Country information

Production systems and value chains are described in this chapter for the five focus countries that in spite of their similarities also show important differences. Main parameters leading to these differences include:

- Landlocked (Mali, Burkina) versus coastal countries (Benin, Ghana and Nigeria), with differences in access to transport and with differences in climates and diseases.
- Francophone (Benin, Burkina, and Mali) versus Anglophone (Ghana and Nigeria), with associated differences in administrative traditions.
- Mainly rural countries (Burkina Faso, Mali, and Niger) versus industrialised and densely populated ones, with Ghana and especially Nigeria serving as engines of growth and points of access. Nigeria holds some 50% of the entire West African population.
- Higher share of crop farmers in southern countries, with other attitudes to livestock resulting in other opportunities and comparative advantages for aid and trade, than for the northern countries.
- Political change, with Mali, Nigeria and Niger increasingly suffering from political and religious tensions, as compared to relatively stable countries like Ghana and Burkina Faso.

In terms of similarities, apart from those related to the east-west isohyets, arable land in all countries is used for permanent crops; in humid zones mainly rubber, oil palm, coconut, cacao, coffee, and banana. Plantations of mango, papaya, oranges, mandarins, and lemons occur in most zones when water is available. In sub-humid and semi-arid zones, trees like the Shea butter tree (*Butospermium parkii*), tamarind (*Tamarindus indica*), *nééré* (*Parkia biglobosa*), and *Acacia albida* are counted among the permanent crops, often integrated in fields of annual crops. The fruits and leaves of the last two are used as high quality supplements for livestock. Annual crops include tubers, cereals and beans. The species and varieties used vary according to the agro-ecological zones.

Last but not least, West Africa ranks average on the scale of income distribution with a dip in the first decade of this century (ADBG, 2012). Regarding long term demographics, Africa as a whole will have the largest growth in global work force in the decades to come, of which East and West Africa will have the largest share (ADBG, 2012). Such changes between countries and between past and present do affect opportunities, stressing the need to look forward rather than to get stuck in what is already done or in expectations based on mainstream thinking.

In this chapter, an overview is given of the livestock sector, the institutions around it, and the current Dutch involvement for the individual countries. In appendix I an overview of agriculture related statistics is given for each country in the form of an infographic. The data presented reflect the situation in 2012, except HDI (2011); trade (2010); and production, self-sufficiency and consumption (2009). Sources used are the CIA World Factbook⁸, UNDP - International Human Development Indicators⁹, and FAO-STAT database¹⁰.

4.1. Benin

4.1.1. General information

The Republic of Benin is the former Republic of Dahomey and a former colony of Germany and France. The country became independent in 1960. Annual crops cover 22% of the land surface and permanent crops 3%. The country has small offshore oil deposits, limestone, marble, and timber as main natural resources (CIA, 2013). Benin has almost 10 million inhabitants and is urbanising with 4% per year. Currently 45% of the population lives in urban areas. The government resides in Cotonou and Porto Novo is the capital of the country. The official language is French. The main religions in the country are Catholic (27%), Muslim (24%), Protestant (10%), and indigenous cults (CIA, 2013); also

⁸ <https://www.cia.gov/library/publications/the-world-factbook/>

⁹ <http://hdr.undp.org/en/statistics/>

¹⁰ <http://faostat3.fao.org/faostat-gateway/go/to/home/E>

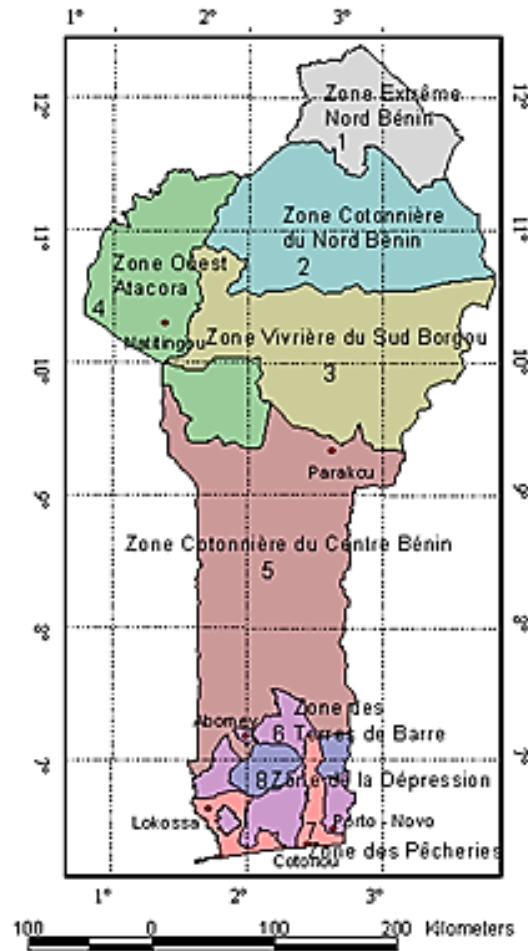


Figure 12: The agro-ecological zones of Benin as officially established by the Government of Benin.

the population of in the north is majority Christian. High population density in the south puts pressure on the land there. The north has a relatively dry climate and soils are poor and overexploited. Current investments of multinationals in land in the south of Benin are seen as a threat by some and an opportunity by others. Beninese scientists defined eight agro-ecological zones (figure 12). The relative dry climate in the north results in challenges for adequate supplies of potable water. Deforestation is also an issue in the country, especially in the southern areas (CIA, 2013).

4.1.2. Livestock sector

Demand for livestock products increases in Benin, in line with developments in neighbouring countries. Total value of the export of agricultural products exceeds the value of imports, but import value of livestock products specifically exceeds export value of these products. For example, Benin imports some 330,000 head of cattle from Burkina Faso and Niger of which some 250,000 are re-exported to Nigeria. Adding another 60,000 from Benin, the net import is 20,000 head of cattle (Yerima *et al.*, 2012), illustrating the comparative disadvantage for cattle in a humid country as Benin (**table 2**).

The distribution of several types of livestock is shown in **figure 7** for the whole of West Africa. Detailed maps of Benin can be obtained from the Global Livestock Production and Health Atlas of the FAO¹¹. **Table 3** depicts the number of heads of several types of livestock in 2011, and the development over the past decades.

¹¹ <http://kids.fao.org/glipha/>

Table 2: Trade in livestock products in Benin, import and export values (1000 US\$) (FAO-stat).

		1980	1990	2000	2010	Growth '00-'10
Agricultural products, Total	Import	95,588	114,187	176,031	459,882	161%
	Export	54,544	84,365	176,955	601,166	240%
Total Meat	Import	943	8,370	35,548	141,178	297%
	Export	-	-	544	93,940	17168%
Beef	Import	256	2,200	34	165	385%
	Export	-	-	-	-	-
Dairy Products + Eggs	Import	2,706	5,790	12,716	20,146	58%
	Export	3	-	9	248	2656%
Milk Equivalent	Import	2,706	5,790	12,716	20,110	58%
	Export	3	-	9	248	2656%
Pork	Import	25	20	94	1,547	1546%
	Export	-	-	-	-	-
Poultry Meat	Import	662	6,150	35,390	139,279	294%
	Export	-	-	544	93,940	17168%

Table 3: Livestock resources in Benin (heads (poultry in 1000 heads)) (FAO-stat).

	1980	1990	2000	2010	2011	Growth '00-'11
Poultry	11,041	17,158	22,484	39,000	40,000	78%
Pigs	174,000	545,668	1,417,090	2,167,250	2,210,570	56%
Cattle & Buffaloes	2,760,000	4,040,200	4,798,220	8,398,500	8,566,450	79%
Sheep & Goats	6,600,000	11,591,090	15,371,750	20,585,740	21,203,210	38%

The extensively managed dairy herds of Fulani and Bando pastoralists are mainly located in the north. Especially in the dry season (January to May) transhumant cattle, coming from Niger and Burkina Faso, compete for water and forage with the agro-pastoral farmers in the north. Due to uncontrolled expansion of crop land, the marked transhumant corridors are closed or narrowed, limiting the space for transhumant herds to migrate and increasing risks of conflicts. In the south one may find some larger specialised dairy producers that benefit from the high prices that some consumers are willing to pay for fresh dairy products. The dairy sector is small but succeeded to have the local cheese accepted as a meat replacer in sauces accompanying rice or starchy food. This is a form of *Vergetreidung* (see par. 2.3), away from beef to milk, and it illustrates how the livestock sector may miss opportunities in other West African countries if it continues to focus on traditional product lines like beef only. It shows indeed how food consumption may move from reliance on beef to dairy, which may thus provide an opportunity to improve food security of the poor, towards food with a lower footprint.

Small ruminants are more and more raised by smallholders and other groups that have an interest in livestock keeping. Sheep and goats from the extensive systems are either consumed locally (grilled) or exported to Nigeria. The consumption of the cane-rats (also called grass-cutter) drives a small sector. This too stresses the need to include backyard animals as an option for new forms of livestock keeping.

Pig production is less common in the north due to higher Muslim presence. In the south and closer to cities, pork is more common and popular for grilling. ASF affected pig production in Benin and needs constant surveillance. In spite of the growing number of commercial pig farms, the pork import increased rapidly over the past years. Data on the relative importance of the intensively kept versus the backyard pig for food security were not easily available.

Poultry production is well spread throughout the country, except for the turkey that is produced in the Atacora for a niche market in Ghana. Small scale poultry production cannot satisfy demand for the country, but its meat is preferred because of the consistency and taste as compared to modern broilers. Cheap import of poultry products compete with local broiler producers. Rapid growth of poultry imports took place between 2000 and 2010, but part is re-exported to Nigeria. Benin has a facility for collecting and processing poultry products called AgriSatch (Dutch Embassy, Benin).

The aquaculture sector is driven by a decrease in fishery catches and an increase in human population. Growth in that sector, from 30 to >150 tonnes/yr. since 2005, focuses on African catfish (*Clarias gariepinus*) produced in the south (FAO, 2013a). Production of tilapia (*Oreochromus niloticus*) in the north is stable since 2005 (around 200 tonnes/yr.), as catches from an increasing number of small artificial lakes are marketed. These lakes were stocked with tilapia by projects to support healthy animal protein food security at local level; it is likely that buying power limits the local consumption.

4.1.3. Institutions and governmental policies on livestock production

Animal production in Benin falls under a broad ministry, the Ministry of Agriculture, Livestock and Fisheries, with a Directorate for Livestock and a Directorate for Fisheries. The main veterinary laboratory is located in Bohicon, north of the capital; most regional directorates have some diagnostic equipment. The ministry has four farms, with cattle and sheep: Okpara, Bétécoucou, Samiondji and Kpinnou. Next to local breeds these farms raise Zebu M'bororo and Goudali. In Kpinnou (south Benin) a herd of Brazilian Girolando was imported in 2004 in an attempt to improve dairy production.

The country's agriculture research is coordinated by the ministry's INRAB (*Institut National de Recherche Agricole du Bénin*), covering 60% of the country's capacity and investments in agricultural research and development (Stads & Hinvi, 2010). Livestock research is carried out by URZR (*Unité de Recherche Zootechnique et Vétérinaire*). Next to INRAB, livestock research is done by the Faculty of Agriculture Sciences of the University of Abomey Calavi and the Faculty of Agronomy of the University of Parakou.

Several NGOs carry out agricultural research, e.g. the NGO Evergreen is said to do research on snail breeding and ruminant nutrition. The Songhai Centre in Porto Novo provides practical training and tests improvements. In the cities Natitingou, Ina and Adja-Ouère Schools for Agricultural Techniques train the Technical Assistants for Rural Development, some of which specialise in animal production. The Medji Agricultural College of Sekou trains the Livestock Assistants and the Polytechnic College of the University of Abomey Calavi delivers Livestock Engineers

Benin's 2005-2015 livestock action plan (CSAO/SWAC, 2007) gives four priority action areas for national strategy, based on the main components of the operational strategic plan:

- Control of animal epidemics by strengthening veterinary protection for animals and improving public health.
- Increase and diversification of livestock products by focusing on animals with clear comparative advantage, e.g. small ruminants, poultry, dairy, and non-conventional animals.
- Promotion according to agro-ecological potential, e.g. via crop-livestock integration.
- Supporting the professionalization of the livestock sub-sector, especially through technical training, as well as strengthening and expanding the livestock infrastructure.

The last two recommendations resulted, among others, in the association of agents in the poultry sector in the *Interprofession de l'Aviculture du Bénin*. This unites the *Union Nationale des Aviculteurs Professionnel du Bénin*, the *Association des Fabricants d'Aliments Bétail*, the *Association Nationale des Prestaires de Services Vétérinaires en Aviculteurs Moderne*, the *Association Nationale des Importateurs de Produits Vétérinaire* and some representatives of still unorganised producers of day-old chicks and the people selling the produce (personal communication Dutch Embassy, Cotonou). Such value chain organisation is expected to improve negotiation power and match the needs of various stakeholders. One of the goals is to get a better hold on exports to Nigeria. In spite of higher production cost in Benin, the Beninese food security might be threatened by exports to Nigeria by Nigerian traders (Yerima & Ale, 2012). Higher production cost is said to result from the low rate of mechanisation in Benin crop farming. Trade of cattle is well documented, but export of other products from the crop and livestock sector is not well quantified as the border is long and transparent.

4.1.4. Dutch involvement

Non-governmental organisations active in Benin include Oxfam Novib, ICCO, SNV and Agri-ProFocus. Recently the Dutch Embassy of Benin has developed a Strategic Plan for 2012 to 2015.

Processing of agricultural products, market development, agricultural organisations, as well as availability of credit for infrastructure and agricultural materials are seen as key issues to develop the agricultural sector and improve food security. Livestock is not a focus area (yet), but demand from Nigeria might provide opportunities, especially as the import/export taxes with Nigeria will disappear (Yerima & Ale, 2012).

The Dutch fish sector sourced marine species in Benin, but sustained quality was a challenge. Development of catfish production was supported by the Dutch company HESY Aquaculture that remains partner in Royal Fish Benin. This company produces fingerlings for the West African market, mainly African catfish, and does grow-out. Local expertise is improving.

4.2. Burkina Faso

4.2.1. General information

Burkina Faso, a former colony of France, became independent in 1960. The majority of the population (about 60%) is Muslim; others are Catholic (19%) or have other or no religion. About one quarter (26.5%) of the population lives in urban areas. Close to 21% of the land area is used for annual crops and less than 0.3% for permanent crops (CIA, 2013). The country has four dominant agro-ecological zones (figure 13). Natural resources in Burkina Faso are manganese, limestone, marble, gold, phosphates, pumice and salt. The main agricultural products are cotton, peanuts, Shea nuts, sesame, sorghum, millet, corn, rice and livestock. Presently China and Turkey are the main export partners, buying gold, cotton and livestock. Capital goods, foodstuffs and petroleum are mainly imported from Ivory Coast, France and Ghana.

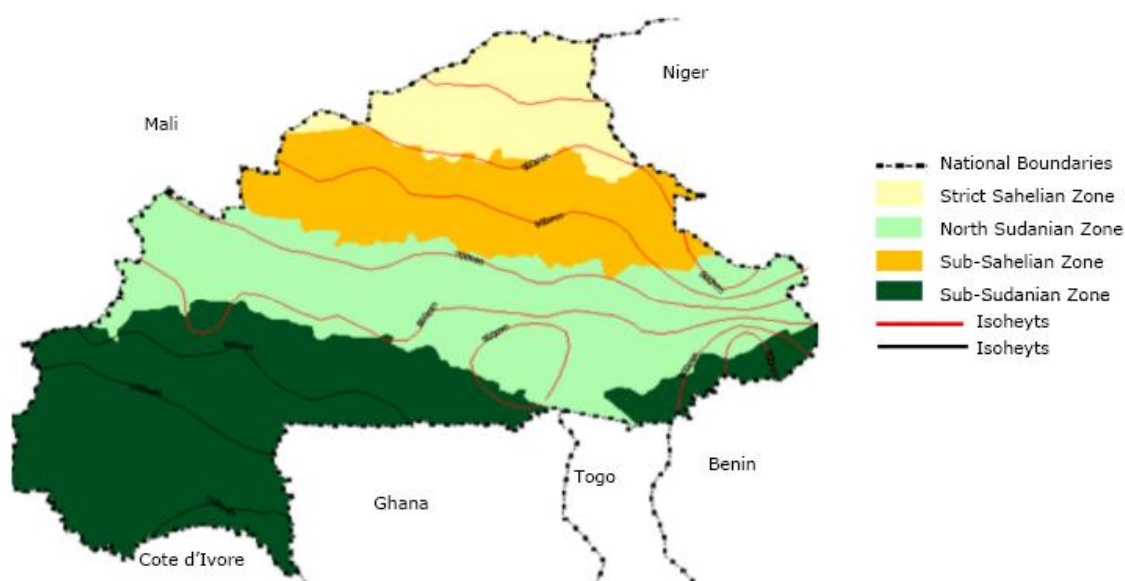


Figure 13: The four main vegetation zones according to the isohefts separating the agro-ecological zones of Burkina Faso (based on UNDP, 2009).

Table 4: Livestock resources in Burkina Faso (heads (poultry in 1000 heads)) (FAO-stat).

	1980	1990	2000	2010	2011	Growth '00-'11
Poultry	11,041	17,158	22,484	39,000	40,000	78%
Pigs	174,000	545,668	1,417,090	2,167,250	2,210,570	56%
Cattle & Buffaloes	2,760,000	4,040,200	4,798,220	8,398,500	8,566,450	79%
Sheep & Goats	6,600,000	11,591,090	15,371,750	20,585,740	21,203,210	38%

Table 5: Trade in livestock products in Burkina Faso, import and export values (1000 US\$) (FAO-stat).

		1980	1990	2000	2010	Growth '00-'10
Agricultural products, Total	Import	71,687	97,511	173,448	306,860	77%
	Export	79,574	116,356	113,078	364,015	222%
Total Meat	Import	219	1,250	116	953	722%
	Export	659	-	6	38	533%
Beef	Import	164	1,250	5	360	7100%
	Export	641	-	-	-	-
Dairy Products + Eggs	Import	13,867	17,293	13,466	15,731	17%
	Export	4	-	11	-	-100%
Milk Equivalent	Import	13,828	17,293	13,466	15,716	17%
	Export	3	-	11	-	-100%
Pork	Import	42	-	56	185	230%
	Export	-	-	6	-	-100%
Poultry Meat	Import	-	-	-	176	-
	Export	-	-	-	15	-

Box 9: Houndé Dairy Producers Cooperative (personal communication Brigitte Ouedraogo, SNV Burkina Faso)

The agro-pastoral system in the Houndé area of west Burkina Faso is based on annual migration of most of the herd, coupled with a permanent presence on village land of a smaller stock of dairy animals. A Dairy Producers' Cooperative (SOCOPROLAIT) coordinates the dairy processing unit. The challenge is to establish a reliable supply, especially during the dry season, improve processing quality, and so expand the presence on the market. Beginning in 2010, the cooperative has taken up this challenge, in collaboration with SNV. The first step was to improve the management of dairy cattle herds with local resources: natural pasture (dry fodder) with supplements of bran and oil cakes. In 2011, the total processed volume reached 36,000 litre/yr. Producers adopted better production and processing techniques, which encouraged the Regional Development Agency to finance a part of the business plan. At each step in the process, efforts were made to safeguard the role of women as strategic actors in the milk value chain. Household incomes rose by 45% per year per member as result of the increased production. The boost given to production and the mini dairy plant under management of SOCOPROLAIT has been a powerful factor in improving the local milk sector and assuring women's participation in decision making.

