

# Uganda smallholder pig value chain development: situation analysis and trends

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# Abbreviations and acronyms

AfDB	African Development Bank
AI	Artificial insemination
ARIS	Animal Resources Information System
ASF	African swine fever
ASL	Africa sustainable livestock
ASSP	Agricultural Sector Strategic Plan
AU-IBAR	Africa Union Inter-African Bureau of Animal Resources
BMAU	Budget monitoring and accountability unit
BoU	Bank of Uganda
CAADP	Comprehensive Africa Agriculture Development Program
CAH	Commissioner of Animal Health
CAO	Chief administrative officer
CDFs	Cumulative density function
CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
CNDPF	Comprehensive National Development Planning Framework
CoVAB	College of Veterinary Medicine, Animal Resources and Biosecurity
CSO	Civil society organization
DAES	Directorate of Agricultural Extension Services
DDA	Dairy Development Authority
DRC	Democratic Republic of Congo
DSIP	Development Strategy and Investment Plan
DVO	District veterinary officer
EA	Enumeration area
ECA	East and Central Africa

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EU	European Union
FAFH	Food away from home
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization of the United Nations' Statistical Division
FOSDA	First-Order Stochastic Dominance Analysis
GDP	Gross domestic product
GHG	Greenhouse gas emissions
HSSP	Health Sector Strategic Plan
<i>icip</i> e	International Centre for Insect Physiology and Ecology
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization
ILRI	International Livestock Research Institute
KCCA	Kampala City Council Authority
LDIP	Livestock Data Innovation Project
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MDIs	Micro deposit-taking institutions
MFIs	Microfinance institutions
MFPED	Ministry of Finance, Planning and Economic Development
MMT	Million metric tonnes
MSCL	Microfinance Support Centre Ltd
MT	Metric tonnes
NAADS	National Agricultural Advisory Services
NADDEC	National Disease Diagnostic and Epidemiology Centre
NAEP	National Agricultural Extension Policy
NAES	National Agriculture Extension Strategy
NAGRC & DB	National Animal Genetic Resources Centre and Data Bank
NaLIRRI	National Livestock Resources Research Institute

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NAP	National Agricultural Policy
NARO	National Agricultural Research Organization
NARS	National Agricultural Research System
NDA	National Drug Authority
NDA	National Drug Authority
NDP	National Development Plan
NGO	Nongovernmental organization
NLC	National livestock census
OWC	Operation Wealth Creation
PEAP	Poverty Eradication Action Plan
PFA	Prosperity for All Program
PMA	Plan for Modernization of Agriculture
PPM	Pig Production and Marketing Uganda Limited
PPP	Purchasing power parity
PVC	Pig value chain
R&D	Research and development
RELINE	Renaissance Livestock Farmers' Network
ROSCAs	Rotating savings and credit associations
SACCOs	Savings and credit cooperatives
SDP	Sector Development Plan
SPVCD	Smallholder Pig Value Chain Development Project
TDC	TAMK Development Consult Limited
TUNADO	Uganda National Apiculture Development Organization
UBOS	Uganda Bureau of Statistics
UBPA	Uganda beef producers' association
UGX	Uganda shillings
UMPCA	Uganda meat producers association
UNHS	Uganda national household survey

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UNPS	Uganda national panel study
URA	Uganda Revenue Authority
USAID	United States Agency for International Development
USD	United States dollar
UVA	Uganda Veterinary Association
VEDCO	Volunteer Efforts for Development Concerns
VSLAs	Village savings and loans associations
WFAP	Water for Agricultural Production
WHO	World Health Organization
ZARDI	Zonal Agricultural Research and Development Institute

# Glossary

<b>Boar:</b>	a live mature male pig
<b>Breeding herd:</b>	sows, gilts and boars used for breeding purposes and serve as parents of the pigs being readied for market
<b>Carcass weight:</b>	post-harvest yield of pork (the weight of the slaughtered pig, after removing internal organs, head and feet)
<b>Enumeration area (EA):</b>	one of the many small geographical regions in the country defined by the Uganda Bureau of Statistics (UBOS), based on the smallest local government I (LCI) and constituting similar size of the population. An EA is known by the name of the LCI and is utilized in sampling households (and communities) in the survey and collecting primary data
<b>Farrow:</b>	give birth to a litter of pigs
<b>Feed efficiency:</b>	a measure of the effectiveness of feed utilization for pork production (ratio of the amount of feed consumed/kg of live weight gain).
<b>Gilt:</b>	female pig that has never given birth (young developing female pig).
<b>Litter size:</b>	the number of piglets born to a pig in a single litter, both alive and stillborn
<b>Market herd:</b>	pigs being raised solely for the purpose of producing pork for market
<b>Million metric tonnes (MMT):</b>	one metric tonne is 1,000 kg; thus 1 million metric tonnes are 1 billion kg
<b>Sow:</b>	a (mature) female pig that has given birth to at least one litter
<b>Zoonotic diseases or zoonoses:</b>	diseases that can be transmitted between animals and humans

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# Executive summary

Agricultural growth is an important instrument for poverty reduction and often more effective in raising incomes of extremely poor people than gross domestic product (GDP) growth originating from other sectors. The low growth rate of the agricultural sector in Uganda highlights the challenge of reversing the declining per capita agricultural production and eradicating poverty in the country, where currently 41.7% of the population lives below the poverty line.

The livestock subsector is one of Uganda's important growth sectors with prospects of improving livelihoods of the rural poor. Small livestock (such as chicken, goats and pigs) are a particularly important "insurance" and "living bank" for poor households, which sell them to cope with shocks and stressors as well as meeting planned financial needs such as school fees obligations. Piggery especially presents tremendous opportunity for rural households to generate income and to move out of poverty because it requires low capital investment and gives relatively quick and attractive returns. Increasingly, more poor women and men are taking on pig rearing because of a guaranteed market. In Uganda, the pig sector is largely dominated by smallholders, who collectively constitute more than 90% of the agricultural system. Smallholders rank pig and crop production highly (highest) as an important source of livelihood and a guaranteed income generator for women.