4.2.2. Livestock sector

Almost all ruminant livestock is in hands of pastoralists and smallholder farmers, among the poorest people in Burkina Faso (Gnanda, 2013). Development of the livestock sector could thus be a way of poverty alleviation, only if done well with due attention to the options of these pastoralists and smallholders. (box 9). Indeed, the last decades showed large increase in production and consumption of both meat and milk. Increased production is mainly due, however, to growth in number of animals, rather than to increased output per animal (table 4). Trade in livestock products increased in the past decade, mostly due to increased import of beef (table 5). Main constraints for livestock farmers are probably land and water shortages, lack of feed and capital, poor performance of indigenous breeds and poor animal health (FAO, 2005). Both of the last are due to poor management. High transportation and transaction costs from Burkina Faso to other West African countries inhibit also the potential of (mainly) the (small) ruminant sector (Gning, 2005).

The distribution of several types of livestock is depicted in **figure 7** for the whole of West Africa; detailed maps of Burkina Faso can be obtained from the Global Livestock Production and Health Atlas of the FAO. Cattle, goats and sheep occur mainly in the centre and north of the country. This is, among others, due to the risk of trypanosomiasis in the sub-humid zones in the south of the country. Over 70% of the country's cattle is kept in transhumant livestock production systems (FAO, 2005). Pigs are mainly found around the capital Ouagadougou.

The meat production strategy of Burkina Faso focuses on using cattle, goats, sheep, poultry and pigs, and small volumes of grass-cutters and rabbits. Burkina Faso started research on the (women group) sheep fattening programs focussing on the huge demand for the two main Muslim ceremonies. Pig fattening by women focusses on the two main Christian ceremonies, and the groups of labourers to

be fed in the cropping season. Extension and support services have not developed (adopted) strategic programs to advise and assist the backyard sheep, goat and pig raisers. The poultry village program developed a successful strategy including the production of special medication (box 20), now practised in other countries. Production of poultry meat increased over the last decades. Especially around larger cities of the country there are opportunities to increase the industrial poultry sector.

Dutch bilateral aid supported construction of abattoirs in Bobo-Dioulasso and Ouagadougou in the past. The MRAH (Ministry of Animal Resources and Fisheries) has technical responsibility for the three abattoirs with a cold storage, located in Ouagadougou, Bobo-Dioulasso and Dédougou. Recently a second abattoir was built in Ouagadougou and more are built in several of the smaller cities. These abattoirs are contracted to private individuals. Next to the problems of tracking and tracing, the private sector noted lack of quality of hygiene, standards in carcass cutting, packaging, and good means of transport.

Burkina Faso has one and soon two state owned feed mills producing concentrates for poultry, pigs, rabbits and dairy cattle. After a deficient rain season, the state sells manufactured feed, corn and cottonseed cake with a subsidy of 50% to cooperatives. In past years this could represent 30% of the production volume of existing factories, but less than 100 kg per beneficiary. In principle the MRAH allocates quota for the produced cottonseed cake, the best available feed. However, the factories give priority to traders of oil, their main clients. Thus the market is not liberal and the freely available quantity is very limited, though not very expensive: 0.20 to 0.50 Euro/kg. In the past 30 years the use of crop residues and hay making has increased. Extension services continue to promote all types of fodder crops, however, without knowing their efficiency for the various production systems and regions.

Most dairy farms use crossbred Zebu-Taurus or dairy Zebu, e.g. Azaouak or Goudaly from South America. Common Taurus breeds are Mont Beliard, Brown Swiss and Frisian. Milk production varies from 5-15 kg/day, lactation periods are sometimes long and most farms have less than 20 cows. Parallel to two state initiatives in dairy processing of some 30 years ago, private and NGO groups are also active in this sector since about 40 years. At present about 150 small private and cooperative processors make good margins from pasteurised milk and sweetened yoghurt. The processed volume ranges between 20 and 2000 litres, but most remain below 100 kg/day. A private farm in the vicinity of Ouagadougou also produces goat cheese. Some cooperatives provide training for their own members and do not depend on state services or projects for skill building.

With regards to aquaculture and fisheries, small initiatives have developed around dams in the surroundings of Bobo-Dioulasso and of the Bagré dam. Since the Akasombo strain of fingerlings became available, some private investors in Bagré have good margins, according to Ghanaian providers of fingerlings. In 2011 the sector produced circa 200 metric tons of tilapia (FAO, 2013a).

4.2.3. *Institutions and governmental policies on livestock production*

The MRAH has, among others, four central technical directorates: Intensification of Animal Production, Extension and Support to the Organisations of Producers, Animal Health, and Natural Resource Management. All are represented in the Regional Directorates of Animal Resources. The regional strength of the Directorate of Natural Resource Management depends on the importance of pastoralism in the respected province. The Directorate of the National Veterinary Laboratory provides technical support to the regional laboratories.

MRAH is responsible for two schools, two centres and two specific programs. One school is national, the other depends on a regional organisation. Animal breeding is covered by the National Centre for Multiplication of Production Animals and the National Centre for Animal Production and Genetic improvement. The last covers all research and demonstration centres of the MRAH. Specific programs are the *Fonds de Développement de l'Élevage* and the *Programme de Développement des Animaux Villageois*. Funds for the first come from a much criticised tax on exports of live animals.

Livestock related research is done by the Universities of Ouagadougou and Bobo-Dioulasso, the National Veterinary Laboratory, the *Institut National Education et Recherche Agricole* (with stations for livestock research near Kamboinsé, Di (Tougan), Katchari (Dori), Farakobâ and Saria) and the *Centre International de Recherche et Développement sur l'Élevage en zones Subhumides*. The latter is part

of the IRD, a French scientific and technical public institution, and one of the main research centres working on trypanosomiasis and local breed together with the International Trypanosomiasis Centre in Gambia.

Potential investors can find support at the Centres de Formalités des Entreprises and three more institutions:

- Chamber of Commerce and Industry;
- Ministry of Trade, Enterprise Promotion and Handicrafts;
- *Maison de l'Entreprise du Burkina Faso*, a joint initiative of public and private sector that might provide the most convenient support.

The Action Plan & Livestock Sector Investment Programme (PAPISE, 2008) forms the basis of policy interventions on livestock production. It focuses on:

- Optimising meat and milk production and productivity;
- Promoting the private sectors and livestock breeders to take the lead in developing the livestock sector, by creating optimal conditions;
- Decreasing the role of the state.

Public investments in the livestock sector of Burkina Faso were reviewed in 2012 (Gnanda, 2013). From 2004 to 2011, the contribution to the GDP was 19% on average, while a little more than 1% of the national budget was attributed to the sector. In spite of losing its first place in the ranking, its contribution increased 24% between 2004 and 2011. Factors limiting the performance of the livestock sector are access to capital, veterinary services and other inputs (feed). The state feels it has insufficient staff for monitoring and extension services. Some groups feel that their access to pastoral resources is limited. Weak road infrastructures increase transport cost of inputs and outputs. The report by Gnanda (2013) recommends the state to review its role in the public-private partnership. Recommendations relating to subsidies on by-products and concentrates, and the efficiency of public interventions in the livestock sector demonstrate that the role of the state might limit but also enhance the role livestock can play for food security (box 18). A paternalistic view of the state is also reflected in e.g. the recommendation to "better exploit the farmers organisations for the dissemination of technologies", instead of attributing them greater role. Gning (2005) already stated that achieving policy changes requires organised interest groups but no such groups exist at large scale. This low rate of organisation might be due to state policies.

4.2.4. Dutch involvement

Around 1990, next to projects on forestry, health, higher education, irrigation and water, the Dutch government also funded five rural development projects in Burkina Faso. Dutch NGOs funded another four. All nine had animal traction in their portfolio and thus livestock. The Dutch funded one pastoralist settlement project and the later dismantled office for animal production. This project also funded abattoirs in Ouagadougou and Bobo-Dioulasso aiming, without success, to export butchered meat to the coastal cities. Over 100 Dutch experts and volunteers worked in all of these and in many other projects during about 30 years. A new action, receiving technical support from SNV, is the biogas component aiming to reduce the use of fire wood and butane. As butane is imported and sold with a subsidy, the quantity of biogas produced in 2010-2011 saved the state already close to 75,000 Euro (46,320,000 CFA Franc) of subsidies. Typically, such a shift from pure livestock activities into adjoining areas of work fits in the niche approach of aid and trade that is open for new activities rather than to remain fixed on traditional modes of working.

Most people (about 85%) depend on livestock for part of their livelihoods. Thus, investing in the livestock sector is an opportunity for Dutch investors. Dutch organisations that continued working in Burkina Faso are among others: Agriterre, SNV, Heifer Nederland, and ICCO. Intervet, a company producing veterinary medicines has a sales representative in Burkina Faso.

4.3. Ghana

4.3.1. General information

The former British colony Ghana became independent in 1957, as first Sub-Saharan country in West Africa. One fifth of Ghana's land area is used for annual crops and 12% for rubber, palm oil, coffee and cacao. The land is rich in natural resources, including gold, timber, industrial diamonds, bauxite, manganese, fish, hydropower, petroleum, silver, salt and limestone (CIA, 2013). The country has seven dominant agro-ecological zones (figure 14). The natural vegetation is determined by the different climatic conditions and soil types. Agriculture in the north is affected by drought spells. Access to potable water, water pollution as well as overgrazing, soil erosion and deforestation are key environmental issues in the country. Ghana has a population of over 25 million people, 71% is Christian, 18% Muslim, and 11% has other or no religion. The country has a 3.5% annual urbanisation rate (CIA, 2013).



Figure 14: The Agro-ecological zones of Ghana (from Höhenheim University).

Ghana's economy has a current growth rate of 7% and agriculture contributes for 25% to the GDP. While the country's per capita income is rising, the average milk and meat consumption is only around 10-20 litres and 1.2 kilograms per person per year respectively. The greatest source of animal protein is fish, often smoked or dried. The estimated number of cattle per 100 persons declined from 8.8 in 1984 to 6.9 in 2000, a case of *Vergetreidung*, (see par. 2.3), while imports of dried milk powder continue to increase. The formal milk sector (supermarkets, restaurants) is dominated by imports.

The Netherlands is both an important import and export partner (CIA, 2013). Ghana imports a range of agricultural products from the Netherlands, of which chicken meat, margarine, oil seed and milk are the most important animal derived products in terms of import value. Trade of livestock product for Ghana are given in table 6.

Table 6: Trade in livestock products in Ghana, import and export values (1000 US\$) (FAO-stat).

		1980	1990	2000	2010	Growth '00-'10
Agricultural products, Total	Import	134,254	187,193	327,098	1,214,758	271%
	Export	743,617	412,749	542,210	1,234,554	128%
Total Meat	Import	8,001	16,540	17,909	128,615	618%
	Export	-	-	216	2	-99%
Beef	Import	5,488	8,930	2,822	11,278	300%
	Export	-	-	135	2	-99%
Dairy Products + Eggs	Import	6,371	9,675	25,502	65,583	157%
	Export	-	-	742	3,443	364%
Milk Equivalent	Import	6,353	9,255	24,494	65,344	167%
	Export	-	-	742	3,440	364%
Pork	Import	1,727	460	1,425	3,473	144%
	Export	-	-	-	-	-
Poultry Meat	Import	520	7,000	12,041	108,039	797%
	Export	-	-	81	-	-100%

4.3.2. Livestock sector

Productivity of livestock in terms of output per animal is low, as in other West African countries. Here too, the challenge for aid and trade is to understand local comparative advantages. In many cases the western production standards are not optimum and people engaging in aid and trade might have to adjust their mind-sets to be effective. Challenges for the development of livestock production in Ghana are amongst other genetic improvement of traditional breeds, prevention and management of animal diseases, availability of feed and water, access to capital and interest rates. Livestock production in and around cities (urban agriculture) is a common phenomenon as in other West African countries. New curricula and research programs are also important, among others to better exploit the potential of urban livestock and unconventional animal production systems.

Some imports of dairy cattle have taken place over the past decades, and especially with problems and failures for use of high producing animals. Some work on dairy, e.g. by Heifer Nederland has helped to get farmers into the milking of cows, with much attention to training and organisation of the farmers (box 10). Marketing remains a problem, but can also be an opportunity if properly addressed.

The distribution of several types of livestock is shown in **figure 7** for the whole of West Africa. Detailed maps of Ghana can be obtained from the Global Livestock Production and Health Atlas of the FAO¹².

Box 10: Dairy in Ghana, holistic approaches by Heifer Nederland (Schiere & Van Mierlo (2010).

The Smallholder Pilot Dairy Project of Heifer Nederland imported 140 in-calf Jersey heifers from South Africa in 2007/8. It was one of the projects since 1943 to establish exotic milk cattle in Ghana. Farmers in the project report yields of some nine litres a day in the first lactation, with newly trained farmers and freshly imported cattle. The Ghana Government supported this program e.g. by providing extension agents as project supervisors. Heifer Nederland considers dairy as an integral part to development. This is a typical aid approach; trainings cover topics as social issues, community health and child nutrition, next to animal feeding, milk-collection, milk-conservation, processing and hygiene, artificial insemination and animal health. Indirect changes are noteworthy at community level. For example, quality of schooling changed and children went from public to private schools because school fees and transport-expenses could now be paid. The attitude towards fresh and processed milk-consumption changed and people come to farms to buy milk and yoghurt, because they are aware that farmers deliver clean and safe milk. The increased farm income is used for household expenses, also permitting dairy families to sell other farm-produce only when market prices are doing well. All family members participate on an equal footing and in some families even daughters benefit from the money earned with the milk sales. The regular income permits families to assure that children have good food. Collective care for the animals is remarkable, e.g. farmers alert each other when a cow is grazing where it should not be grazing. Last but not least, disappointment regarding a private sector processing plant made farmers more pro-active. They now process milk at home and they collaborate to find more reliable companies to sell their milk. The cooperatives now own milk-collection and simple cooling facilities to better manage the storage of milk.

¹² <http://kids.fao.org/glipha/>

Cattle production is concentrated in the north and close to the capital Accra in the south. Investments in cattle meat production are increasing in the northwest. The country has some commercial livestock near urban centres, as well as semi-state owned farms with 1,000 to 3,000 heads of cattle mainly for meat, not for dairy (Van Der Mheen-Sluijter *et al.*, 2011). Intensive pig production is limited around urban areas but backyard pigs are found in many rural areas. The import of pork increased over the years with 144% suggesting opportunities for growth in that sector, not surprising if the sector is very small to start with. It challenges producers to find other feed resources than grain-based diets from western textbooks. Dutch feed business with experience in feeding of agro-industrial waste might contribute. Poultry production is spread through the country and smallholders with local breeds produce the majority of poultry in Ghana. Commercial production of modern broilers or eggs is considered to be difficult as a result of competition with cheap imports, even in a time where poultry production is rapidly growing (157% from 2000 to 2011). **Table 7** depicts the number of heads of several types of livestock in 2011, as well as their growth over past decades.

Table 7: Livestock resources in Ghana (heads (poultry in 1000 heads)) (FAO-stat).

	1980	1990	2000	2010	2011	Growth '00-'11
Poultry	11,500	9,686	20,472	47,752	52,575	157%
Pigs	379,000	473,946	324,000	536,000	568,000	75%
Cattle & Buffaloes	804,000	1,144,790	1,302,000	1,454,000	1,498,000	15%
Sheep & Goats	3,875,000	4,242,130	5,820,000	8,614,000	9,024,000	55%

The Volta Lake offers opportunities for aquaculture. Many private and government initiatives emerged on its fringes: 70 to 85% of the country's fish-farming is done in and around the lake. Aquaculture focuses on grow-out in cages both upstream and downstream of the dam, and the hatchery and nursery of tilapia. The state aquaculture research station and training centre is located along the lake in Akasombo. Since the availability of the Akasombo tilapia strain, private investments in a cold storage-distribution centre and a feed mill were done and in general the number of private investors is increasing. In 2011, production of tilapia was more than 18,000 and African catfish around 600 metric tons (FAO, 2013a). Several Dutch players are active in Ghanaian aquaculture as demand for fish products is expected to increase. Challenges relate to decreasing fish populations because of illegal fishing (Van Der Mheen-Sluijter *et al.*, 2011). Overall, Ghana seems to offer great comparative advantages for fish culture.

4.3.3. Institutions and governmental policies on livestock production

Currently Ghana's Ministry of Food and Agriculture has three technical directorates: Crops, Veterinary Services and Animal Production. A Ministry of Fisheries and Aquaculture Development was created recently. At regional and district level the ministry is represented by Regional and District Agricultural Development Units. The Ministry is responsible for two related subsidised organisations, the Veterinary Council and the Fishers Commission.

Agricultural research is coordinated by the Council for Scientific and Industrial Research. The Council covers among other the Animal Research Institute and the Marine Fisheries Research Division (Stads *et al.*, 2004). The Animal Research Institute's main station lies in Katamanso. One colonial centre for livestock research is Pokuase Agricultural Research station, handed over to the Council in 1962. It now seems to have another destination. The University of Legon includes a Livestock and Poultry Research Centre. Agricultural research is also done by the University of Cape Coast, the Kwame Nkrumah University of Science and Technology at Kumasi and the University of Development Studies at Tamale.

Two offices assist investors: the Ghana Free Zone Board and Ghana's Investment Promotion Centre. The last is a public services commission. The board covers the industry in Tema, Sekondi, and Shama and the Ashanti Technology Park located at Ejisu in the centre of Ghana. The Ghana Investment Promotion Centre's website lists several opportunities in the value chain related to provision and production of agricultural inputs (including dairy and veterinary), agro-processing, packaging, storage and distribution, and technological and support services. Investments in various livestock and aquaculture activities, agro-processing, and waste processing industry may benefit from tax holidays. The Ghana Netherlands Chamber of Commerce and Culture can facilitate business

cooperation for Dutch investors. A strong aquaculture lobby resulted in incentives such as duty free imports of feed. Processing of tuna and many other marine species may present an opportunity. Seafood is among the most productive sectors but the marine sector seems to lose pace while aquaculture is growing thanks to the Volta Lake.

In 2007, the ministry developed the Food and Agriculture Sector Development Policy. Its Livestock Development Policy aims to “increase supply of meat, animal and dairy products from domestic production of 30% to 80% by the year 2015, and contributing to the reduction of incidence of poverty among farmers from 59% to 30% by the year 2015.”

Key aspects of this policy are:

- Improve animal health.
- Improve access to quality feed and water.
- Enhance performance of indigenous breeds through a program of selection.
- Develop commercial poultry to improve meat supply in the short term, while transforming smallholder production into profitable enterprises.
- Improve access of operators to technology and financial instruments to enhance their competitiveness with imports.
- Address issues of processing and marketing and increase awareness on food safety and public health.
- Advocate an enabling environment for intensive urban and peri-urban livestock farming.
- Create awareness among stakeholders on the Road Traffic Regulations regarding the transportation of livestock.
- Advocate fair trade, and facilitate the development of a livestock statistics and monitoring.

4.3.4. Dutch involvement

A list of current Dutch companies involved in Ghana is reviewed by The Ghana Netherlands Chamber of Commerce and Culture (GANECC, 2013) and Van Der Mheen-Sluijer *et al.* (2011), it includes:

- Coppens International BV: sales of fish feed from the Netherlands;
- Skretting NW Europa / Nutreco: sales of fish feed from Europe through local distribution;
- Rainbow Sustainable Solutions: project for sustainable fish production;
- Koudijs Feed and De Heus Voeders: export of feed concentrates via business partner in Ghana. Delivering additional protein (soy and maize) for animal feed to meet demand;
- Friesland Campina has a sales representative in Accra, Ghana;
- AgroEco / Louis Bolk Institute: participatory research and advice on agriculture;
- Wienco: import of agricultural inputs

4.4. Mali

4.4.1. General information

In 1960 the country of Mali became independent of France. The country’s urbanisation rate is 4.8%, currently 35% lives in urban areas. Only 28% of the population is literate. The majority of people is Muslim (95%); others are Christian (2.4%) or have another or no religion (CIA, 2013). The country is landlocked and predominantly arid (figure 15). Only 5% of the land area is used as arable land of which 0.1% is used for permanent crops.

Mali has one tea plantation in the southeast. The country is rich in natural resources like gold, phosphates, kaolin, salt, limestone, uranium, gypsum, granite and hydropower. Transport infrastructure is weak both in terms of roads and the railway Bamako-Dakar. Better and well maintained roads would be a great improvement.

Agriculture in Mali is mainly confined to the south, the riverine area irrigated along the Niger river, and irrigated plains in the so-called *Office de Niger*. The last received much Dutch aid. Current environmental issues are deforestation, soil erosion, desertification and inadequate supply of potable water (CIA, 2013), offering perhaps problems as well as opportunities.

The Inner Niger Delta is flooded annually. The area provides dry season pastures while also having an (internationally recognised) role in global biodiversity. Both are threatened by the tendency to increase the irrigated areas by making polders (Bosma *et al.*, 2013). Dried fish is one of the export products of this zone.

Main export products are cotton, gold and livestock. Major export partners are China and Malaysia. The country imports petroleum, machinery and equipment, construction materials, foodstuffs and textiles from e.g. France, Senegal and China (CIA, 2013). The main import from The Netherlands to Mali is milk powder.

Table 8 shows the trade in livestock products.

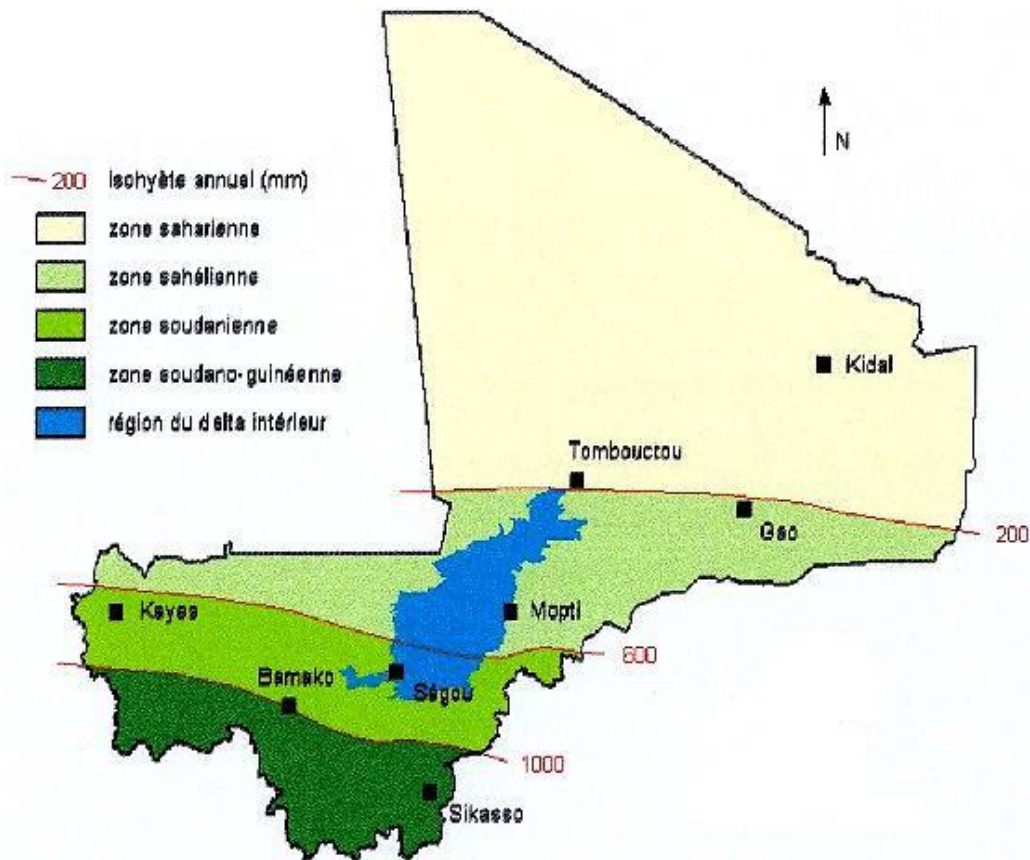


Figure 15: Main agro-climate zones of Mali and annually flooded area of the Inner Niger Delta (from FAO).

4.4.2. *Livestock sector*

The livestock herd in Mali is the largest of West Africa, officially totalling >9 million heads of cattle, 12 million sheep and 15 million goats (Table 8). This might be rather conservative estimates as higher numbers are sometimes given (Van der Mheen-Sluijer *et al.*, 2011). Most livestock is kept on smallholder farms, but 40 - 60% of the cattle is found in large herds of absentee owners. In the north, grazing livestock is kept in a nomadic pastoral system. While most pastoral herds in West Africa move north-south and vice-versa, around the Inner Niger Delta in Mali movements are east-west and west-east. Rainy season pastures for part of these herds are in Mauretania. Meat is an important product from cattle and small ruminants. Export of skins and leather is also an important, but still underexploited, contribution to the national economy (Diarra, 2010).

Table 8: Trade in livestock products in Mali, import and export values (1000 US\$) (FAO-stat).

		1980	1990	2000	2010	Growth '00-'10
Agricultural products, Total	Import	74,917	115,464	110,132	395,024	259%
	Export	190,688	250,635	253,940	210,892	-17%
Total Meat	Import	498	2,220	155	1,902	1127%
	Export	7	-	-	97	-
Beef	Import	467	2,200	27	552	1944%
	Export	1	-	-	-	-
Dairy Products + Eggs	Import	3,712	22,320	16,148	36,063	123%
	Export	-	-	-	154	-
Milk Equivalent	Import	3,712	22,320	16,141	35,759	122%
	Export	-	-	-	154	-
Pork	Import	19	20	64	193	202%
	Export	-	-	-	-	-
Poultry Meat	Import	-	-	30	1,071	3470%
	Export	6	-	-	91	-

Table 9: Livestock resources in Mali (heads (poultry in 1000 heads)) (FAO-stat).

	1980	1990	2000	2010	2011	Growth '00-'11
Poultry	12,000	22,000	25,000	36,750	36,711	47%
Pigs	48,000	56,000	58,375	75,089	75,914	30%
Cattle & Buffaloes	5,850,000	4,996,000	5,934,740	9,163,280	9,438,180	59%
Sheep & Goats	13,000,000	12,172,000	16,300,000	28,387,800	29,807,100	83%

Mali has seven major abattoirs for ruminants and fourteen for poultry (Coulibaly, 2008). The latter is surprising as the average consumption of poultry and eggs is low. Perhaps the number is related to the presence of intensive broiler farms around the capital. The low average meat consumption might be due to the pastoralist production system and a more general consumption preference for milk compared to other West African countries. It illustrates that production of meat by pastoralists does not really contribute to local food security of beef. Pastoralists tend to drink milk and occasionally slaughter goats or sheep without eating much beef at all. The distribution of several types of livestock is shown in **figure 7** for the whole of West Africa. Detailed maps of Mali can be obtained from the Global Livestock Production and Health Atlas of the FAO¹³.

Five abattoirs have a cold chain, but most are not working continuously due to failing demand (Anonymous, 2012). Constraints for the sector are the transaction cost of transport (high due to payment of 'informal' fees), a lack of professionalism in the chain, and 'traditional' means of transport. The lack of professionals limits the possibility for useful tracking and tracing that in turn leads to guarantees for food safety required by supermarkets that turn to imports from other continents. The investment program on meat focuses on improvements in feed, abattoirs, quality of meat, and mobility of live animals (Anonymous, 2012).

Cattle are mainly exported 'on the hoof' to coastal countries like Ghana, Ivory Coast and Senegal. Some fattening of beef is done around large cities with abattoirs. SNV supported strategic partners in the value chain, such as the *Federation des Exploitants de Bétail et Viande du Mali*, the *Union Régionale de la Filière Bétail Viande* of Sikasso and the *Fédération Amadane* in their lobbying actions. They succeeded in reducing the number of police controls between Bamako and Dakar from 40 to 3. Consequently, transactions costs diminished (Anonymous, 2012).

Peri-urban zones of Bamako benefitted from many earlier efforts to stimulate dairying since about 40 years. The office PRODEVALAIT was created in 2009 to manage the dairy strategy of Mali (MEP, 2008). After an inventory of milk production basins, producers were to be trained and organised

¹³ <http://kids.fao.org/glipha/>

around milk collection points. From there, milk should be transported to dairy processing plants to be built by private investors. Due to political pressure in 2012 the milk collection points were built before the producers were organised in most places. If a cooperative or private persons sign management contracts the milk collection point is equipped with a pasteuriser of 200 litres and a fridge, both functioning on gas. Part of existing small processors are organised, or at least supported by NGOs: VSF-Belgium, AVSF-France, VSF-Suisse, Danaya Nono and CAB Démeso. Most of these SMEs process less than 500 kg/day into pasteurised milk, yoghurt, and fènè (overnight naturally fermented milk after pasteurisation that can be kept well for several days outside the fridge). The first units producing cheese and butter had to quit due to management and hygiene constraints (Bosma *et al.*, 2013).

In 2012, the best performing small dairy unit experienced difficulty to market more than 2000 kg/day of products during the seasonal peak (Bosma *et al.*, 2013). Seasonality of production continues to be a challenge in most of the country. For larger dairy plants in Ségou, Diafarabé and Mopti this constraint could be reduced by sourcing from both the Inner Niger Delta (flooded in the rainy season) and in surrounding non-flooding areas.

Consumption of fish products in Mali is almost equal to meat consumption, which is relatively high for a landlocked country (Van der Mheen-Sluijer *et al.*, 2011). Mali still has a good potential of in-land fisheries but catch is not well managed, leading to overfishing. Post-harvest losses are high and improving the processing and storage of fish is a challenge. The demand for frozen fish still increases, and products are imported from Senegal, Ivory Coast and Mauritania. Public small initiatives to promote aquaculture exist in the Inner Niger Delta (USAID and the Netherlands), and in the south around the Sélingué dam and in the Sikasso region (Belgian Technical Cooperation). However, except for the extreme north, fish is farmed in ponds and tanks; over 300 farms were counted in 2011 (Anonymous, 2012). The market for tilapia is increasing. In 2011 the sector produced already more than 600 metric tons of tilapia en 1400 metric tons of African catfish.

4.4.3. *Institutions and governmental policies on livestock production*

The sector's policy is developed by the Ministry of Livestock and Fisheries. The ministry has three technical directorates and within these, there are departments for the various market chains and for the natural resource base. Next to these it has at least four independent national offices: the PRODEVALAIT (Program for the development of the dairy value chain), an inspection of animal production and fisheries, a training centre, and the central veterinary laboratory. At regional level the ministry is represented by three directorates: the Regional Directorate of Animal Resources and Industries; the Regional Directorate for Veterinary Services and; the Regional Directorate for Fisheries. These have agents in the provinces and in some districts. At least four other ministries, directorates or offices play a role in the development of the value chain. The support for the cooperative movement is given by the Ministry of Social Action and Solidarity and of Elderly (Ministry of Social Welfare and Solidarity and of the Elderly People). The official farmer's representation is the Chamber of Agriculture.

The Ministry of Livestock and Fisheries is responsible for the veterinary research, mostly done by the central veterinary laboratory. Research in animal production depends on the Institute of Rural Economy of another ministry. Next to six regional programs, the Institute of Rural Economy has several research stations, of which the most known for livestock research are named after their location: Sotuba and Niono. The Polytechnics Institute of Katibougou trains at BSc and technician level, its research activities are limited.

The Directorate of Industries from the Ministry of Commerce and Industries gives authorisation to start business. The agency supporting investors is the Agency for the Promotion of Investments in Mali.

The Mali government acknowledges the potential of its livestock sector. It designed a development policy for the main value chains - meat, dairy and hides and leather – to inspire the regional program. Over the past 30 years the use of crop residues and hay making has become more common.

Key points of attention of the government policy are to:

- Increase animal production by genetic means, animal feed, water control, health protection and rational herd management.

- Develop production of meat, milk, leather and skins to satisfy national demand and promote export.
- Improve quality and safety of animal products for local, national and international markets.

4.4.4. Dutch involvement

Much work was done by Dutch supported projects in Mali. Agricultural research was supported in projects done by a) the Dutch Royal Tropical Institute in Sikasso for some 30 years, and by b) Wageningen UR in Niono in two distinct periods. The Royal Tropical Institute project did farming systems research in southeast Mali between 1980 and about 2000. Between 1976 and 1980 Wageningen UR research focussed on pasture productivity (*Production Primaire au Sahel*), and from 1988-95 on intensification of crop and animal productivity (*Production Soudano-Sahélienne*), also for other Sahelian conditions (see Penning de Vries & Djitéye, 1982; Breman & Sissoko, 1998). The Office de Niger benefitted from one of the largest support programs of Netherlands bilateral aid worldwide. Office de Niger is an irrigation project where the introduction of animal traction was one of the activities; for some years a livestock expert was added to the team to prevent negative trade-offs from the extension of irrigated areas. The Dutch training of and support to farmers' organisations and the small scale technology rice milling brought a revolutionary change to the Office of Niger (just as it did in the Vallée du Kou in Burkina Faso). For many years, other projects supported (reproductive) health, gender aspects of rural development, and sustainable cropping systems.

The Netherlands are the most important exporter of poultry meat to Mali. Only one Dutch company, Argolanda BV (hides and leather), seems to buy livestock products in Mali. Other Dutch companies currently selling livestock inputs and products in Mali include:

- H.Verstraten Trading BV: dairy cattle from the Netherlands
- Alfasan: veterinary medicines
- Imeko Dairy Products BV and Friesland-Campina: milk powder
- K.I.SAMEN: artificial insemination of dairy/meat cows (PSI- support)
- Skretting NW Europa / Nutreco and Coppens International: small amounts of fish feed
- Hollandais Til-Aqua International, Fleuren & Nooijen: aquaculture equipment
- Cornelis Vrolijk: fish caught in Europe or at the coast of Mauritania
- Parleviet v.d. Plas: exporting frozen fish
- Yirina: support farmers who produce organic cotton for the export market

Other Dutch companies also showed interest to sell livestock related products in Mali: Koudijs Animal Feed, Unilac Holland (milk powder) and Jacobs Inter Trading (milk powder).

Specific issues to aid and trade in Mali are reduced potential of the large semi-arid area for livestock production as priority is given to irrigated rice. Rice is macro-economically not as beneficial as livestock production, since it goes at the expense of animal production. The use of land for crops alone is favoured when looking at the potential for cropping alone, while the crops and livestock together could yield even more (Breman & Traoré, 1987; IMPD, 2007; Behncke & Kerven, 2013). The potential to produce cereals in the rain-fed areas is hampered by weak soil fertility management. If well managed, these can yield at least double, against lower cost. Soil fertility is a bigger issue than often understood. It is the basis for sustained food production, often relying on manure from animals grazing on large areas to drop their excreta on rather small plots of cropland. Most probably the relationships between crops, livestock, and soil fertility are the biggest issue in West Africa, as basis for sustained food production, stable incomes and politics.

4.5. Nigeria

4.5.1. General information

Nigeria, also known as the giant of Africa, became independent in 1960 after a period of British influence and control that started in the late 19th century. The land area of Nigeria exceeds 910,000 km² of which 39% is used for annual crops and 3.5% for permanent crops. The country has nine agro-ecological zones: (i) mangrove forest and coastal vegetation, (ii) freshwater swamp communities, (iii) tropical high forest zone, (iv) derived Guinea savannah with relict forest, (v) Southern Guinea savannah zone, (vi) northern Guinea savannah zone, (vii) Jos plateau, (viii) Sudan savannah, and (ix) Sahel savannah (Oyenuga, 1967, figure 16). This division of the agro-ecological zones hides that the higher altitude Plateau State implies a cooler climate there, with average temperatures between 18-22°C. Typically, such cooler areas provide niches for dairy and poultry as well as for crops, such as vegetables. Livestock in such areas may have to compete with high value crops. High value crops tend to have little relevance for local food security.

The population of Nigeria is 7th largest of the world. It has urbanisation rate of 3.8%/yr. Almost half of its inhabitants now live in cities, with great contrast between rural and urban areas as elsewhere in West Africa (box 11). The majority of the population is Muslim (50%), Christian (40%) and 10% indigenous beliefs. Considerable tension is caused by political divides, often simplified as being between Muslim orientated northern states and non-Muslim southern parts of the country.

The presence of natural resources like natural gas, petroleum, tin, iron ore, coal, limestone, niobium, lead, zinc and arable land attracted investments of international companies. Oil is a key export product and export partners include the USA (17%) and India (12%). Some 9% is exported to the Netherlands. As such, the cities act as an important and dominating market in West Africa or even beyond. For example, >90% of all Nigeria's demand for sugar seems to be imported in spite of the sugar estates in the country. Table 10 gives an overview of Nigeria's trade in livestock products.