Consumption of livestock products in Uganda has been on the rise over the last two decades and is expected to continue unabated due to population growth, urbanization and gains in per capita income. Pig meat particularly, among other types of livestock meat, continues to register a steady increase in the level of per capita consumption. Consumption of pork is more frequent, with consumption highest during periods of low food availability, hence increasing its potential to contribute to nutritional security. The annual per capita consumption of pork in Uganda, the highest in east and southern Africa, is estimated at 3.4 kg based on 2006 estimates from the Food and Agriculture Organization of the United Nations (FAO). The pork consumption though popular, remains well below the levels needed to achieve adequate intake of the critical nutrients that meat can provide. The national per capita consumption of meat in Uganda is low (about 10 kg) compared to the 50 kg recommended by the FAO and World Health Organization (WHO).

Although piggery is increasingly recognized as an enterprise with great potential, it has not been among the priority enterprises in the 2015/16–2019/20 Agricultural Sector Strategic Plan (ASSP) and the 2010/11–2014/15 Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) Development Strategy Investment Plan (DSIP). There are no well-defined development strategies and activities for pig development in Uganda. Neither is piggery aligned to the national development plans and strategies for poverty reduction. The current policy environment is not as favourable to the development of pig value chains, compared to the way it is for prioritized livestock such as dairy. In terms of research, there has been limited research efforts targeting increased production and productivity of piggery by responsible government institutions. And in terms of government policies, only the National Agricultural Advisory Services (NAADS) has some relevant activities that directly promote pig production in the country.

The pig value chain is largely unorganized and operates in an informal market system, compounded by a weak legal and regulatory framework. The prevailing national policies of liberalization, privatization and decentralization have resulted in less government participation in the livestock subsector and more involvement of the private sector in providing and enabling easier access to livestock inputs and services for farmers. The same policies have limited the government's regulatory roles on inputs sourcing and use, leading to poor quality inputs, especially of animal feeds and drugs. The lack of organization of actors (e.g. farmers, traders and processors) in the value chain creates inefficiencies that open doors for exploitation and poor-quality of the inputs. Other challenges faced by the industry include the extremely limited access to financial services for market actors, particularly smallholder pig farmers and medium-sized business enterprises.

Despite the challenges, the pig value chain has potential to ensure pro-poor development, since it is the poor and marginalized groups, including women, who engage in piggery. On top of that, Uganda has a comparative advantage in both production of pigs and consumption of pork, and enormous potential to serve the neighbouring regional markets. Non-state actors including nongovernmental organizations (NGOs) and research institutions have been supporting interventions to promote pig production and marketing. However, development of the pig industry requires concerted efforts and meaningful collaboration among all policymakers, research and development partners involved in livestock to build capacity of key actors in the pig value chain in order to improve competitiveness and reduce inefficiency in the chain.

This report assesses the conditions within which the pig value chains in Uganda operate and sets out a broader national context for the rapid and in-depth pig value chain assessments and analysis at site or small geographical scales through subsequent research activities. Specifically, this report (i) provides an overview of past trends, current status and the likely future directions in pig value chains in Uganda, and (ii) identifies the underlying challenges and opportunities faced by different actors in the smallholder pig production value chains. The study utilizes primary and secondary data from different sources to generate findings that will be useful to ILRI and other stakeholders that are interested in developing piggery in Uganda.

# Introduction and objectives of the study

Agricultural growth is an important instrument for poverty reduction and can be at least three times more effective in reducing poverty compared to growth from the rest of the economy (de Janvry and Sadoulet 2010). Rural poverty in developing countries, including Uganda, can be attributed to the limited creation and facilitation of pro-poor investment options across households, and this continues to hamper agricultural growth (Headey et al. 2010). The agriculture sector employs about 70% of the population in Uganda (World Bank 2018) and contributes about 25% to the country's GDP (UBOS, 2017). However, budget allocation to the sector does not match its importance and is far less than the 10% recommended under the Comprehensive Africa Agriculture Development Programme (CAADP)<sup>1</sup>. The public expenditure on the sector fluctuates between 3–5% of the national budget. Growth in the agricultural sector has stagnated in the last two decades, averaging 1.9% in the period 2007/08–2016/17, and yet the annual population growth rate remains high (estimated at 3.2%). The trends in agriculture's contribution to GDP, and contribution by the different agricultural subsectors, is shown in Figures 1 and 2, respectively. In the financial year 2016–17, the sector contributed 24.9% (at current prices) to total GDP, of which 13.5% was from food crops and 4.2% was from livestock (UBOS 2017).

The low growth rates in the sector highlight the challenge of reversing the declining per capita agricultural production and eradicating poverty in country where 41.7% of the population lives below the poverty line (World Bank 2019). In rural areas where about 31.3 million (78%) of the people live, poverty is more pervasive than in urban areas. Agricultural production is the dominant occupation in rural areas with 92% of the households engaged in farming (Davis et al. 2017), of which 56.8% of the people are women (McCullough 2017).

Research in Uganda has shown that access to productive assets, including all types of livestock, may provide rural households with a tremendous opportunity to generate income and to move out of poverty (Ellis and Bahigwa 2003; Ellis and Freeman 2004; Lawson et al. 2006). Furthermore, Tatwangire (2011) reveals that low levels of productive asset endowments in rural Uganda have made access to livestock an important instrument of poverty reduction. Despite the high level of inequality in access to livestock, Tatwangire (2011) found a clear positive correlation between household welfare and access to additional livestock endowments (including pigs), after controlling for the endogeneity of livestock endowment and the unobserved heterogeneity. This finding is in line with the empirical evidence from previous studies (Riethmuller 2003; Ellis and Freeman 2004 and Kristjanson et al. 2004) that returns to asset endowments, income and consumption levels of the rural poor can increase significantly when more emphasis is put on interventions that enhance agricultural growth, accumulation of household's asset portfolios, including livestock, diversification of enterprises, and further growth in productivity and marketing.

Livestock and livestock products play an important role in income generation and are a source of high-quality protein to many households. In Uganda and the rest of the East and Central Africa (ECA) region, production and consumption of livestock and livestock products has been growing rapidly to the extent of creating a livestock revolution (Delgado et al. 1999; Delgado et al. 2001; Kristjanson et al. 2004; Pica-Ciamarra, 2005 and Omamo et al. 2006). However, the food and nutritional security situation in Uganda is still below the recommended level. For example, the national per capita consumption of meat is only about 10 kg, which is below the 50 kg recommended by FAO and WHO. Similarly, the average caloric intake/person per day in Uganda, though reported to have increased from 1,494 in 1992 to 1,971 in 2005, is still less than the 2,300 calories/person that is recommended by WHO (Republic of Uganda 2010). According to the newly released UN report, undernourishment<sup>2</sup> is prevalent in Uganda and increased from 24.1% in

1. CAADP aims at advancing increased agriculture performance through improved policy reforms and institutional development. The focus is to ensure a 6% annual agricultural productivity target and related impact on socio-economic parameters including job creation, food and nutrition security and poverty alleviation.

2. The WHO defines the prevalence of undernourishment as an estimate of the proportion of the population whose habitual food consumption is insufficient to provide the dietary energy levels that are required to maintain a normal active and healthy life.

2006 to 41.4% in 2018 (FAO et al. 2018). This translates into an increase in the number of malnourished people from 6.9 million in 2006 to 17.6 million in 2018. There is need for research evidence on why the proportion of households that are food insecure continues to increase, despite government efforts to improve agricultural production and productivity.

Figure 1. Percentage contribution of Uganda's agriculture to GDP, 2008/09–2016/17

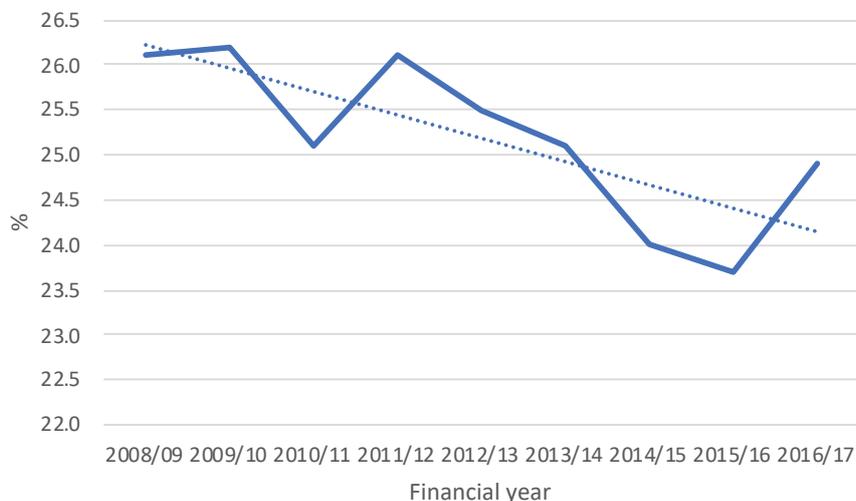
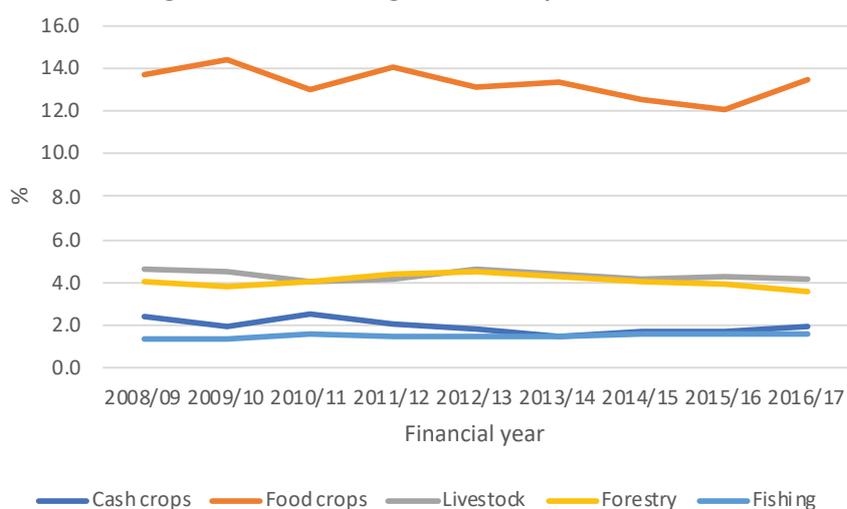


Figure 2. Percentage contribution to Uganda's GDP by subsector, 2008/09–2016/17



Uganda's strategies for economic growth and development are guided by its Vision 2040 that seeks 'a transformed Ugandan society from a peasant to a modern and prosperous country within 30 years. The national strategy acknowledges the role of agriculture in economic development and seeks to transform the sector from subsistence to commercial production. Several policies and strategies in line with national development plans have been instituted towards agricultural transformation with the objective of increasing production and productivity. These include the National Agricultural Policy (NAP) of 2013, the Agricultural Sector Strategic Plan (ASSP) of 2015/16–2019/20 and the Agricultural Development Strategy and Investment Plan (DSIP) 2010/11–2014/15. The NAP envisions a competitive, profitable and sustainable agricultural sector, which it hopes to achieve by transforming subsistence farming to sustainable commercial agriculture (MAAIF 2013).

The aim of the current Agricultural Sector Strategic Plan (ASSP) and National Development Plan (NDPII) is to achieve prosperity for all through improved agricultural productivity, improved rural household incomes and effective food and nutrition security. The government is also committed to promoting private sector investment (based on the private sector-led strategy) in agriculture. The private sector-led strategy aims to increase production and productivity; improve access to markets of agricultural products; expand exports; eradicate income poverty through

value addition and integration, strengthen institutions in the sector and ensure sustainable economic growth and development. Improvements in the performance of the public sector are expected to remove constraints that prevent the private sector from investing in different agricultural products value chains, including live pigs and pig products, thus, reaching a higher level of economic growth in the country.