One of Nigeria's important natural resource areas is the Niger delta, with huge potential for among others aquaculture. It suffers, however, from massive oil spills due to uncontrolled theft of oil. Pollution from industry and human waste is a general issue, next to desertification. Imports into Nigeria consist of machinery, chemicals, transport equipment and manufactured goods, as well as food and live animals. Imports of dairy products and poultry meat are large.

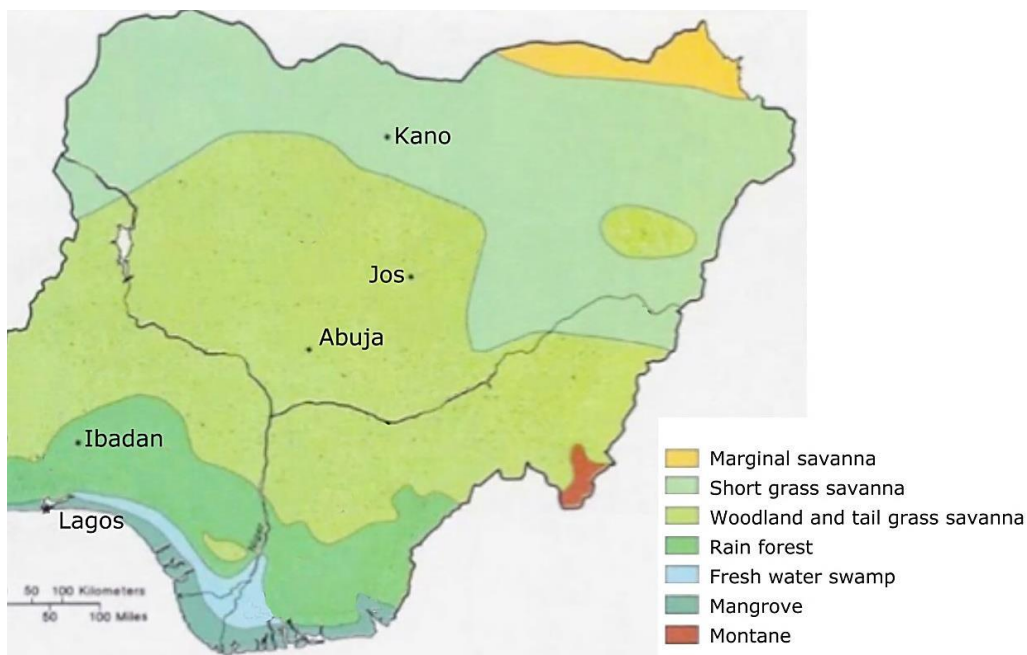


Figure 16: The nine agro-ecological zones of Nigeria (source University of Texas).

Box 11: Nigeria, a micro-cosmos of western Africa.

Nigeria is the engine and giant of West Africa, but similarities and opportunities between Nigeria and other countries of West Africa are many. The country shows the same agro-ecological zoning from semi-arid via sub humid to humid, associated with generally quite similar problems and opportunities as elsewhere in West Africa. However, the country is larger, it has greater power and differences are perhaps more pronounced. Also in Nigeria as in other countries of West Africa there is a region with slightly higher elevations where vegetable growing and dairy are better possible than in the lowlands. Infrastructure is improving even if it still may have a long way to go.



Contrasts in Nigeria reflect those of West Africa as a whole: at the left a traditional Fulani kitchen (Burkina Faso) and right the vision of Eko Atlantic-City, an investors paradise for the coast of Lagos, Nigeria. Food security concerns are a matter of aid in the left hand picture and a matter of trade in the right hand picture.

4.5.2. Livestock sector

In the past ten years the livestock resources in Nigeria increased with 25% in cattle, 53% in pigs and 70% in poultry (**table 11**). The main constraint to intensification of these sectors and in aquaculture is the need to import feed, also because these imports are not duty free. That is easier than in landlocked countries, but the need for imports makes industrial livestock production less competitive while also requiring long term vision on nutrient surpluses. Other industries develop strategies for local sourcing (box 12), not easy in the case of milk for which the country has no great comparative advantage.

The distribution of several types of livestock is given in **figure 7** for the whole of West Africa. Detailed maps of Nigeria are available from the Global Livestock Production and Health Atlas of the FAO¹⁴. The 18.8 million heads of cattle are mostly concentrated in the north. Challenges in the dairy sector include organisation of producers (cooperatives); productivity per animal; dispersion of milking herds

over large areas; collecting, processing and marketing of milk; costs of inputs (fodder, medicine, concentrates, and services;) and trained personal (Annette *et al.*, 2012). Challenges of collection and unfavourable condition for dairy production result in high prices of fresh milk and high imports of milk.

The somewhat cooler average temperature at the slightly elevated Jos plateau makes it one of the few places more appropriate for dairy production. Thus, dairying with crossbreds and full bred European cattle takes place mainly on the Jos Plateau, if it can compete or integrate with high value crops. The larger dairy farms at the Jos Plateau have had reasonable success in supplying local markets with fresh milk products (HVA International, personal communication). Recent political tensions on the Jos Plateau may affect these developments.

Pork production occurs in the south and near urban centres. Key issues to improve pork production in Nigeria are nutrition, availability of labour and skills, capital, disease control, breeding and marketing (Akinola, 2010). The density of poultry production is high in the south and near urban areas. Most poultry is kept by subsistence farmers (Adeyemo *et al.*, 2012), but industrial farming starts to take off (Veldink, personal communication). Challenges in the sector relate to quality of feed ingredients and chicks, feed costs, access and costs of veterinary services and marketing information systems. Provision of financial assistance to subsistence and small scale poultry farmers by means of soft

¹⁴ <http://kids.fao.org/glipha/>

loans is suggested (Adeyemo *et al.*, 2012). That calls perhaps for an aid rather than a trade approach, even if business might find interesting niches in this work. The challenge for trade would be to combine this with maintaining food security, e.g. via CSR strategies.

Nigeria has 14 million ha water surface where fish can be cultured, mainly producing African catfish, carp like species and Nile Tilapia (FAO, 2013a). Sometimes fry imported from the Netherlands is used in the fish culture. The country has many artificial lakes in abandoned open (tin) mine pits, especially on the Jos plateau, which might offer an opportunity for cage culture. Larger farms have nurseries in tanks using recirculation aquaculture systems, and grow-out to market weight in ponds.

Table 10: Trade in livestock products in Nigeria, import and export values (1000 US\$) (FAO-stat).

		1980	1990	2000	2010	Growth '00-'10
Agricultural products, Total	Import	2,099,238	561,041	1,129,299	5,637,065	399%
	Export	445,515	228,226	339,387	1,164,070	243%
Total Meat	Import	85,780	254	607	92,103	15073%
	Export	-	12	-	-	-
Beef	Import	58,200	48	90	3,484	3771%
	Export	-	12	-	-	-
Dairy Products + Eggs	Import	280,750	73,820	133,851	519,294	288%
	Export	-	-	-	1,125	-
Milk Equivalent	Import	280,160	74,776	133,926	517,431	286%
	Export	-	-	-	1,125	-
Pork	Import	160	58	452	1,274	182%
	Export	27,000	133	11	86,856	789500%
Poultry Meat	Import	2,099,238	561,041	1,129,299	5,637,065	399%
	Export	445,515	228,226	339,387	1,164,070	243%

Table 11: Livestock resources in Nigeria (heads (poultry in 1000 heads)) (FAO-stat).

	1980	1990	2000	2010	2011	Growth '00-'11
Poultry	79,760	126,090	113,200	192,313	192,313	70%
Pigs	1,000,000	3,410,000	5,047,620	7,471,730	7,700,000	53%
Cattle & Buffaloes	12,108,000	13,947,000	15,118,300	16,013,400	18,871,400	25%
Sheep & Goats	19,347,000	35,781,000	68,500,000	93,946,700	95,300,000	39%

Box 12: Nigeria and the larger Dutch Companies - dairy and brewers.

Several larger Dutch companies have branches in Nigeria. Friesland Foods, Nutreco (Skretting NW-Europe) and Heineken are active in the Agro-sector. The operating company Friesland-Campina WAMCO Nigeria supplies millions of consumers with dairy products through its extensive distribution network. Fresh dairy is a luxury for most Nigerians and people from other countries in West Africa. To ensure that the products are affordable they are also available in smaller packages. Raw materials are mostly imported from the Netherlands and processed locally into end products. The main production location for milk in Nigeria is in Lagos while the company is increasingly active in the difficult business of local sourcing of milk in the sub-humid and arid zones.

Nutreco/Skretting is studying the opportunity to install a (fish) feed-factory in the region. At present it sells feed produced in France throughout West Africa. In Nigeria they have a share in Durante's small feed mill. The largest market for manufactured feed is in Nigeria, but Ghana is said to have the best business climate for that. Transport is a major cost factor, without even accounting 'illegal' transaction cost.

Heineken, also a Dutch agro-based company in Nigeria, actively works on local sourcing of brewer's grain. This helps local farmers compete against imported grains while raising incomes of smallholder farmers, thus contributing to poverty alleviation at a local level. Local sourcing also reduces transport-related footprint. Heineken has a target of sourcing 60% of all its raw materials locally by 2020 across West Africa; in 2012 it sourced 48% locally in Nigeria. Current local sourcing initiatives exist in ten countries across Africa involving over 100,000 farmers and their families.

4.5.3. *Institutions and governmental policies on livestock production*

The Federal Departments of Livestock and Fisheries of Nigeria's Federal Ministry of Agriculture and Rural Development, regulate livestock, aquaculture, and veterinary activities and research throughout Nigeria. The department of livestock and fisheries have offices (State Departments) in each state to coordinate support and animal health controls. Each of the 36 states has a Ministry of Agriculture and Natural Resources with Livestock, Fisheries or Veterinary Divisions that operate state farms and provide technical and veterinary assistance.

The Ministry supervises and funds Research Institutes and Colleges of Agriculture and Forestry. Agencies of interest under the Federal Ministry of Agriculture of interest are the National Quarantine Services, the Veterinary Council of Nigeria and the Agricultural Research Council of Nigeria. Research on fisheries and aquaculture is done by the Nigerian Institute for Oceanography and Marine Research and by the National Institute for Freshwater Fisheries Research, while training on aquaculture and integrated farming is ensured by the African Regional Aquaculture Centre.

The Federal Government Agency to support investors is the One Stop Investment Centre of the Nigerian Investment Promotion Commission. The commission has lists of opportunities in the value chain, most of which can acquire a Pioneer Status valid for three year: cultivation, processing and preservation of food crops and fruits; cattle ranching and piggery of not less than 500 heads; integrated dairy production; large-scale inland fishing farms; deep sea trawling and processing; coastal fishing and shrimping; manufacture of agricultural machinery and equipment, and of nets from local raw materials.

The Ministry has launched an Agriculture Transformation Agenda focusing on:

- Agriculture as a business instead of a development project.
- The transformation of the agricultural sector to create jobs, create wealth and ensure food security, with a focus on youths and women.
- Value chains where Nigeria has comparative advantage.

Agricultural Value Chain Plans are made for several subsectors including dairy, fisheries and poultry. With respect to dairy the government aims to increase the national dairy production and raise the income of dairy producers. To achieve this, organisation of production, collection and processing as well as marketing of dairy production are objectives in the plan. And to further illustrate the drive for increased production the government aims for fisheries "to create an enabling environment for increased and sustainable production of over one million metric tonnes of aquaculture fish and to generate five hundred thousand jobs within five years."

Improved quality, chain organisation and exports are part of the objectives. In case of poultry, the goals are to support "sustainable growth with expanded capacities for regional competitiveness so as to contribute more to animal protein supply, job and wealth creation". Ensuring animal feed, improving the organisation of the chain, and use of commercial breeds are part of the objectives.

4.5.4. *Dutch involvement*

Some strengths and weaknesses for aid and trade were mentioned. Friesland Campina has a 50% market share in sales of milk powder via its local company WAMCO. It is also active in sourcing local milk from pastoral communities (Annatte *et al.*, 2012; Köster, H.W., 2013, personal communication). It was involved, some 10 years ago, in setting up of integrated dairy farms at the Jos Plateau that have now gone on their own.

Other examples of Dutch involvement in the livestock sector are:

- Fleuren & Nooijen (aquaculture) supported the development and kept a share in Durante Fish Industries Ltd in 1999 in Nigeria.
- Durante Fish Industries Ltd represents Skretting/Nutreco in Nigeria and invested in a small feed mill. Skretting/Nutreco itself is studying the possibilities to invest in a large fish-feed factory in West Africa with a similar idea for Ghana.

5. Challenges and opportunities, an intermezzo

The previous chapters identified major drivers behind changes in production systems and food security, in addition to specific country information. The resulting differences and similarities in livestock keeping and food chains are many. Differences in space and time demand attention for niche opportunities. Similarities, that especially exist from east to west, demand identification of common challenges and opportunities. Further, a focus on comparative advantages helps to understand where, how, and whether to meet increased demand for animal products. For example, opportunities for livestock may be outdone by better comparative advantages, e.g. for vegetables. At the same time, comparative advantages do change over time. Many areas with traditional pastoralist communities are slowly moving towards mixed farming. When looking at opportunities for livestock in such areas one has to consider a new role for livestock in crop systems. Similarly, when looking at economics of cropping one needs to consider the combined economics of crops and livestock rather than of single commodities like irrigated rice alone. Micro-economics often used by trade do not always agree with macro-economic reasoning often used by aid.

5.1. A zonal and general view on challenges and opportunities

Scenario diagrams, also called ‘choice diagrams’, see for example figure 11, can help to better understand the opportunities and purpose of aid and trade. Overall, per zone, the following general and face-value opportunities are found (identified without much further analysis):

- In humid and sub-humid zones: pigs and broilers in backyard systems for rural food security and in commercial systems for urban food security;
- In sub-humid zones: backyard chickens (eggs, meat, savings) and pigs (both backyard and commercial), layers and broilers (backyard and commercial); dairy production with trypano-tolerant animals;
- In semi-arid zones: dairy production with Zebu crosses; production of lean ruminant meat and leather; village backyard level poultry and [pastoral] sheep and goats; more farfetched is soil fertility management;
- In arid zones: production of lean ruminant meat, mutton, hides and skins; more farfetched is natural resource management.

The brief list presented above gives a generalised view on opportunities per agro-climate zone, while many local differences do occur. The term face value is used because that type of interventions do not result from deeper analysis. In fact, the list may also be too general. If context specificity and deeper drivers are not taken into account, opportunities will be missed. Aid and trade can have different perceptions as well. Introduction of technology sometimes has far-reaching and unexpected consequences: The trade of food and other resources shapes opportunities just as much as food production alone does.

There can be tension between trade and resource allocation. For instance, when integration on farms gets replaced by mixing between regions or between rural and urban areas, the resulting specialisation can lead to nutrient excess in urban areas and nutrient shortages in rural areas. The choice of technology shapes opportunities and side effects that may be different per category of producer, as further discussed in chapter 6. Occurrence of niche, rather than standard production systems and value chains, is rule rather than exception, so opportunities are easily missed.

Paradigms on multi-functionality of livestock in these West African countries are often overlooked by industrial-minded trade, thus potentially missing opportunities for sustainable development.

5.2. A functional view on challenges and opportunities

Local and backyard farming systems can best contribute to food security if the following interventions are addressed:

- Breeding of local dairy breeds such as the Zebu maure and Zebu azaouak dairy cattle, and Red Maradi and Maure goats.
- Support for locally relevant legislation, organisation of value chains, and professionalization of management, in order to keep value in the region.
- Assist design and marketing of technologies separately for different animal production systems and value chains for backyard and small scale (figure 11), micro-meso (figure 17), and development goals (figure 19).

For industrial systems, opportunities are related to improving the volume and margins through:

- Involvement in local and national feed markets to develop economical, rations and use of agro-industrial wastes.
- Introduce conventional and more modern methods of climate control, reduction of emissions for high yielding industrial poultry and pigs.
- Vocational training for running development of semi-commercial farms as well as development of curricula that prepares students, future policy makers, and industry people to handle a range of production systems with their trade-offs.
- A range of processing, cooling and packaging systems suited for short, medium and long chains (figure 17).
- Breeding of chickens and pigs that perform better under high humidity and high temperatures, with lower grade feed, perhaps with lower individual growth rates
- Breeding of pigs using high fibre diets.
- Premix feeds for pigs, poultry and ruminants to fit in with locally available feed products and to reduce costs related to manufacturing and transport.

Box 13: Changes in West Africa, the context of future trade and aid for livestock production and food security.

In West Africa, roles and shapes of livestock keeping change in line with the changing context. Relevant changes in the context include:

- Population pressure affects power relations between pastoralists, crop farmers and urban investors, creating tensions between new rules of the game and age-old informal agreements. Combined with modern (chilled) transport this may offer opportunities for decentralised processing, also to increased disruption of cattle corridors.
- Local entrepreneurs and business communities gain self-confidence and power, leading to opportunities for local sourcing and employment of local specialists in service provision, and for local business in supply of agricultural inputs (such as medicines, feed ingredients, feed processing, etc.).
- New players show up, e.g. China, Brazil and South Africa, as well as new producers (local and immigrants from Southern Africa), thus increasing the need for innovation in West African markets.
- Urbanisation offers new markets with and changing food preferences, offering options for fast food and supermarkets, but also for urban farming and local foods. Together with the local (micro-and meso) markets these markets could be conceived to be mutually beneficial rather than competing.
- A young and politically aware workforce emerges, often leaving agriculture for good, sometimes staying on and helping to give new impulses to local farming and agribusiness.
- Public awareness increases, e.g. on market prices due to access to (global) information via internet and mobile phone, also contributing to changing consumer taste and new opportunities for aid and trade
- Greater roles for the private sector shifts ownership of knowledge from public to private actors, leading to more effective animal health services in some cases, to greater control of agribusiness over local resources in others, and/or to neglect of the potential of localised and backyard production for food security.
- Religious tensions and spill-over of conflict from other regions affect stability and local food security, even in spite of good performance of agricultural production itself. Thus, logistics of food distribution may be up for large changes.
- Concerns on water scarcity, oil prices, and climate change increase, combined with (des-) aggregation of hitherto mixed farming, forcing the agricultural sector to come up with new production systems and supply chains that save/recycle nutrients.

5.3. A future-oriented view on challenges and opportunities

Overall, much is changing in West Africa. Hence, focus of any development should be on what will be rather than on what presently is. The notion of changing drivers and related realities introduced in chapter 2 (listed in box 13), for West Africa make clear that one should consider agriculture as a dynamic rather than a static sector. Modification of current research agenda's and curricula is crucial to develop a balanced view on the combination of so-called modern farming methods and decentralised, locally suitable production and value chains.

5.4. Some context-specific challenges and opportunities

In general terms, challenges and opportunities related with changing drivers and differences between farming systems can be summarised as:

- Especially the semi-arid regions have a comparative advantage for lean meat production, but much less so for dairy, due to low feed quality and quantity of natural pastures as well as distance to the market. Development of pastoral systems can suffer from insufficient grasp of the issues.
- The comparative advantage shifts from keeping animals alone, which graze harvested crop fields, towards on-farm mixed crop-livestock systems. Livestock starts to play more roles in support of cropping rather than as single activity. Work on crops that ignores benefits and problems of animals is short-sighted with narrow focus, especially in relation with issues of soil fertility.
- For sustainable crop production the maintenance of soil is crucial and in agro-pastoral systems animal manure can play a role in combination with the use of fertiliser. From 'living apart together' (as phrased by Slingerland (2001), the system can evolve into an on-farm integration where crops benefit from manure and livestock enjoy better feeding. However, *production* of manure by animals is myth since animals shift nutrients, at the cost of losses, rather than produce nutrients.
- Monogastric livestock like pigs and poultry have a comparative advantage for utilisation of the better quality concentrate feeds around cities and in coastal areas. Design of feeding systems using feeds of a lower quality is an option, e.g. considering the potential use of by-products for swine feeding in which the Dutch have much experience.
- Non-conventional animals (cane-rat, guinea fowl, native chicken, camels) are important, especially for local food security and an undervalued resource in national statistics. They often form a significant part of the animal population while receiving least attention.
- Choice of technologies from publicly funded research programs and curricula determines which people in the food production and value chain will benefit most. In that sense, the large informal sector tends to be at a disadvantage as compared with the formal sector, perhaps at the cost of local food security. Investments [in research] for higher productivity of backyard and unconventional animals can be more profitable than often thought.
- Foreign companies will have to increase local sourcing to acquire a local license to operate, as well as to reduce the footprint. Local sourcing of milk is difficult since milk for macro-markets has a low comparative advantage throughout West Africa. Dairy companies might thus be pressed to find alternative action for local sourcing of milk.
- Low capital availability is a problem due to which most farmers can't use their land as collateral. Thus, informal and grassroots banking as much if not more than introduction of formal system that, again, tend to favour only specific procedures.
- Possibilities exist for low (and higher) levels of practical training (facilities), also for public and private extension agents, especially in terms of training to cope with variation in farming systems and value chains
- Illegal transaction costs are often quoted as a hindrance for trade. Arguments about that, however, depend on local conditions. They also tend to underestimate the value of informal systems. Moreover, the relative strength of large business and wide-open borders, combined with weak legislative systems may fail to ensure equal resource distribution and/or food security (Stiglitz, 2012).

5.5. An endless list

Much longer, sheer endless lists could be prepared of challenges and opportunities, depending on whether one focusses at the distinction in agro-ecological zones, countries or regions, backyard or commercial, micro vs macro markets, and challenges and opportunities over time. Condensation of such a list in a standard SWOT would not do justice to the variation at hand and it is beyond this quickscan to undertake a detailed effort. box 14 gives a rather random listing of some remaining challenges and opportunities that were only implied in the previous chapters.

Box 14: Additional issues, a selection.

- Markets in countries like Burkina Faso and Mali are still too small for large scale investments. Small farmers continue to produce pigs and eggs in backyard or scavenging conditions. Transition to a new balance between 'backyard and local' to commercial and (inter) national scale deserves more attention, implying a need to do banking for smaller as well as larger producers.
- Support of extension and other support services, e.g., banking, legislation, research and education should continue to better use the opportunities arising from changes in comparative advantages and work with variable rather than standard approaches to farming.
- Know-how on fish farming increases in both Ghana and Nigeria, countries with a good natural aquatic resource potential for fish farming. Ghana has well-selected local tilapia species. Nigeria uses a variety of local species without good breeding programs; most catfish fingerlings come from Europe.
- Especially in land-locked countries, the cost of transport weighs heavy on the options of intensification and focus on intensification should not cancel work on traditional and more decentralised systems.
- Mali and Burkina Faso know examples of dairy enterprises and cooperatives (though on average a processed volume of less than 1000 kg/d). In general, packaging of local dairy products is sloppy and not attractive to consumers, an opportunity for business! In both countries, moreover, policy is moving to favour dairying with local cattle (Zebu azaouak / maure) and goats (*Capra hircus* maradi / maure), shaping demand for X-bred animals as much as (or more than) for imports of high yielding animals.
- In Burkina Faso and Mali, the state interference in production and in distribution of inputs and slaughterhouses is still important. That warrants further study on success/ failure of similar policies from elsewhere to establish alternatives.
- Burkina Faso has built up localised know-how on fattening sheep for festivities, and on village poultry vaccinations through trained farmers. In other countries, there are also examples of village vets. Both are examples of possibilities to strengthen the informal and backyard sector, Mali has a broad natural resource base for its large pastoralist herd in the South, as well as a (threatened) dry season pasture in the inner delta of the Niger. However 40 - 60% of the cattle have absentee owners, therefore Mali's dairy capacity is overestimated.

5.6. Basics for understanding livestock systems in West Africa

Last but not least, in terms of opportunities, much work has been done over past decades on (mixed crop-) livestock systems of West Africa. Much of that was Dutch-funded and a good review would be worth the effort, taking relatively little time since most ex-experts are still alive and kicking. Notably, in peak years some 40 to 60 SNV volunteers worked in each of the countries. Around the year 2000 the focus changed from projects to sectors, making specific livestock activities funded by Dutch aid harder to trace. However, for example SNV still continues to play a role in the regulations around trans-border mobility of pastoral herds. Involvements of other NGOs and Embassies also continue. Things are now possible that were unimaginable in the past, but many basic rules are known that indeed need consideration before investing in additional research:

- Pastoralism is often the best way to use resources in areas with unreliable rains, not in the least because of the non-linear mind-sets in those systems; that survive by adjustment rather than by setting fixed goals and processes (Leach et al, 1997).
- The flexible, opportunistic approach of pastoralists to survive in their variable environment implies that there are many ways to skin a cat (Ickowicz *et al.*, 2012). It is a learning point for (foreign) business entering the zone to know that focus on core business and standard operating procedures are not helpful for survival in such variable conditions. Flexible approaches have an important advantage here.

- Drinking places in arid conditions need to be embedded in local structures to avoid problems as around the Forage Christine in the Oudalan of Burkina Faso in 1973. Desertification is more often caused by failing institutions and wrong mind-sets rather than by livestock. In other words, many problems need social rather than technical fixes.
- The combination of poor feed quality, high temperature, and high humidity limit individual milk production of imported taurine cows, also due to (tick-borne) diseases. Focus away from high yields per individual animal towards economics of the whole enterprise may unlock hidden potentials, with lessons to be learnt from around the world, also from developed countries.
- Small animals like goats, sheep, backyard poultry, and cane-rats provide capital for daily [emergency] expenses for both pastoral and crop farm households, and especially in the humid south. They are an underrated resource for food security of poorer households, not only by providing nutrients but also by serving as petty cash to be exchanged for food, medicine and the like
- Introduction of animal traction broadened cattle ownership in cropping societies beyond control of the chiefs, thus starting agro-pastoralism in these societies
- Vaccination campaigns such as against Rinderpest eradicated epizootic diseases from the region, i.e. some diseases can be controlled. Trypanosomiasis is may be somewhat on its retreat, but it is and will be a serious limitation for many years to come.
- In many places the nutrient status of soils is a greater limitation for growth of vegetation than the water availability (Breman & Sissoko, 1998). As said before, in many places the design of mixed crop-livestock systems (basics of which are known) is key to future food security.
- Livestock production systems, especially the pastoral and mixed systems, perhaps not including the industrial systems, are too complex to think that an intervention in one detail can alter the system in an effective way. Better understanding of the whole system is necessary for long term sustainability.

6. Trade-offs and policy choices

Identification of challenges and opportunities in livestock production and value chains as presented in chapter 5 was rather face-value and general. Different views can be held on these opportunities, ranging from too optimistic, too pessimistic, or even contradictory. Many myths continue to exist (box 15), on large as well as small scale production, worthy a good review. In addition, what appears to be good at face-value often has unexpected consequences. Attention to trade-offs in policy choices makes things more complex but also more creative for both the public and private sector. A comprehensive set of choices is beyond the scope of this quickscan. However, this chapter sets the scene for further discussion and it gives examples of policy choices and trade-offs. The biggest trade offs in this report occur in the tensions between small (more local) and large scale (more international) food systems in terms of people, planet and profit (the triple bottom line).

Box 15: Sustainable smallholder livestock production in the tropics: myth or reality (based on Udo, 2013).

Realities:

- Backyard and small scale poultry are the first and last resort for the poor, especially for women in societies where women's access to sheep and cattle is less acceptable.
- Labour productivity of (zero-grazing) smallholder dairy is higher than for crops and wage labour, but dairy is not for the resource poor, who will benefit more from goats or pigs.
- Dairy's informal market provides higher prices to farmers and lower prices to consumers. Creation of rural employment and income is a main benefit of small scale dairy processing.
- Intensive dairy production systems tend to need irrigation water (in many cases from non-permanent aquifers) at the rate of over 600 litres per kg of milk.

Myths:

- "In Africa, western dairy cattle can produce 30 kg milk/day": perhaps they can in the highlands or in air-conditioned housing, but on regular farms (funded with Dutch aid) the average remained below 10 kg/day, even under optimal feeding.
- "Intensive systems have the least environmental damage per unit product systems": this apparent advantage is due to the fact that the full environmental costs of feeds used are not accounted for.
- "CO₂ emissions are lowest for high producing cows": environmental impact of free-grazing dairy in Africa is high indeed, but, expressed per kg milk, the emissions of large farms and average sized farms are similar. After correcting for multi-functionality the latter score best, and large farms are similar to zero-grazing (figures for large farms of 107 cows, 9kg/d; average sized farms of 14 cows; 9kg/d; zero-grazing farms of <3 cows; 4.5 kg/d).

6.1. The triple bottom-line and what starts to be known

Dutch agricultural and foreign policy aims are, among others, to seek opportunities for aid and trade, through which animal production can be an engine for growth as well as a source of food in local and (inter)national markets. Other policy aims refer to concerns about a) food security and poverty in rural areas, b) reduced nutrient and GHG-emissions, and c) sustainable use of resources like oil, water and soil-organic matter, including animal welfare. Introduction of any technology in any given farming system has trade-offs (e.g. between farm-economics, ecology, high vs sustainable yields). For example, focus on veterinary issues on the right hand side of figure 11 implies a comparative disadvantage for producers on the left hand side. Single focus on face-value opportunities also tends to miss markets in the sense of what is called BOP. That is abbreviation for the *Base of the Pyramid* approach in which the poorer sections of society are seen as a resource rather than as problem for development (London, 2008; Prahalad, 2004). Detailed discussion of these choices is beyond this quickscan. However, we do identify major tensions (trade-offs) between farming for local food supply and income generation (scenario 1) on the one hand and larger scale / industrialised farming for urban food supply (scenario 2) on the other hand. Design of a third scenario with a mix of several development trajectories of scenarios 1 and 2 (not a compromise or average), can be a key responsibility for public policy (Van Der Ploeg, (2001, 2008), Stiglitz, 2012). Simplification helps to see the forest for the trees and discussion of trade-offs in this chapter, therefore, juxtaposes scenario's 1 and 2. In that sense we discuss the trade-offs between food security and resource use (allocation) in

rural versus urban areas, set against a background of notions from people, planet, and profit (the triple bottom line), e.g.:

- People: food security, equity, gender, cultural identity, and farmer and animal welfare;
- Planet: GHG and nutrient emissions, deforestation, biodiversity, water use, and soil erosion;
- Profit: short and long term return on investment, income, employment.

Much PPP thinking tends to evolve around the search for a win-win solution, even if the opposite is often more likely (win-lose). A win-win in aid and trade occurs, for example, when markets facilitate sale of produce from rural areas, thus raising rural income and reducing food prices in cities. Negative trade-offs and counterproductive policies do occur, however, when one gain goes at the expense of another, and/or when the effect is opposite of what was hoped for. For instance:

- Efforts to improve market access for rural people result in food extraction from and malnutrition in rural areas. (Agri-Profocus does interesting pro-active work on these issues, e.g. with their agrihubs).
- Crop or livestock insurances, if well intended but poorly designed go at the expense of food security, rather than to support food security (box 18).
- Grass- vs. grain based beef, with respectively lower and higher ecological footprint depending on functional units and weighting of effects (John Hermanssen, pers. comm., 2013), This can imply a choice between lean and fat beef, the latter with a higher footprint per unit edible protein (if food security is the goal!), elaborated further on.

Methods to quantify choices on PPP include environmental assessment tools like foot printing and life cycle analysis and social impact assessment tools like livelihoods analysis and gender analysis. Much starts to be known (just as a large knowledge base was built up already on the ecology of livestock keeping in West Africa). From such PPP assessments it has become clear that:

- Dairy, pork, and poultry systems tend to have lower environmental footprints than beef. Dairy tends to have an overall lower footprint than beef. Much starts to be known about this type of comparisons (see among others De Vries & De Boer, 2010; Steinfeld *et al.*, 2006; Gerber *et al.*, 2011; Hermanssen & Kristensen, 2011; Cederberg & Flysjo 2004; Cederberg & Stadig, 2003). For a case from fish farming, a relevant activity with increasing comparative advantage in West Africa, see box 16.
- Industrial systems are often claimed to better assure public health, however, even wet markets pose no great health hazards if properly cleaned. Instead, the latter do assure better and cheaper access of local (even urban) populations to animal products.
- Links between industrial production systems and large food chains imply high transport related costs (transport itself, packaging, cooling, and storage) for the larger value chains. Local and mixed food systems can well have a lower footprint due to lower (transport related), CO₂ emissions and higher use of by-products, while also generating more rural resilience and equity.
- Claims are that low-yielding animals generate more GHG-emissions per unit product than high yielding animals (Gerber *et al.*, 2011). That is true only for a narrow range of very low productions, however, and it tends to ignore other services by those animals, especially relevant in areas with variable climates and lower production potentials per area unit.
- Productive pastoral systems need dry season pastures in flood prone areas of lakes and rivers, now increasingly claimed for irrigation. Irrigation of crops is often assumed to have higher economic output but that is only considering the profit at micro-level. New evidence shows that irrigation schemes can have a negative effect on the regional economy and food security (macro-level aspects) since it tends to ignore the alternative output of rangeland (box 17).
- The footprint of rangeland based lean meat might increase, if it were fattened for instance, dependent on the functional unit (lean or fat meat). The unique 'Bamako filet' would be lost while fattening adds no real meat to the carcass. Moreover, grain based concentrates could probably better be used for pigs, poultry or even dairy. Thus, even setting a taste preference of fattened and/or lean meat has an effect on the footprint with trade-offs between the interests of people, profit, planet, as well as between producers and/or consumers in different value chains.
- Much is known indeed, but also very much depends on the method of measurement, the relative priorities, the functional unit and the context. Indeed much work has to be done on a range of

issues to make these general notions useful for comparison of local system (an issue for funding). For example:

- High water requirements are no problem in wetter regions, but crucial in the case of using (fossil) water from aquifers that are not rapidly replenished.
- In terms of economic measurements there is a need to distinguish between the reasoning of cash-strapped smallholders and more cash-oriented enterprises, between those that use crop-residues or 'whatever is available' and those that primarily adjust the feed to their present target levels of production.
- Notions of animal welfare cannot be extrapolated from one country to another. For example, cattle transport on the hoof by animals that have always walked, can be preferable over cramped transport in trucks (assuming that in both cases enough drinking water is available).

Box 16: Footprint and other environmental aspects of fish-farming.

Depending on the production system, GHG emissions of fish farming as CO₂-equivalent vary between 1.3 and 9 kg/kg fresh fish produced (Kluts *et al.*, 2012). For SO₂ (Acidification Potential) this varies between 6.7 and 35 kg/kg and for energy between 21 and 135 MJ/kg fresh fish produced (Bosma *et al.*, 2011). Average water use for culturing fish is estimated to be 10 m³/kg fish (Verdegem & Bosma, 2009), varying from some 6 (mainly for feed input and evaporation) to > 100 m³/kg (Verdegem & Bosma, unpublished). Part of the differences are due to the production systems: systems using water flow-through to keep water quality good have higher water use than those recycling water, but the latter use more energy.

High density mono-culture pond systems with fish growing only on input of feed, need more refreshment water and more feed per kg fish produced, and have higher pollution rates (nutrient losses), than well-chosen poly-culture systems of multiple fish species and crustaceans exploiting the pond's natural food-web and using nutrients more efficiently (Bosma & Verdegem, 2011). In addition, fish like tilapia and grass carp can handle lower quality feed (such as waste products and grasses). They thus have lower footprints than more demanding carnivorous or fast growing species like salmon and shrimps. This issue is analogous in the case of traditional versus genetically engineered cow breeds.


Box 17: Pastoralism, irrigation, cross-border mobility, and living with uncertainty.

Behnke and Kerven (2013) compared the economic benefits generated by three alternative agricultural systems (in Ethiopia's dry lowlands): pastoral livestock production, irrigated cotton, and sugarcane estates. They state that "despite considerable investment by government in cotton and sugarcane farming, pastoralism is consistently more profitable, while avoiding many of the environmental costs associated with large-scale irrigation projects." Micro-economic benefits for the state are higher in irrigated system. However, overall macro-economic output is larger in case of pastoral livestock production. "As we enter an increasingly climate constrained world, our findings suggest that pastoralism is less risky for long term resilience and economic stability." Note by authors: They could also have mentioned issues such as property and user rights of water, related with distribution of its benefits over society, another issue for policy research as elaborated by Stiglitz (2012).

Another argument to be revised is that pastoralism is an archaic production system. Pastoralist production per hectare can be as high as on modern ranches in semi-arid rangelands of the America's and Australia (Bremen & De Wit, 1983). In addition, pastoralist systems can also be tools in conservation of the fragile ecosystem. They are less risk prone than often thought, as they can exploit scarce resources of which the location is uncertain from year to year. A SWAC / ECOWAS report (2009) demonstrates a political turn: cross-border movement between states and nations of nomadic and transhumant pastoral herds need to be facilitated. SNV advises authorities in border regions in Burkina Faso, Mali and Niger on policies and practices to make this feasible (box 2).

6.2. Trade-offs and counterproductive policies

Decisions on options for aid and trade need to consider the pros and cons (trade-offs) of each specific production system and associated value chain. That is an area of work requiring much more attention. This was already implied in the previous paragraph. It is elaborated here a bit more by using the following examples and by visualisation in figure 17:



	Home & neighbours micro-market	Village & peri-urban community meso-market	City & (inter)national chains macro-market
Market type	micro-market	meso-market	macro-market
Distance producer-consumer	short	medium	large
special packaging	jar, jug...	bottles	plastic etc.
storage	not relevant	up to 1-2 days	> 2 days/weeks
food miles	0 - 5 km	5 - 25 km	> 25 km
hygiene	can be OK	needs to be OK	crucial
community value	high	can be high	not relevant
commodity value	low	higher	high
diversity	high	lower	standard

Figure 17: Distinguishing markets based on scale (micro, meso and macro) in this case applied to dairy. Macro scale markets imply use of more sophisticated resources and higher transport related CO₂ emissions than the meso and micro scale markets.