The main objective of this situation analysis is to assess the conditions within which the pig value chains in Uganda operate. Such an analysis is defined as a systematic collection and study of past and present data to identify trends, forces and conditions with the potential to influence the effective assessment, and in this case, the functioning of pig value chains in Uganda. This study therefore sets out a broader national context for rapid and in-depth pig value chain assessments and analyses at site or small geographical scales through subsequent research activities. Specifically, this report (i) provides an overview of past trends, current status and the likely future directions in pig value chains in Uganda, and (ii) identifies the underlying challenges and opportunities faced by different actors in the smallholder pig production value chains.

The study utilizes primary and secondary data from different sources to generate findings. Data was sourced from FAOSTAT the statistical website of the FAO, the Animal Resources Information System (ARIS) of the Africa Union Inter-African Bureau of Animal Resources (AU-IBAR), MAAIF, the Uganda Revenue Authority (URA), and various household surveys conducted by the Uganda Bureau of Statistics (UBOS), NGOs, international organizations, for example the International Food Policy Research Institute (IFPRI), and the private sector. The study further utilized extensive desk research of existing literature and policy frameworks. Key informant interviews were also conducted with experts in the livestock sector and regulatory institutions of local governments and key players in the private sector.

The findings of this situation analysis will be useful to ILRI and other stakeholders that are interested in developing piggery in Uganda. In particular, the management of the ILRI SPVCD project will use the findings to select appropriate research approaches (toolkits) to assess the pig value chain (PVC), and to identify and test best-bet solutions that can address the main constraints in the value chain. The SPVCD project aims to improve livelihood security, incomes and assets of rural and urban smallholder pig producers, particularly women, and other value chain (VC) actors in a sustainable manner, through increased productivity, reduced risk and improved market access.

# Livestock subsector in Uganda

The livestock subsector is one of Uganda's important growth sectors with prospects of improving the livelihoods of the rural poor. Small livestock (such as chicken, goats and pigs) are a particularly important source of insurance for poor households which sell them to cope with shocks and stressors (Scott et al. 2016). The sector accounts for about 17% of agricultural value added and 4.3% of GDP (UBOS 2018). About 4.5 million households (70.8%) rear at least one kind of livestock, with 99.1% engaging their families as the main source of labour for livestock rearing (UBOS 2008). Animals and birds kept include cattle, goats, sheep, pigs and chicken, among others. In economic value, cattle are considered the most important livestock with significant contributions of over 40% to the value of livestock production and about 7% to the value of agricultural production (UBOS 2017). Although to a lesser extent, goats and sheep meat production is equally important, as is pig and chicken meat production, to the agricultural GDP. Traditionally women are not allowed to own cattle, but they are allowed to own smaller animals such as pigs (Tuyizere 2007).

## Trends of annual production

According to the FAO, livestock production has been steadily increasing in Uganda over the last two decades. The increase is attributed to the growing demand for livestock products (portrayed as the livestock revolution) and interventions in the livestock subsector, which have not only helped to control animal diseases, but also led to improvement in livestock production systems. Between the 2008 livestock census and the 2016 annual estimates by UBOS there was steady increase in the population of cattle, pigs and poultry. By 2016, there were 14.4 million head of cattle, 15.7 million goats, 4.3 million sheep, 4.0 million pigs and 46.2 million poultry of which 40.5 million are exotic birds (Table 1). Small ruminants (sheep and goats) estimates registered a slight decline in 2014 before recovering in the following year. There was an increase of 5.2%, 10.8%, 10.9%, 11.2% and 3.4% from 2014 to 2016 in the number of cattle, sheep, goats, pigs and poultry, respectively. The pig population recorded the highest growth and is promising in its significance towards contributing to agricultural GDP.

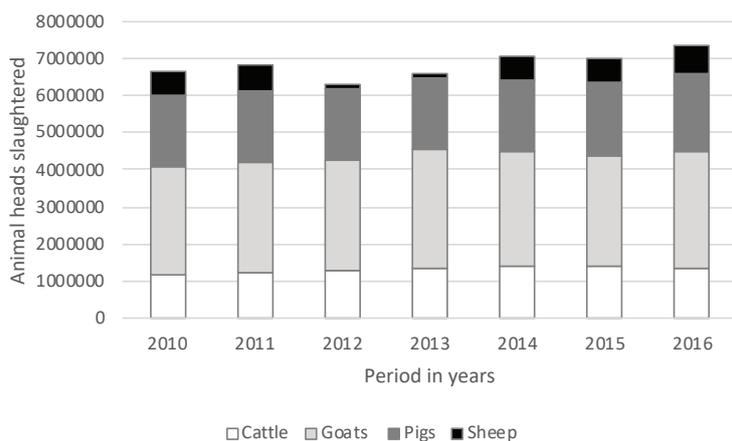
Table 1. Trends in livestock population (values in '000') in Uganda

Species	Livestock census 2008	Period in years					% increase 2014–2016
		2012	2013	2014	2015	2016	
Cattle	11,409	11,979	13,020	13,623	14,031	14,368	5.2
Sheep	3,413	3,842	3,937	3,842	4,198	4,307	10.8
Goats	12,450	1,4012	14,433	14,011	15,312	15,725	10.9
Pigs	3,184	3,584	3,691	3,584	3,916	4,037	11.2
Poultry	37,448	36,956	43,396	44,698	46,039	46,291	3.4

Source: FAO (2016)