Scale of farming affects trade-offs between people, profit and planet. The footprint of modern poultry breeds in industrial systems can be relatively low as well as high in comparison to local systems, depending on many factors. Huge variation defies, as yet, clear conclusions. Industrial systems tend to require high quality feed, intensive management, and other specific technologies and resources, among others depending on how and where the feed is grown. The footprint of well-managed local poultry used in semi-commercial systems or even backyard farms can be considerably lower. If indeed well managed and if using local left-over feeds they show a fair production level on medium quality feeds and less intensive management and resource uses. Backyard and semi-commercial systems may even play a locally positive role by cleaning waste, turning it into valuable produce. Controversy prevails, depending on the system chosen and arguments on 'average' small or large production systems mislead rather than being useful. Local animals do, however, play a positive role in rural livelihoods. Industrial systems can even have negative impacts on rural livelihoods by extracting value (money, nutrients) from the countryside.

Scale and nature of markets and their production systems affect trade-offs between PPP (fig.17). Marketing systems operating at micro and meso level tend to have lower footprint and less social inequalities, compared to markets at macro levels. Markets at macro level depend on processing and transport (using energy and emitting GHG) bringing about issues of resource distribution (local food security, rural vitality and so on). Support for large scale markets to assure food security (in cities) may thus have negative results (in rural areas). That is a case of counterproductive policies if food security in rural areas is an objective. The point of smaller versus larger markets is also reflected in arguments of the next chapter on (de)centralised abattoirs box 19). In addition, larger scale and more commercial enterprises tend to depend on longer value chains (thus on more sophisticated resources). In essence, local production for local food supply tends to differ from production of more cash and export-oriented commodities. Last but not least, arguments about markets in general terms tend to miss the point, if assuming that small and large produce the same commodity.

Scale and degree of interaction between animal and crop systems also affect footprint and distribution of resources. Traditionally, cattle keepers in agro-pastoral zones graze harvested croplands of crop farmers, an integration between animals and crops typified as 'living apart together' by Slingerland (2001). Direct and localised mutual benefits are the result: animal keepers get feed (crop residues) and crop farmers get fertiliser (manure and urine). No transport related costs are involved and the linkage covers a small distance. Growth of urban areas, associated with centralisation of rice-milling and oil seed pressing can cause that access to by-products like cotton seed cakes and rice bran is easier around cities than in rural areas. In fact, in West Africa some of the economics of scale in centralised milling were based on subsidies in the form of tax holidays, using public money to enhance large scale trade, leading to accumulation of income and of nutrients in (peri-urban) areas. Taken together this implies that the economics of larger scale tend to be associated with excreta accumulation (pollution) in urban fringes rather than direct return to the fields, In addition, added value

for crop residues ends up in and around cities, drawing resources and potential income from rural areas, while causing higher transport (related) CO₂-emissions.

More examples exist where the effects of underlying drivers and resulting trade-offs are ignored. Two last cases refer to

- Drilling of water holes and crop and livestock insurances. Many failures in these fields stem from inadequate understanding of drivers that shape the production system and the value chain. Thus, to sum it up, well-intended programs may have reverse effects, a phenomena generally called counterproductive policies. For example, the effects of droughts in the 1970ies led to programs to drill water holes, resulting in more rather than less overgrazing around the water holes.
- Efforts aimed at greater food safety, e.g. via pasteurisation and certification may make the milk too expensive and out of reach for poorer classes. It also shifts added value from small business into the hands of larger businesses are likely to give farmers the wrong incentives and can threaten food security (box).
- Accumulation of resources is, sometimes funded by public money, e.g. based on (hidden) subsidies in the form of tax-concessions. Some urban businesses indeed lost their advantage when tax holidays expired, e.g. rice and cotton mills in Mali and Burkina Faso became decentralised again after tax-holidays expired. The smaller units also have fewer contracts for export of cotton seedcake and thus such feeds become better available for local livestock keepers if systems remain decentralised. This shows again that trade is no guarantee for food security.

Box 18: Insurances can threaten food security.

Some livestock and crop insurance programs can have disappointing results (Gardner & Kramer, 1986). Ill designed Insurance programs make that the incentive for farmers shifts from efficient production to rent seeking (Roumasset, 2007; Chambers & Quiggin, 2002). Such insurance programs do not promote, but threaten food security. One may wonder why NGOs have assisted insurance companies in promoting crop and livestock insurance in Africa and Asia. Insurance companies hoped to benefit from aid money just as they benefitted from US government subsidies for crop insurance in the US. Fortunately, new schemes now pay average damage, thus still giving individual farmers an incentive for higher production. Such subsidy in the US is maintained, often not for economic reasons but for partly political reasons (generation of votes). Perhaps some venture capital joins the lobby because they are interested in a new rent market using NGOs as a vehicle. At present one of their best money makers are the micro-credits in least developed countries of which the promotion started and managed by NGOs paying for most of the operation cost. Farmers can use more cost efficient ways leading to financial sustainability and food security in a risky environment: soil improvement, diversification, limiting herd size, cooperative saving and trading, value chain development. For inclusive development and sustainable food security, support by aid and trade should focus on these issues.

7. Aid and trade - approaches for the future

Four major livestock production systems have been identified:

- pastoral systems,
- mixed crop livestock systems, increasingly integrated on-farm,
- more intensive systems (dairy, industrial poultry and pigs), and
- backyard animals (crucial for food security of weaker sections in society).

Across these four production systems this quickscan identified a great difference in scale, from household and community oriented to urban and (inter)national, here called micro, meso, and macro (fig.17). The micro scale involves little trade but is of great and often underestimated importance for food security. The macro-market depends entirely on trade and it may, in some cases, have unexpected negative effects on local food security.

This chapter combines similarities and differences between countries and zones into a general diagram with trade-offs especially between the micro and the macro scale of value chains. Based on that it sketches some preliminary choices for public and private policy. This is followed by a sketch of current and possibly future activities by (Dutch) aid and trade in West Africa. Special attention there is given to work that leads into the future rather than to business as usual. The central point in this chapter is the choice of technology and its effect on food security with other aspects of PPP for rural and urban societies. A case study on hides, skins and lean beef, relevant to semi-arid zones of West Africa (box 19) is expanded into a generalised discussion of such options and trade-offs. The arguments are perhaps immature, but their main aim is to trigger discussion beyond face-value recommendations, i.e. to find appropriate approaches for the future rather than to focus on traditional core business approaches.

Box 19: Hides and skins, unique *Bamako* filet, and decentralised abattoirs.

Comparative advantages for different forms of livestock production differ between zones. They are not static. Change is rule rather than exception, both in production and consumption. Thus comparative advantages and the associated challenges and opportunities are prone to change. For example, semi-arid regions have comparative advantages in terms of producing lean meat, hides, and skins. These comparative advantages remain, even if meat replacers, other products, and/or a change in consumer taste may alter current consumption patterns. Different improvements of local beef production systems and chains exist, also depending on whether one refers to the beef, or the skin or the organisation of the processing.

The main comparative advantage of semi-arid zones in West Africa was and will probably be lean meat of what we here call the *Bamako*-filet quality. Quantities produced of lean meat may change indeed, but the point is that the type of beef produced here is well suited to both local ecologies and consumers' preferences. Similarly, the poulet bicyclette (or farm chicken) can also continue to have its own niche for local and even (peri) urban food security if not pushed out by commercial broilers and if not too much neglected by research programs with a singular focus on industrial systems. Production of fat beef from beef-lots in other places of the world tends to have a higher footprint in terms of grain used per kilogram of meat produced. That fat type of beef may have to re-assess its quality definition, however, among others due to concerns on food security and climate change, before the *Bamako*-filet would have to change its own unique quality definition. Working on maintaining and/or improving the identity of *Bamako*-filet is thus as relevant as simply converting it via fattening into a conventional, face-value international quality standard with doubtful ecological value. Improvements in the value chain for hides and skins could perhaps focus more on quality according to international standards. Much of the leather is exported to global markets and much quality can be gained by improved handling in the value chain.

On the contrary, the emphasis of improvements in the meat chain could be on maintaining or increasing the share of added value to producers and their communities. Decentralised slaughterhouses can play a role in keeping value in the region by exporting, if necessary, chilled meat (with lower footprint than frozen meat) and by catering to improved local wet markets that have a still lower footprint and that better serve food security in the region, apart from food security in urban areas outside the region.

7.1. Trade-offs and choices for aid and trade

Choice of technology depends on the location and goals of intended programs. That is the reason to distinguish between different production systems and to attempt a segmentation of the value chains according to scale and nature of operation. However, choice of technology also determines the shape and function of the production system and value chain. Figure 18 summarises the relation between choice of technology and scale/type of value chain in relation to long versus shorter chains on characteristics of the communities involved. The decisions in figure 18 contrast a series of approaches and issues in terms of PPP with their suitability as per scale of farming and value chain. Both aid and trade have effect on local and higher levels, but their scope and choices on how to develop the chain can differ.

Moreover, choices for aid and trade need to consider the future, and not remain stuck in the past. In case of aid, it implies that NGOs and policy makers have to avoid a mind-set that thinks mainly in terms of preserving pastoralism and poor countries. For trade it implies that entrepreneurs have to seek novel solutions to local problems, avoiding mainstream solutions and technologies without considering issues of the triple bottom line and ignoring opportunities just around the corner. This second point is elaborated later in this chapter, constituting the last argument of this report.

Lastly, food security for wealthier urban areas consumer (voters) differs substantially from food security in rural areas. The two may even be at odds with each other. Many intermediate forms of food security exist. Trade-offs are especially obvious when choosing for smaller or larger markets. Trade can increase the total added value for the chain. Still, large and long chains can imply that a large proportion of that added value tends to end up in urban rather than rural areas, shown in the first two bars of figure 18. Actually, milk and meat collection can also result in higher extraction rather than production. Trade does indeed not always serve food security in rural areas, as in Europe during the Irish potato famine, some 150 years ago, where starved Irish emigrated on ships from the same port as where grain was shipped from to England (Sen, 1981). The other bars in figure 18 represent choices for development approaches in terms of the triple bottom line, all deserving more reflection and study.

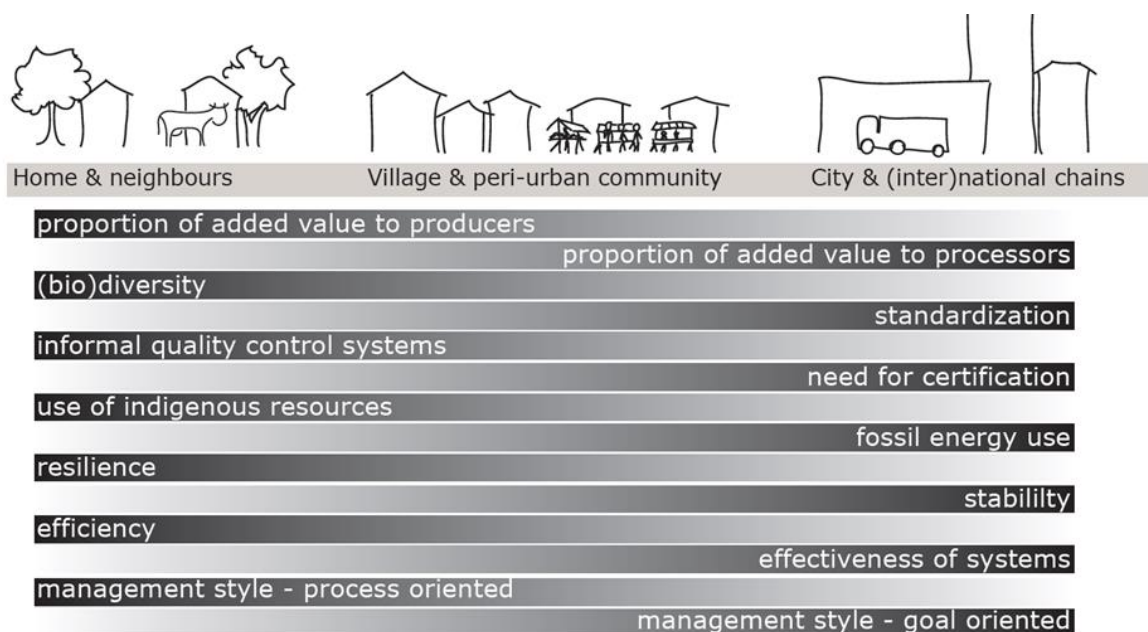


Figure 18: A sketch of trade-offs between aspects of, among others, the triple bottom line (development goals) on the way from local to global scale. Intensity of shading reflects effects of selected approach.

NB: the bottom two bars reflect the contrast between the process oriented pastoral, basically flexible innovative approach and the focus on core-business (Brouwer & Peters, 2011).



Figure 19. A sketch of technologies/interventions/action on the scale of aid to trade, based on the diagram regarding trade-offs in figure 18.

7.2. Technologies and mind-sets for aid and trade

Many inventories can be made of technologies to be used in aid and trade. One way to list and categorize these technologies is to arrange them according to categories inputs & services (feed, breed, seed, skills, etc.); management approaches (arranging and combining resources on farm or in a value chain); and outputs (milk, meat, eggs, income, satisfaction, employment, effect on long term sustainability). Another way, as used in figure 19, is to classify technologies in terms of chain development (profit and people), production systems (profits), import and export (profit) and others (people and planet). One point is that there is no lack of technologies that could be considered for use in West Africa.

At the end of this report we thus take a closer look at a rather random number of technologies arranged according to their role in aspects of people, planet, and profit (figure 19**figure**). The bottom line was indeed that choice of technology affects farmers and society, a crucial point. Choice of technology also determines the long term effects on producers, their communities and societies. A typical, but also controversial and perhaps small, case of technology for poorer sections of societies is the choice for thermostable vaccines, rather than a choice to develop sophisticated vaccines that need the better controlled conditions of large chains (box 20). It aims to show that policy of public and private sector can make creative choices in terms of PPP, much more than what is commonly done along the line of face value intervention. Better cases can perhaps be formulated (figure 11 and **box 16**), but this quickscan only intends to identify principles of the discussion.

Box 20: Thermostable vaccines (TSV), and choice of technology for rural food security.

Many smallholders live in rural areas with limited access to vaccines, as refrigerators are not well available. Using thermostable vaccines for major livestock diseases, like NCD in poultry, could solve this problem. Thermostability is a relative characteristic. Most vaccines need to be transported at 2-8°C, but vaccines can be selected for thermostability, making it possible to store them at room temperature for some time (Chen & Kristensen, 2009). For many years, the Australian Centre for International Agricultural Research (ACIAR) and the FAO have collaborated with governments, NGOs and universities to develop TSVs against NCD (FAO, 2001). At first, ACIAR developed a heat-resistant vaccine (HRV4) that could be applied by coating the chicken feed; however, the degree of protection depended on the type of feed carrier used. The initial adoption by pilot communities in Malaysia was successful, but uptake outside Australia and Malaysia was limited because of the high cost and problems with transporting and storing the vaccine-coated grain. Further study developed the I₂ avirulent heatstable NCD vaccine. Using eye-drop application by farmers this vaccine was successfully tested in among others Ghana (Awuni *et al.*, 2008; IAEA, 2006). I₂ is produced in several countries.

The development of an effective TSV against NCD illustrates choices faced by governments, development agencies and pharmaceutical companies in reaching out to poor farmers, so as to effectively ensure improved food security in rural areas. The cost of the initial vaccine put it beyond the reach of the poorest members of the group it was intended for, so additional support and aid was required to ensure that the most needy benefit from the technical development. Farmer health care for poultry is predominantly based on plant-based traditional remedies (Moreki, 2013). For other diseases, scientific investigations, as well as aid and trade initiatives, should give more attention to effectiveness and use of medicinal plants that are already available in remote areas. As an important note, companies may use such initial programs on important diseases to get foothold in rural areas or to compensate for lack of local sourcing, perhaps as a self-enlightened form of CSR. Examples of such actions are known from elsewhere.

7.3. More of the same versus fresh approaches

Part of aid and trade technologies essentially build on previous, face-value approaches, i.e. on more of the same. However, encouraging cases of innovative approaches are known too. Some of them may need further work but this study chose to highlight a few of such innovative approaches as encouraging examples. Here we draw special attention to two of such changed approaches:

- The Dutch cattle breeding society CRV shifted from a single focus on their highly valued Holstein-Frisian breed to offering a range of breeds, even including Gir and Nellore Zebu types (figure 20) Such an approach stands in sharp contrast with that of another cow-exporter who pushed sales of Holstein-Frisians exclusively, as argued by its representative “for lack of alternative”.
- The use of cooling technologies adapted to local conditions and therefore local markets, involved small scale ice-cooling for fish (Vink Koeltechniek) or solar-power for cooling of milk (Mueller) (figure 21). Much remains to be done, but it is a start, and notably the involvement of Vink Koeltechniek in Somalia helped conserve surplus fish catches, thus improving local food security.



Figure 20: Dutch cattle breeding: from Us Mem to Sunny Boy to a Girolande dairy cow.



Figure 21: Solar panel milk cooler and a container size milk factory, produced in the Netherlands for a farmer cooperation in Kenya.

Several (Dutch) companies, persons and NGOs are currently active, based on a tradition of innovation in the Netherlands. That experience and attitude may be useful in the design of creative approaches for aid and trade for West Africa or elsewhere (Box 21). Not everyone needs help but several instruments for cooperation with West Africa are further available. Many of the parties, however, do not seem to be well aware of each other's work and more intensive exchange might be useful. The key areas of Dutch expertise and the changing international engagement are given in appendices II and III.

Box 21: Some novel approaches that Dutch livestock sector actors managed to provide.

- Different milk-replacers for calf rearing, suited to local needs
- Pre-mixes for local feed mixing
- Decentralised certification systems
- Work on agrihubs, meetings of local players in the chain
- Generation of local knowledge and skills
- Cold chains in several forms
- Dairy products and inputs for milk production, collection and processing, from rennet to stainless steel
- Processing of animal products
- Animal health approaches and veterinary medicines through local pharmacies or representatives
- Shift from heavy reliance on antibiotics to increasingly antibiotic-free animal production
- Novel farming systems such as conservation farming, organic farming or urban farming
- Scenario studies on plants, livestock, societies and the like
- Design of novel and animal friendly housing and housing with elaborate climate control
- Reduction of fertiliser use for dairy pastures, while maintaining or increasing production
- Skills and institution building
- Novel fish farming and reproduction methods
- Sales of feed (ingredients) through direct sales, representatives, and partnerships

8. Conclusions and recommendations

Livestock production systems and value chains are so varied and changing that one can hardly imagine that not more useful linkages would be possible than what is realised today. Over the past several decades Dutch aid played a significant role by building experience in West Africa. Under changing relationships, the priorities may differ from the past. Major farming systems, value chains and their niches each require their own approach about which much is known, perhaps in need of greater review. Major policy choices exist especially due to trade-offs between focus on smaller and more local markets versus those at more urban and (inter)national markets. A major clue for successful involvement might lay in creative approaches for survival rather than rigid focus on core business. That attitude of creative survival might well be a useful reflection of what traditional livestock people in the West African countries have practiced for many centuries and what made them survive in an ever changing environment.

This quickscan was done to provide suggestions on policy and business in aid and trade for improved West African livestock production. An underlying concern is the need for both aid and trade to contribute to food security. The emphasis on livestock for food security is due to increasing demand for animal products by consumers in growing cities, and the fact that local potential for production of foods from animals seems underexploited.

Overall, the first set of conclusions is that livestock indeed continues to play an important role in sustainable agriculture of West Africa. In addition, much is known on livestock systems in this part of the world, also from previous (Dutch) aid and trade involvement. Those experiences deserve further review and update, beyond the scope of this quickscan. Still, data on agriculture are very poor, often using old survey results and development plans, without much updating. Statistics also tend to ignore certain information, e.g. on importance of the informal sector and on roles of unconventional animals or farming systems. Moreover, major differences exist in development paradigms. There is, above all, a need to revise the notion that trade positively improves food security, since the opposite can also be true. Food security needs to be specified, e.g. in terms of level (local, national or beyond) or type of product (basic staple foods versus added value products). Lastly, discussions on the need for open borders are too ambiguous to be useful. On one hand there is a stress that ECOWAS should strive to reduce so-called illegal taxes and border controls. On the other hand there are reports that insufficient control of borders leads to food security problems on the poorer side of a border, caused by higher demand from wealthier markets on the other side.

In spite of uncertain data and differences in paradigms there is no doubt that many drivers can be identified that together shape livestock production systems. Knowledge on such drivers like climate, soils, social and economic factors can serve as levers to enhance food security. Effective action requires understanding of these drivers for change in livestock systems and their associated supply chains. Trade-offs occur, e.g. where increased trade at higher levels can decrease more local food security, especially where trade implies greater geographic scale of the value chains. Higher economic efficiency and narrower or more rigid production goals can also ruin rather than increase system productivity, especially in regions with adverse and uncertain climates or politics. For example, economics of irrigation schemes for crops need to consider lost opportunities for livestock keeping (and vice versa).

Much is possible for aid and trade in West African livestock development. Success requires, however, understanding of local drivers and conditions. Failure of development projects is also known, often due to use of technologies in wrong places or processes. The term technology in this report is used in a broad sense, and much depends on proper distinction between production systems and segmentation of value chains. Sometimes more can be achieved with socio-economic intervention than by introduction of machines and inputs.

The main production systems are a) pastoral systems, b) mixed crop livestock systems (increasingly integrated on-farm, c) more intensive systems (dairy, industrial poultry and pigs) and d) backyard animals (crucial for food security of weaker sections in society). These production systems offer potential for fairly straightforward, face-value, application of production technologies, if suited to local conditions. Segmentation of value chains refers mainly to (geographical) scale of operation, from local

(micro- and meso-) to international (macro-scale). Focus on either one of these implies trade-offs in terms of resource allocation, rural development and scale of food-security.

Attention to traditional or mainstream trends and segmentation criteria may miss important other processes, suggesting wrong approaches, causing missed opportunities or adverse action. In West Africa, for example, there is a growing need for on-farm integration of crops and livestock production, as an option with opportunities to ensure soil fertility where animals are secondary rather than first to cropping. Alongside, however, there continue to be opportunities for successful adaptation of traditionally pastoral systems into the new ecologies and economies. The in this report oft quoted neglect for the informal sector and unconventional animals may be another missed opportunity. A last example is the process of *Vergetreidung* that remains hidden by mainstream attention to increasing demand for livestock products by wealthier sections of society. That would lead to uneven focus on animal products for food-security, ignoring that especially poorer sections may increasingly depend on products from plant origin, also an opportunity for aid and trade.

A second set of more detailed conclusions and recommendations is presented here in five categories:

West African livestock context

- Many differences exist between production systems, from the arid north to the humid south of West Africa. This demands segmentation and alertness for niche production that varies with regards to soils, climate, distance to markets, Francophone versus Anglophone traditions, and (changing) local values.
- Many similarities exist, mainly from east to west along isohyets and around cities. Thus, experience from one country can be used in other places; agro-ecological zone approaches are perhaps more useful to identify opportunities than country-wide ones.
- Climate and ecological conditions restrict the quality of animal feed; together with diseases and low husbandry management this severely limits the output of livestock.
- Oversized herds and overgrazing after a long period without major droughts, and subsequent droughts in the last three decades of the twentieth century forced many pastoralists to move south and to adopt a more mixed agro-pastoral system.
- Increased competition between herders and croppers, and increased cattle ownership by crop farmers imply that improvement of crop production may be an effective indirect way to maintain and increase output from the livestock sector.
- Existing production systems like pastoralism, mixed crop-livestock farming, and backyard rearing are subject to change, but they also have good reason (to continue) to exist. Well-managed pastoralism, for example is efficient in protecting the sahelian ecosystem, using existing skills. However, changes in political setting, population pressure, and climate make it imperative that either system management is adapted, or that new systems are developed.
- Fish farming is taking off in West Africa and offers opportunities where water and markets unite. Ghana and Nigeria, in particular, have an aquatic resource potential for fish farming. To allow farmers to compete with imports from China, Ghana adjusted its import tariffs for fish feed and Nigeria is likely to follow.
- Trade is hampered by weak road infrastructure, high (illegal) transaction costs, weak legal conventions between the states, and law enforcement. ECOWAS aims to change all this but its impact so far is rather meagre. Much informal trade occurs where formal trade finds it hard to function.
- Value-laden terms like illegal taxes and open borders need to be taken with a grain of salt to better understand local problems and opportunities. Depending on the context one report may claim that borders need to be more open to make sure that trade will ensure better food-security, while another might claim that borders are so transparent that stronger demand from the other side of the border may affect local food security due to smuggling of food

Main animal production sectors

- In the West African climate, dairy cows without climate control dairy cows can hardly produce more than 6-10 kg/day (average over lactation), even under good farm management. Sophisticated methods to overcome adverse effects of climate will not contribute to sustainable food security.
- Cows with high genetic potential from temperate countries and long food-chains rooted in large commercial farms owned by large companies are unlikely to assure sustainable local food security.
- Cross-breeds and improved local dairy breeds are effectively shown to have good potential in the less humid zones if well-fed and well-managed.
- Seeking ways to keep cottonseed cake and products from other oilseeds or grain milling available for local feeding of ruminants, combined with good breeding and selection programs, will make a difference for local food security. Export of such by-products to other areas, or even to outside West Africa, would be a typical case where trade has a negative effect on local food security and poverty reduction.
- Centralised processing facilities may make economic sense, but they increase extraction of local resources, in grain milling as well as slaughtering or meat processing facilities. In some cases they have been supported by government subsidies and collapsed after the subsidy was withdrawn, showing also the dis-economies of such centralisation. More work on (dis-)economies of scale is urgent.
- Feed-mills often focus on complete feeds, extracting resources from production areas. Marketing of good supplements (premixes) for local rations with grains and other feedstuffs produced on-farm would boost the livestock production and keep added value in the communities.
- Trypano-tolerant breeds of the humid zones are typically more beef breeds, unless crossed with exotic breeds, e.g. with Jersey in Ivory Coast.
- Marketing lean beef, typical of West Africa, provides a forward vision on livestock development as opposed to copying approaches like fattening feedlots from other regions of the world, like fattening feedlots.
- Fattening of (lean) beef cattle may be economically attractive in some cases, but it does not contribute to food security and is ecologically questionable. Pigs and poultry may provide an ecologically and socially better way than beef cattle to use grains and by-products like bran and oilseed cakes.
- Ecologically speaking the choice for salmon and crustaceans such as shrimp can resemble the introduction of high yielding cows from temperate countries, since both require more care and scarce resources than (more locally adapted) catfish, tilapia, or crossbred cows.
- Much is now known on measuring aspects of PPP (e.g. environmental impact assessments, life cycle analysis). Priorities and interpretation of such work depends, however, on local conditions and more work in this area is recommended.

Challenges and recommendations for further research

- Much is known from previous work from (Dutch) aid and trade, information that deserves to be reviewed and used today, e.g. on aspects like advantages and limitations of pastoralism, use of crossbreeding, and use of rangelands, often with emphasis on organisation rather than on technology.
- Many technologies and management approaches have the potential to be introduced into the changing livestock scene of West Africa, especially in highly variable niche markets. More work on modification of these interventions is necessary, however, to better suit local conditions and technologies, a challenge for the parties trying to export their goods to West Africa.
- Technologies can be grouped according to suitability for (inter)national and local food chains, with implications for food security and involvement of aid or trade, or in newer jargon public or private.
- Technologies and skills aimed at supplying distant supermarket chains and beyond West Africa are unlikely to add value to the rural areas and unlikely to support food security. More work on this aspect of technology choices is recommended.

- Maintaining soil fertility and soil organic matter of cropland areas is a huge challenge for West African food security, worthy of continued support. In mixed agro-pastoral systems farmers can use the manure from livestock but alternatives such as composting and green manuring need more attention.
- Further study of the scenarios for aid and trade will help to assess trade-offs between food production, processing, and distribution in long chains.
- More work is needed to find a new balance with new global trade partners (e.g. Brazil, China, and South Africa) and with the rapid changes affecting animal production, e.g. shifting trade flows, new consumption patterns, growing awareness of people or the need to better handle soil quality.
- Livestock production in West Africa is affected by activities of, and policies favouring, new large farmers, and by a shifting emphasis from aid to trade. The effect of all this on local food security deserves more study.
- The growing proportion of youth on the one hand provides a pool of cheap labour, and on the other hand creative labour forces using ICT and other technologies. The first can become a threat when not utilised (i.e. when they can't find paid work), the second is an opportunity to create (self-)employment through appropriate policies and support mechanisms.

Opportunities

- Small animals, like goat, sheep, backyard poultry, and grass cutters, provide capital for small and daily expenses for both pastoral and crop farm households, more so in the humid south, and are an underrated resource for food security of poorer households.
- Comparative advantages (and their change) imply that it can be questionable to strive for self-reliance, especially for products like milk, certain fish species, and other products in which West Africa has no real comparative advantage. Calls for increased local sourcing could be an opportunity to shift to sectors with better comparative advantages.
- The call for local sourcing is just one symptom of changing contexts, which are further characterised by growing awareness and capacities of local agents.
- Much is to gain from reduction of diseases, developing and using low cost medicines and approaches like village veterinary workers - not the least for the livelihood and food security of resource poor farmers.
- Taking food production chains as averages tends to hide niche opportunities and to falsely lead to notions of competition. Segmentation of markets and production chains is the key word here. One example is that co-existing rather than competing markets exist where small scale informal dairy chains cater to local demand for fresh milk. Another example is where notions of one single meat chain hide possibilities for decentralised slaughtering (with airlift of chilled meat). In fact, wet markets may actually better supply local markets and assure food security than large chains, emitting less transport related CO₂ and leaving more added value in West Africa.
- Variation and changing conditions are a challenge, but alertness for niche approaches can imply many opportunities for aid and trade if players take flexible approaches. This is an extra opportunity for small and medium enterprises.
- Long term opportunities include in-depth investments to get involved in local networks and resource flows; examples include local sourcing, alternative cooling chains, and decentralised processing facilities.
- Interesting work on aid for local and regional marketing is implemented by NGOs like Agri-ProFocus and Agriterra - to better identify local needs and to bridge the gap between too much trade and too little aid with regards to food security.
- Many (Dutch) agencies and instruments for (livestock) developments exist, often not aware of each other's activities and deserving some coordinating efforts. The (larger) private sector is present in West Africa but especially small and medium enterprises might benefit from some coordination in utilisation of instruments of NL Agency, PUM, FDOV, NWO-WOTRO and the like.
- Short term opportunities lie in supply of critical inputs, such as knowledge, premixes, cooling-equipment, and milk replacers, provided the emphasis is on robust and decentralised approaches rather than sophisticated ones.

Policy choices and trade-offs

- Food security can benefit from increased trade, but trade is no guarantee for food security. Experiences to the contrary suggest caution with a general belief in win-win between food security and trade. A good review on positive effects of trade for local food security via larger scale trade is overdue.
- More work is also recommended on trade-offs between development of large scale farms with long value chains on resilience of rural areas, between long value chains and the need and possibilities to reduce GHG emissions, and between the need to ensure distribution of added value over producers and processors. A typical trade-off for West Africa is that fattening of animals with lean meat as used in the *Bamako-filet* can lead to a market with, perhaps, more added value but with loss of traditional quality against higher environmental impact and less meat for the poorer sections of society.
- Livestock and crop insurances are meant to provide a safety net for producers, but may provide a negative incentive if wrongly conceived. Promising ways to improve these systems seems to be on the way, but require more attention.

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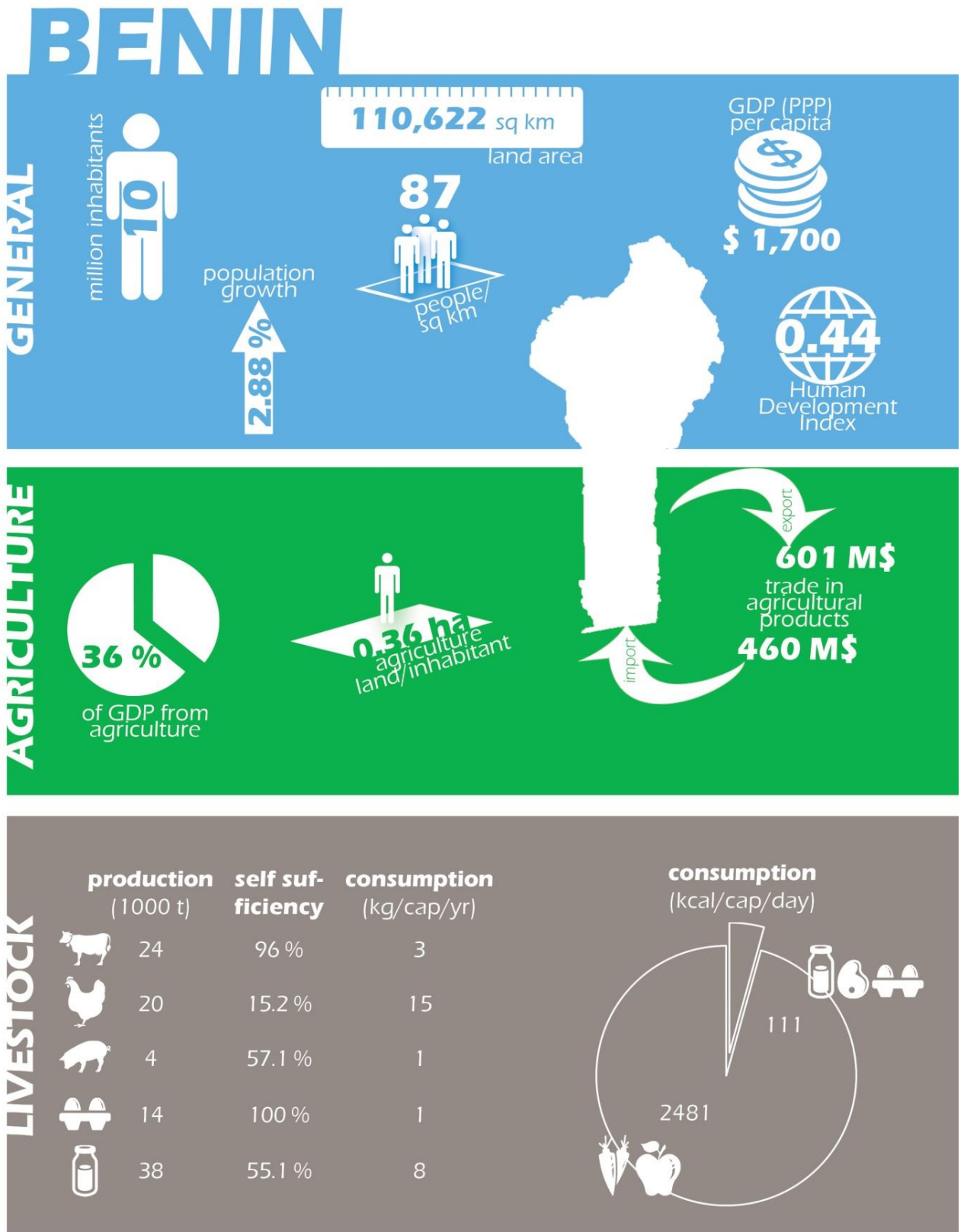
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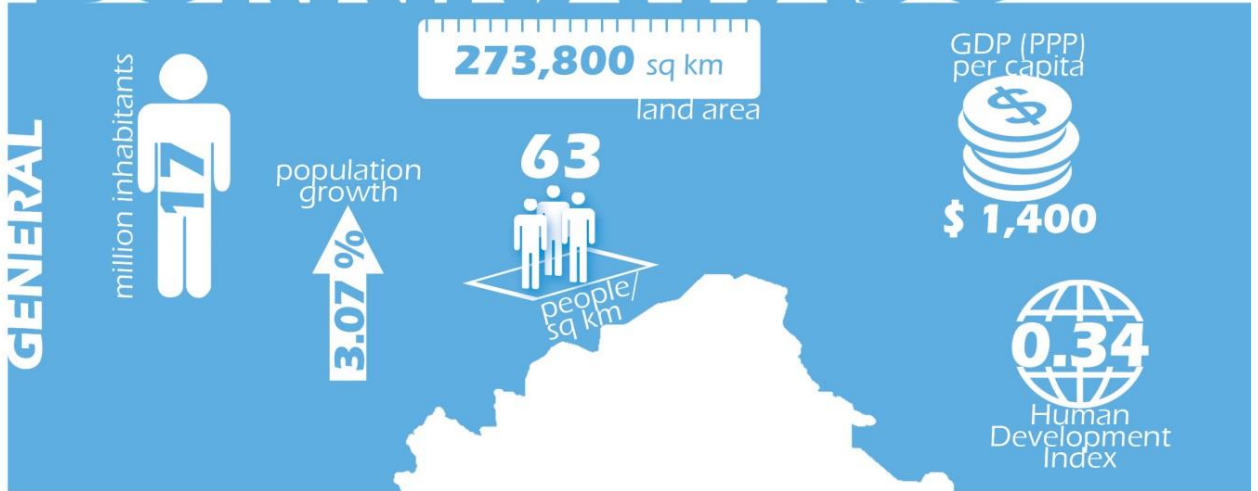
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APPENDICES