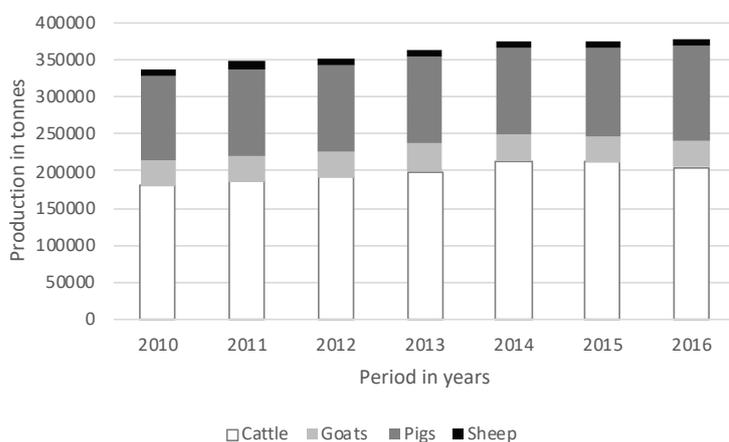
Figure 3 shows the number of livestock slaughtered between 2010 and 2016. The trend shows that goats registered the highest number in terms of heads slaughtered annually followed by pigs. The trend showed a decline in the number of goats slaughtered in 2015 followed by an increase in the following year. The number of pigs slaughtered in 2014 was lower than in 2012 but this changed in the subsequent years. The number of sheep slaughtered annually increased consistently up to 2016; while the number of cattle slaughtered decreased in 2015 and 2016 compared to earlier years.

Figure 3. Number of produced/slaughtered animals



Production (in tonnes) of livestock follows the same pattern as in Figure 3. Cattle recorded the highest production growth from 2010 to 2015 before registering a drop in 2016 (Figure 4). This was followed by pigs which registered a steady increase in production between 2010 and 2016 except in 2012 and 2014 (FAOSTAT). Sheep and goats reported a decline in production in 2014 and 2015.

Figure 4. Production (t) of livestock animals (FAOSTAT 2018)



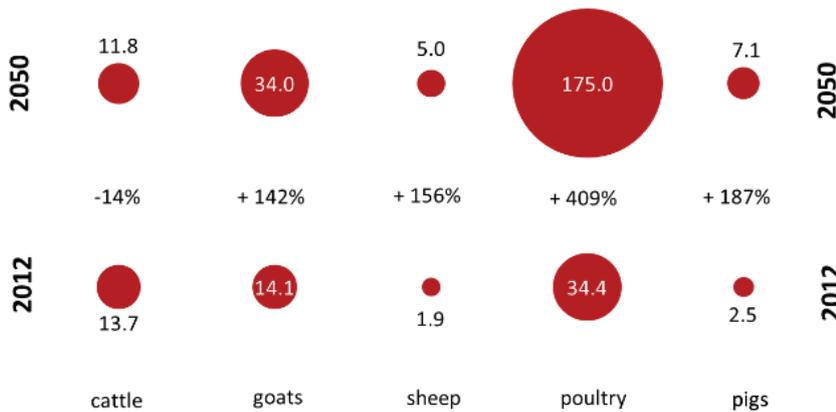
Africa sustainable livestock (ASL) projections estimate that between 2012 and 2050, the production of all types of meat and that of milk in Uganda will increase by 164% and 41%, respectively (Figure 5). Production will increase at a minimum of 17% for beef to 490% for poultry meat, with annual growth rates ranging from 0.5–5.2% respectively. Growth of pork meat production is estimated at 225% with an annual growth rate of 3.4% ranking third after poultry and egg production.

Figure 5. Projected production of animal source foods, 2012–2050

	Estimated production, 000 tons			Growth, 2012-2050	
	2012	2030	2050	percentage	annual rate
Milk	1 461	1 816.1	2 065.8	41%	1.0%
Beef	192.0	220.5	225.0	17%	0.5%
Mutton & Goat	45.1	81.6	123.5	173%	2.9%
Poultry	62.1	202.0	366.5	490%	5.2%
Eggs	45.9	143.9	256.5	459%	5.0%
Pork	121.0	230.0	393.0	225%	3.4%

Figure 6 presents the projected livestock population by 2050. All livestock population, except cattle, will be more than double the standing stock, increasing from a minimum of 142% for goats to a maximum of 409% for poultry. The pig population overall growth rate (187%) comes second after that of poultry (409%). The projected growth of these livestock species will be driven by the growing demand for meat, milk and eggs as a result of increase in human population, urbanization and gains in real GDP per capita income.

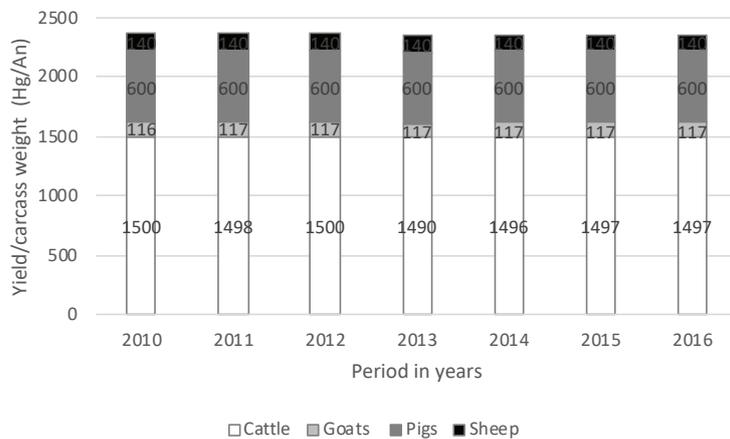
Figure 6. Current and projected livestock population ('000') by species, 2012–2050



Source: Africa sustainable livestock 2050

Figure 7 shows carcass weight of cattle, goats, sheep and pigs recorded between 2010 and 2016. Goats, sheep and pigs showed no change in productivity over the entire span of seven years. The carcass weight of cattle was recorded at 150 kg/animal in 2010 and 2012. Other times it showed a decline and later an increase, though not significant, of the carcass yield. The 60 kg carcass weight/pig slaughtered is by far higher than the minimum carcass weight of 15 kg/pig recorded by the Pig Production and Marketing Company (PPM), and the 40 kg average slaughter weight established in a study conducted by Walugembe et al. (2014) in Uganda.

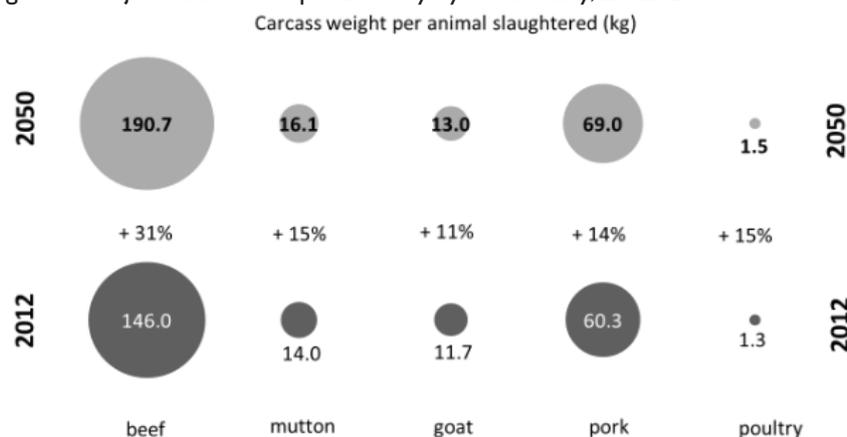
Figure 7. Yield/carcass weight (hectogram/animal) 2010–2016



Projections of growth in livestock productivity for the next three decades is indicated in Figure 8. Livestock productivity is expected to vary between 11% and 31%. Beef carcass weight will increase by 31% followed by mutton and poultry (15%). Pork will have an estimated increase of 14% from the 60.3kg carcass weight per animal slaughtered in 2012.

When the average productivity in Uganda is compared to that of other regions of the world, the country is performing poorly, but does not perform differently than the average for East Africa and Africa as a whole (Table 2). In the case of pigs, the average carcass weight in Uganda is estimated at 600 hg/animal (or 60 kg/animal) and is higher than the average yield in East Africa and Africa in general (47.9 kg and 48.8 kg, respectively). However, when compared to Asia, Europe, America and the world, it is evident that Uganda still lags behind. It is therefore important that more effort is put into harnessing livestock yield, especially in pigs, cattle and chicken.

Figure 8. Projected livestock productivity by commodity, 2012–2050



Source: Africa sustainable livestock 2050

Table 2. Average livestock carcass weight, Uganda vs. the rest of the world, 2018

Item	Uganda	Eastern Africa	Africa	Asia	Europe	Americas	Global
Chicken meat	12,974	11,806	12,655	13,143	16,174	20,991	16,271
Cattle meat	1497	1376	1576	1615	2584	2753	2184
Goats meat	117	105	110	126	115	130	122
Pigs meat	600	479	488	748	894	909	799
Sheep meat	140	117	143	173	162	177	169

Note: Yield/carcass Weight in terms of 0.1 gr/animal for chicken and hg/animal for other animals. Source: FAOSTAT (2018).

Both the production and consumption of livestock and livestock products is expected to continue growing unabated, particularly for the pig sector. This growth is essentially driven by increase in population, urbanization and wealth, alongside some improvements in animal health control and production. Pig and small ruminant production are especially responsive to increases in demand, and growth in these sectors has driven much of the livestock revolution globally (Delgado 1999). However, current livestock growth still leaves a lot to be desired, given food and nutritional security in Uganda is still below the recommended level, with almost 48% of Ugandans being energy deficient, implying that they are unable to have a regular diet that provides the minimum energy required to lead an active and healthy life (UBOS and WFP 2013). In fact, undernourishment affects 41.4% of the population, and wasting and stunting in children are a major concern (FAO et al. 2018).

## Patterns of livestock resources

The pattern of distribution of livestock resources in Uganda across income class, rural/urban, or other relevant grouping (gender and age, especially young children) are presented based on the two cross-sectional national data sets collected by IFPRI in the year 2000/01, and UBOS in the year 2009/10<sup>3</sup>. The UBOS data set forms the second round of the Uganda National Panel Survey (UNPS). The first round of this panel data is based on the Uganda national household survey 2005/06. The two rounds of the survey collected data on socioeconomic characteristics at both household and community levels and are rich with information on agricultural crop and livestock production.

3. The UNPS 2009/10 collected data on among others: livestock ownership, livestock expenditure, livestock income, and production and sale of livestock products. The data is rich with information on the dynamics of household livestock ownership, earnings from livestock sales, expenditure on animal purchases and other expenditures necessary to raise animals (UBOS 2012). The UNPS survey started in 2009/10 and keeps track of about 3,123 households that are distributed over 322 enumeration areas (EAs) out of the selected 783 EAs that were visited by the Uganda national household survey (UNHS) in 2005/06.

Noteworthy is that the UNPS is carried out annually, over a 12-month period on a nationally representative sample of households. The data is therefore able to accommodate vital issues of seasonality associated with the composition and expenditures on consumption. The survey was conducted in two visits and captures agricultural outcomes associated with the two cropping seasons of the country. Each household was interviewed twice in two visits that are six months apart. The survey covered all the 34 enumeration areas (EAs) visited by the Uganda national household survey (UNHS) 2005/06 in Kampala district, and 72 EAs (58 rural and 14 urban) in each of the regions: (i) Central with the exception of Kampala district; (ii) Eastern; (iii) Western and (iv) Northern.

According to UBOS (2012), equal probability, and with implicit stratification by urban/rural and district (in this order), was employed to select the UNPS' EAs from each stratum of the UNHS 2005/06 EAs, except for the rural portions of the 10 districts that were oversampled by the UNHS 2005/06. In these 10 districts, the probabilities were instead deflated to bring them back to the levels originally intended. The UNPS strata therefore includes: (i) Kampala City, (ii) other urban areas, (iii) Central rural, (iv) Eastern rural, (v) Western rural, and (vi) Northern rural.