Appendix I: Infographics of agriculture related statistics per country



BURKINA FASO



GHANA

GENERAL

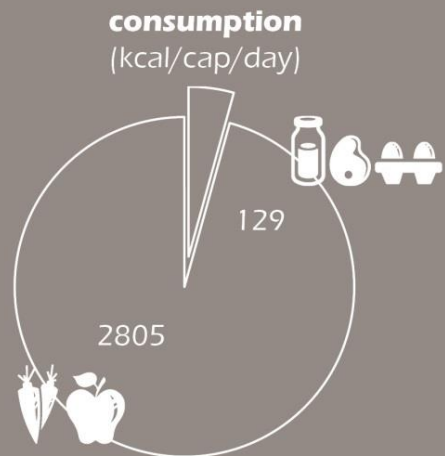


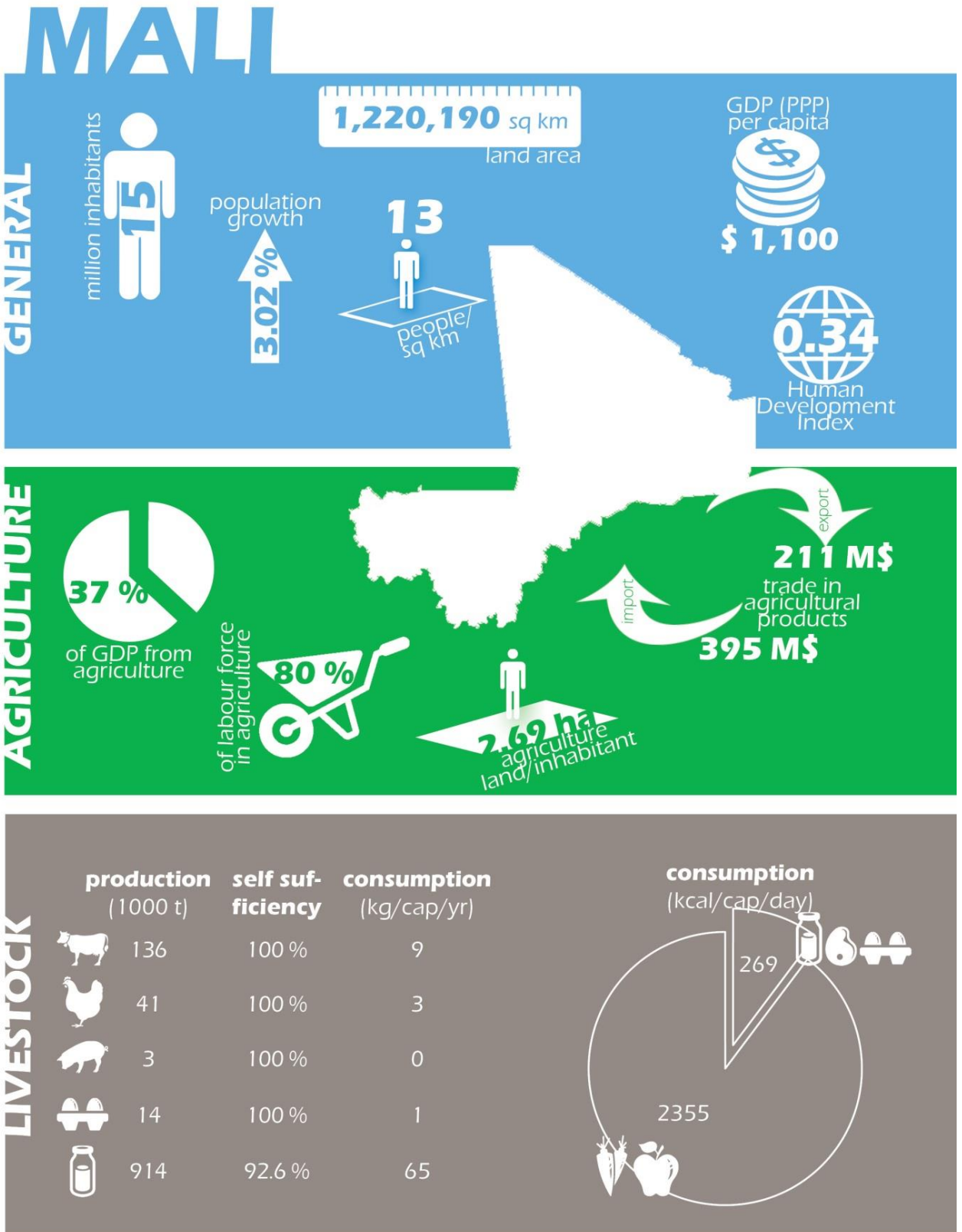
AGRICULTURE



LIVESTOCK

	production (1000 t)	self suf- ficiency	consumption (kg/cap/yr)
	26	74.3 %	1
	48	37.2 %	5
	18	72 %	1
	37	100 %	1
	38	27 %	6





NIGERIA

GENERAL

million inhabitants
170

population growth
2.55%

910,768 sq km

land area

187
people/
sq km

GDP (PPP)
per capita

\$ 2,700

0.47

Human
Development
Index

AGRICULTURE

31%
of GDP from
agriculture

of labour force
in agriculture






70%

0.45 ha
agriculture
land/
inhabitant

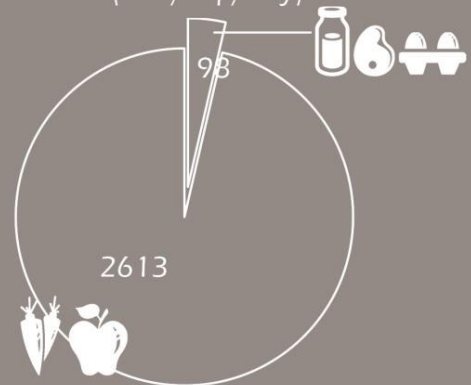
1,164 M\$
trade in
agricultural
products

5,637 M\$

LIVESTOCK

	production (1000 t)	self suf- ficiency	consumption (kg/cap/yr)
	298	99.7 %	2
	257	99.6 %	2
	226	100 %	2
	613	100 %	4
	483	35.3 %	8

consumption
(kcal/cap/day)



Appendix II: A quick look at the Netherlands

Source: van der Lee et al., 2013

The changing context of international engagement

- The Netherlands government, through its Top Sector Policy, stimulates the so called Golden Triangle to remain competitive in the international environment: The public-private cooperation of government, private sector and knowledge institutions focuses on innovation in the Agro Food Sector. Joint efforts of government, private sector and knowledge institutions are expected to result in better positioning of the Dutch agri-livestock business and sector in third countries. Collaboration with the development cooperation sector is growing, especially in developing countries (Golden Pyramid).
- The Netherlands government is a key contributor to the intergovernmental Livestock Dialogue and the group within the Global Research Alliance that focuses on nutrient cycles and efficient manure management. This will translate in pilot projects in Vietnam and Kenya, and in a number of PPPs on this subject. Several collaboration initiatives support biogas installations with smallholder farmers (SNV and HIVOS - African Biogas Partnership Program; Asia Biogas program in Vietnam/Indonesia).
- Food security, and hence agriculture and agribusiness, is one of the focus areas in Netherlands Development Cooperation. This is expected to remain so over the next decade.
- The role of private sector in development cooperation is becoming more prominent. Dutch agri-business, knowledge institutions, and public-private partnerships are expected to increase overseas investments, technical assistance, and trade. This will require new ways to address pre-competitive institutional issues in the livestock sector of partner countries.
- A wide variety of government instruments is (or used to be?) available to support Dutch companies to engage in international trade and investments: trade missions, fairs, public-private partnerships, feasibility studies on livestock-related topics, and investment co-financing.
- Dutch public opinion on intensive livestock production and its side effects is challenging the sector to come up with sustainable solutions and systems changes. The sector (private companies, farmer and industry associations, knowledge institutes, and government agencies) already has produced many sustainable solutions, related to resource efficiency, environmental, animal welfare and food safety issues. These may also be put to good use in the international context.
- However, when operating abroad, Dutch companies have to take into account that negative publicity can influence general public opinion. Where public sentiment and overseas investments interact, the latter can easily be influenced by Dutch public opinion, as the recent public debates on “export of mega-farms to Eastern Europe” and “pollution with horse meat” illustrate.
- A significant number of Dutch SMEs with innovations in the agricultural sector are not active at international level and should be stimulated to participate and position themselves internationally.
- Government budgets for development cooperation and other government subsidies for international engagement are likely to decrease over the next decade. The remaining subsidies are likely to be monitored and evaluated well on their effectiveness and side effects.

Key areas of Dutch expertise

- The Netherlands has extensive experience and knowledge on intensive livestock systems. This ranges from land use to feeding and from breeding to product quality. This expertise has resulted in systems with a high resource efficiency and low emissions to the environment on family farms with a medium scale of production. Many of this expertise is primarily resting with farmers and private companies. Others, like the control of infectious animal diseases, rests more with public agencies.
- The Netherlands has much experience with and knowledge of organising efficient food chains (from feed to fork) with integrated and holistic approaches regarding quality control and reaching efficiency in the chain.
- The Netherlands has well developed large scale input (feed, genetics) and processing industries (dairy, meat) with much international experience. Quite a number of these companies have investments in countries outside the EU. Many Small and Medium-scale

Enterprises (SMEs) offer special equipment and/or services, but only few have significant experience in countries outside the EU.

- Domestically, the Dutch livestock production sector has limited growth potential. Some growth is expected in the dairy sector due to abolition of the quota system; other production sectors may decrease in size. The market for large scale companies and SMEs increasingly will be outside the Netherlands and even outside Europe. Large internationally operating companies, gradually replace Dutch staff by foreign staff, who know the local context.
- Meanwhile, and in spite of its achievements in terms of productivity and product quality, the Dutch livestock sector continues to struggle with a number of issues, especially around the social acceptance of livestock production in the Netherlands; other persistent issues affecting livestock production include manure overload, animal disease outbreaks, and resistance to antibiotics. Experience and expertise that is developed by private and public sector players to solve these issues can be used in an international context as well. On the other hand, the actors in the Netherlands could also learn from experiences and expertise in a number of countries with livestock hotspots.

Appendix III: Agencies, private groups and NGOs involved in Western Africa

AgriCord

www.agricord.org

AgriCord is a global network of agri-agencies, non-governmental organisations for development cooperation with structural links to the farmers' and rural members' organisations in their home countries. Agri-agencies are mandated by the farmers' and rural people's organisations in their own country. Their mission is to strengthen the organisations that represent and defend family farmers in developing countries. AgriCord is composed of 9 agri-agencies (in France, the Netherlands, Belgium, Canada, France, Sweden, Asia and Senegal) and 4 associated members (in Finland, Italy, Spain and Germany)

Agri-agencies share a history (rooted within farmers' and rural people's organisations), values (professional solidarity, mutualism, sustainable development, family based farming and entrepreneurship) and approaches (professional organisations leveraging agricultural development, farmer-to-farmer advisory services). Agri-agencies share a vision on poverty reduction through the strengthening of farmers' organisations: strong farmers' organisations contribute to democracy, to economic growth, and to a more equal income distribution.

The agri-agencies have set up AgriCord with the ambition to be "the" reliable service network for farmers' organisations in developing countries. Each agri-agency can mobilise competences in the whole network, and thus make sure that these farmers' organisations get the best possible support. Agri-agencies are convinced that synergies will enhance the development impact of their work. To make this possible, the mission of AgriCord is:

- to lobby and advocate for stronger roles of farmers' organisations in developing countries;
- to mobilise technical and financial resources for farmers' organisations in developing countries;
- to promote joint learning and pooling of experiences between members of the network;
- to develop joint planning, implementation, monitoring and evaluation;
- to stimulate and facilitate the presence of its members in international fora on development cooperation, and - in specific cases- to represent its members in such fora.

Agri-ProFocus

www.agri-profocous.nl

Agri-ProFocus is a partnership with Dutch roots that promotes farmer entrepreneurship in developing countries. The partnership was founded in 2005 with the aim of rallying together professionals, expertise and resources around a joint interest in farmer entrepreneurship. Agri-ProFocus network members are organisations and companies that gather, train, connect and provide inputs and credit to farmer entrepreneurs and producer organisations. The network operates both at a Dutch(-based) level and at a developing country level, the latter in so-called Agri-Hubs, which are multi-actor arenas in support of entrepreneurship. The long-term vision is that the Agri-Hubs become effective one-stop shops for all to find their specific interests in doing business.

The Agri-ProFocus team can be called upon to assist in brokering deals, actors can meet face-to-face in events and the online platforms provide a place for meeting and discussion on a daily basis. By promoting entrepreneurship and connecting producers with national and international markets, Agri-ProFocus members aim to both open up market potential for business in developing countries, as well as meet with the challenge of sustainably feeding 9 billion people by 2050. The network is supported by a team of dedicated facilitators, based in the Netherlands. In every Agri-Hub country, a coordinator or coordination team supports the local network.

FMO - Entrepreneurial Development Bank

www.fmo.nl

FMO is a Dutch Development Bank that finances companies, projects and financial institutions in developing and emerging markets. The bank believes that entrepreneurship is key to creating sustainable economic growth and improving people's quality of life. Developing countries are often considered high risk – and even their most innovative, promising businesses often do not have access

to the financing needed to reach their potential. Therefore, FMO supplements this need with a range of services and products that include:

- Equity, loans and guarantees
- Capital market transactions
- Mezzanine and other tailor-made solutions
- Long-term and short-term project financing
- Access to our expertise, vast network and partnerships

FMO also fosters capacity development, focussing on e.g. financial administration, planning skills, and sustainable business practices. Its solid profile makes it possible to invest in higher risk markets, in some cases on behalf of the Dutch government. Founded in 1970, FMO is a public-private partnership, with 51% of shares held by the Dutch state, and 49% held by commercial banks, trade unions and other private-sector representatives. FMO has an AAA rating from Standard & Poor's.

NABC

www.nabc.nl

The NABC (Netherlands-African Business Council) is founded in 1946 as a non-governmental private sector organisation. The organisation is driven by their vision that trade and stronger economic relations lead to mutual gain for Africa and the Netherlands. Their mission is to create a network and platform for several parties as "the place to be" for doing business in Africa. By doing so, Africa is promoted as the continent where Dutch businesses can flourish and explore new markets thanks to a growing middle class and the positive future prospects. The NABC is being driven and funded by about 300 private companies, which are their members. Part of NABC's services are paid for by users. The NABC is active in the fields of water technology, port development, agriculture, oil and gas. In order to enhance cooperation between Africa and the Netherlands, the NABC organises outgoing and incoming trade missions in close cooperation with local agencies and embassies. Next, the NABC organises annual and monthly business networking events, international conferences, seminars, workshops and customised services for their members and partners.

NL Agency - Facility Sustainable Entrepreneurship for Food Security programme

www.agentschapnl.nl

The Facility Sustainable Entrepreneurship for Food Security of NL Agency stimulates public-private cooperation in the field of food security and private sector development in developing countries. This means that government, business, and possibly NGOs and knowledge institutions join in a partnership with the Ministry of Foreign Affairs. They can apply for subsidies for projects that focus on:

- Increase in sustainable food production
- Better access to healthy food
- More efficient markets
- Improvement of business climate

In the end, this contributes to sustainable economic growth, self-reliance and alleviation of poverty.

NUFFIC

www.nuffic.nl

Nuffic is the Netherlands organisation for international cooperation in higher education. Its motto is "Linking Knowledge Worldwide". Nuffic is active in managing programmes, on the instructions of the Dutch government, the European Union and third parties, in the following field:

- Providing reliable information about Dutch and foreign higher education.
- Strengthening the position and profile of Dutch higher education and scientific research.
- Evaluating diplomas and promoting the transparency of education systems.
- Combining knowledge and expertise and making knowledge and expertise available.
- Performing activities for third parties that are not financed by public funds insofar as such activities are in keeping with the frameworks of government policy.

Whichever way you look at it, linking knowledge worldwide means bringing people together, because it is knowledge that makes us unique. Knowledge cannot be given away, it can only be shared with

others. This sharing often leads to the creation of new knowledge. That is how Nuffic adds to the wealth of knowledge on our planet by communicating with each other and by forming networks to share it in.

PUM management program

www.pum.nl

PUM has advised entrepreneurs for 35 years. PUM stands for *Programma Uitzending Managers* which is Dutch for Manager Deployment Programme. However, as PUM has long since ceased deploying managers only (PUM currently works with specialists and entrepreneurs too) it nowadays applies the abbreviation with the addition of: Netherlands senior experts. Their operations are funded by both the Dutch government and the Dutch private sector, based on the philosophy that a self-sufficient SME sector is beneficial to global development.

PUM connects entrepreneurs in developing countries and emerging markets. PUM works with senior experts from the Netherlands, each of whom has gained at least 30 years of experience in a business environment. These senior experts voluntarily devote their knowledge to the execution of short-term, solid consultancy projects at the work floor. By sharing knowledge they help entrepreneurs build sufficient knowledge to grow their businesses to the next level. This benefits local business as well as the surrounding community. Their 3,200 volunteers advise 2,000 entrepreneurs annually in almost every field imaginable: from logistics to welding, and from the hotel and catering trade to carpentry. PUM-experts take a fresh look at any business they visit. With them they take a range of other tools for development, e.g., the Vehicle program and the Hans Blankert fund, both for start-up investments in training and smaller businesses. They focus on business issues foremost, but also on potential environmental and social improvements, often easily and often without additional costs. Even better, sustainable solutions prove to save money in the long run.

SNV

www.snvworld.org

SNV is an international non-profit development organisation. They believe that no-one should have to live in poverty and that all people should have the opportunity to pursue their own sustainable development. Founded in the Netherlands nearly 50 years ago, they have built a long-term, local presence in 38 of the poorest countries in Asia, Africa and Latin America. Their global team of local and international advisors work with local partners to equip communities, businesses and organisations with the tools, knowledge and connections they need to increase their incomes and gain access to basic services – empowering them to break the cycle of poverty and guide their own development.

By sharing specialist expertise in Agriculture, Renewable Energy, and Water, Sanitation & Hygiene, they contribute to solving some of the leading problems facing the world today – helping to find local solutions to global challenges and sowing the seeds of lasting change. SNV aims to make a lasting difference in the lives of 15 million people living in poverty over the period 2013-2015. In a world characterised by persistent poverty, but also by fast developing opportunities and increasing local capacities, a supply driven and one-size-fits-all development strategy increasingly misses the point. Demand-driven approaches, carefully crafted to the local context and inspired and fed by a robust global knowledge base, are needed to realise the required breakthroughs in view of local needs and global challenges.

SNV's goal is to catalyse sustainable development processes. They support people to access and develop the capabilities, services and opportunities needed to live a healthy, productive and otherwise fulfilling life, while sustainably using the natural resources they depend on. Unlike many other development actors, SNV does not offer funding, but specialises in supporting the resourcefulness of development actors. Together they develop local capacities, strengthen governance systems, and make markets work for the poor. They believe four factors are essential to the success of development initiatives; Inclusive development, system change, local ownership and contextualised solutions.

Appendix IV: Consulted persons

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