The IFPRI primary data set was collected in 2001 under the project "Policies for Improved Land Management in Uganda". The IFPRI survey covered two thirds of Uganda including southwest, central, and eastern and some areas in northern Uganda. A stratified sampling procedure was employed based on a classification of Uganda's territory according to agricultural potential, market access and population density. The study covered a total of 450 households in 107 communities.

## Proportion of households that raise or own animals in Uganda

The national livestock census (NLC) Report 2008 reports that the overall proportion of households that keep pigs in Uganda is 17.8%. Results of the NLC report are summarized in Table A1 (in the appendix). They indicate that about 1,135,130 households in Uganda were rearing pigs in 2008; and of these, the majority (23%) were in the Central region, followed by 20.6% in the Western region, 16.3% in the Eastern region and only 9.3% in the Northern region. The mean herd size among all households is 0.5, and 2.8 pigs among households owning pigs (UBOS and MAAIF 2009). The detailed information on the spatial distribution of proportion of households owning pigs and the corresponding distribution of pig numbers in Uganda are presented in Figure A1 and A2 in the appendix.

Further analysis (see results in Table 3) of the Uganda Bureau of Statistics data (UBOS/UNPS 2009/10) indicates that a larger proportion of households (64.5%) in Uganda keep poultry, other birds, rabbits and have beehives. About 60% of all households keep small animals (goats, sheep, pigs etc.), while only 37.5% of all households keep cattle and other large animals such as donkeys and mules.

Table 3. Proportion of households that raised or owned animals during the 12 months, 2009/10

Raised or owned animals	Cattle and pack animals in the last 12 months		Small animals in the last six months		Poultry and others in the last three months	
	Freq.	Per cent	Freq.	Per cent	Freq.	Per cent
Yes	907	37.53	1445	59.78	1559	64.47
No	1510	62.47	942	40.22	858	35.53
Total	2417	100	2417	100	2417	100

Source: Computed by author, based on UNPS 2009/10 survey data.

Note: (i) pack animals includes donkeys and mules; (ii) small animals include goats, sheep and pigs; (iii) others include such animals as rabbits, turkeys, ducks, geese and other birds, and beehives.

These figures suggest that a substantial number of households rear different types of animals as part of their livelihood strategies. It is also widely agreed that women in Uganda participate actively in managing livestock species, especially small animals, that are raised in the form of backyard activities. Therefore, interventions that specifically target women with improved livestock husbandry practices should be able to increase not only production, but also consumption level of foods of animal origin, and this is vital for poverty reduction and economic growth.

## Number of livestock owned, sold, and slaughtered by gender in the last 10 years

The analysis of livestock resources among Ugandan households that keep at least one of the various animals (i.e. cows, donkeys, mules, sheep, goats, pigs, chicken, other domesticated birds, and rabbits) was conducted for the year 2000/01 and 2009/10. Results of this analysis are summarized in Tables 4 and 5. Note that the data sets employed are cross-sectional and allows only the comparison sample means of different households. Each table summarizes the number of animals owned at the end of the year, and the number of animals sold and slaughtered within a year.

Table 4. Number of livestock owned, sold and slaughtered by gender in 2009/10

Household head's sex	Animal type	Number owned at the end of			Number sold within the past			Number slaughtered in the past		
		12 months			12 months			12 months		
		Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	Cows	5.4	7.2	710	0.7	1.6	710	0.1	0.3	710
	Donkeys	0.0	0.2	707	0.0	0.0	707	0.0	0.0	707
	Mules	0.0	0.0	707	0.0	0.0	707	0.0	0.0	707
	Sheep	0.7	2.4	1070	0.1	0.3	1070	0.0	0.1	1070
	Goats	3.6	3.8	1071	0.6	1.5	1071	0.1	0.6	1071
	Pigs	0.8	1.9	1070	0.3	1.2	1070	0.0	0.1	1070
	Chicken	9.0	9.1	1160	0.9	3.3	1160	1.2	2.4	1160
	Other birds	0.7	3.0	1160	0.1	0.9	1160	0.1	0.5	1160
Female	Cows	4.8	7.7	211	0.5	1.4	211	0.1	0.3	211
	Donkeys	0.1	0.5	211	0.0	0.0	211	0.0	0.0	211
	Mules	0.0	0.0	211	0.0	0.0	211	0.0	0.0	211
	Sheep	0.7	2.7	379	0.1	0.5	379	0.0	0.2	379
	Goats	3.3	4.2	379	0.4	1.1	379	0.1	0.4	379
	Pigs	0.7	1.5	378	0.2	1.0	378	0.0	0.1	378
	Chicken	7.4	7.3	406	0.5	1.5	406	0.9	2.0	406
	Other birds	0.5	2.6	406	0.1	1.1	406	0.1	0.5	406
Total	Rabbits	0.1	0.7	406	0.0	0.3	406	0.0	0.0	406
	Cows	5.2	7.3	921	0.6	1.6	921	0.1	0.3	921
	Donkeys	0.0	0.3	918	0.0	0.0	918	0.0	0.0	918
	Mules	0.0	0.0	918	0.0	0.0	918	0.0	0.0	918
	Sheep	0.7	2.5	1449	0.1	0.4	1449	0.0	0.1	1449
	Goats	3.5	3.9	1450	0.5	1.4	1450	0.1	0.5	1450
	Pigs	0.8	1.8	1448	0.2	1.1	1448	0.0	0.1	1448
	Chicken	8.6	8.7	1566	0.8	3.0	1566	1.1	2.3	1566
Other birds	0.7	2.9	1566	0.1	1.0	1566	0.1	0.5	1566	
Rabbits	0.1	0.8	1566	0.0	0.3	1566	0.0	0.1	1566	

Note: (i) Other birds include turkeys, ducks, geese and pigeons, (ii) figure in the table include means, standard deviations and frequencies, (iii) Statistics in the table were computed by author based on UBOS 2009/10 round of UNPS survey.

Table 5. Number of livestock owned, sold, and slaughtered by gender in 2000/01

Household head's sex	Animal type	Number owned at the end of 12 months			Number sold within the past 12 months			Number slaughtered in the past 12 months		
		Mean	SD	N	Mean	SD	N	Mean	SD	N
Male	Cows	3.6	4.7	269	0.6	1.2	269	0.1	0.3	269
	Sheep	1.9	2.3	66	0.4	1.0	66	0.1	0.2	66
	Goats	3.8	4.3	307	1.2	2.2	307	0.2	0.5	307
	Pigs	1.8	1.9	119	1.6	2.7	119	0.1	0.3	119
	Donkeys	0.5	0.7	11	0.0	0.0	11	0.0	0.0	11
	Chicken	8.1	10.1	345	2.4	5.3	345	2.5	4.0	345
	Other birds	3.5	4.5	67	0.7	1.9	67	0.1	0.4	67
	Rabbits	2.1	2.8	22	3.7	7.3	22	0.2	1.1	22
Female	Cows	2.4	3.3	26	0.5	1.2	26	0.0	0.2	26
	Sheep	0.7	1.2	6	0.7	1.0	6	0.0	0.0	6
	Goats	3.7	3.6	26	1.5	2.2	26	0.2	0.5	26
	Pigs	0.8	1.1	11	1.1	1.4	11	0.0	0.0	11
	Donkeys	1.0	1.4	2	0.0	0.0	2	0.0	0.0	2
	Chicken	7.9	8.4	26	0.8	2.2	26	0.7	1.5	26
	Other birds	2.9	4.4	8	1.8	3.1	8	0.1	0.4	8
	Rabbits	2.0	.	1	1.0	.	1	1.0	.	1
Total	Cows	3.5	4.6	295	0.6	1.2	295	0.1	0.3	295
	Sheep	1.8	2.2	72	0.4	1.0	72	0.1	0.2	72
	Goats	3.8	4.3	333	1.2	2.2	333	0.2	0.5	333
	Pigs	1.7	1.9	130	1.6	2.6	130	0.1	0.3	130
	Donkeys	0.6	0.8	13	0.0	0.0	13	0.0	0.0	13
	Chicken	8.1	9.9	371	2.3	5.2	371	2.3	3.9	371
	Other birds	3.4	4.4	75	0.8	2.0	75	0.1	0.4	75
	Rabbits	2.1	2.7	23	3.6	7.2	23	0.3	1.1	23

It can be seen from Table 4 that the overall average number of animals owned by livestock-keeping households in 2009/10 was highest (5.2) for cows followed by that of goats (3.5); pigs (0.8); sheep (0.7) and is least for rabbits (0.1). Similarly, livestock-keeping households keep on average more (8.6) chicken birds compared to 0.7 of other poultry birds. And while this pattern is similar to the case 10 years ago (in 2000/01), the average numbers of animals owned appears to have changed slightly. For instance, Table 5 reveals that the average number of cows owned were 3.5 followed by 3.8 for goats; 1.8 for sheep; 1.7 for pigs; 2.1 for rabbits, and 0.6 for donkeys. In the last 10 years, therefore, the position of pigs as a livestock enterprise improved from a fourth to a third position, after cows and goats.

In terms of gender, the animal ownership gap between male-headed and female-headed households is reducing with time. However male-headed households continue to own more animals on average than female-headed households. For example, while male-headed livestock-keeping households owned on average 3.6 cows in 2000/01; female-headed counterparts owned 2.4 cows. Similarly, male-headed livestock-keeping households owned 1.8 pigs on average, compared to 0.8 pigs of female-headed households during the same time. Ten years later (in 2009/10), we see that male-headed livestock keeping households still own: more (5.4) cows compared to 4.8 of female-headed households; slightly more (0.8) pigs compared to 0.7 pigs of female-headed; more goats (3.6) compared to 3.3 goats of female-headed households; more chicken (9.0) compared to 7.4 chicken of female-headed households, and more other birds (0.7) compared to 0.5 of female-headed households. However, the number of sheep and rabbits is similar across male-headed and female-headed livestock-keeping households. Regardless of gender of the household head the number of cattle per household increased between 2000/01 and 2009/10, whereas the average number of pigs appears to have reduced during the same period. Furthermore, the number of female-headed households that are engaged in livestock sector is much less compared to male-headed households. This can be attributed to constraints that often affect female livestock farmers more than is the case for male farmers.

The numbers of animals sold and slaughtered in a year are also summarized in Tables 4 and 5. The number of pigs sold in 2009/10 is on average 0.2 across all livestock-keeping households. This is, however, more (0.3) among male-headed households compared to 0.2 in households that are female-headed. The same pattern in 2009/10 is true for all other animals when it comes to numbers sold or slaughtered (see Table 4), and this has not changed much in the past 10 years (see Table 5 for similar statistics in 2000/01). Households seem to prefer selling live pigs to slaughtered pig carcasses. Very few households slaughter pigs on the farm.

## Proportion of households that own, sell and slaughter pigs

In this section, descriptive statistics are presented to highlight the changes in the number of households that engage in pig ownership, sale and slaughter in Uganda. The question is whether the pattern of participation has changed in the past 10–20 years. Results in Table 6 show that the overall proportion of livestock farm households that own pigs increased from 10% in 1990, to 20.9% in 2000/01, and to 30.9% in 2009/10. In particular, the proportion of male-headed households owning pigs was 21.4% in 2000/01, compared 14.7% of female-headed households. However, these proportions increased in the last 10 years. About 30.6% of male-headed households owned pigs in 2009/10, compared to 31.9% of their female-headed counterparts.

Results in Table 6 further reveal that 12% of male-headed households and 14.7% of female-headed households participated in the sale of pig in 2000/01. Ten years later the proportion of households that sold pigs reduced to 9.2% for male-headed households and 7.7% for female-headed households in 2009/10.

Table 6. Proportion of households that owned and sold pigs, 1990–2010

Particulars	1990		2000/01		2009/10	
	Freq.	%	Freq.	%	Frequency	%
<b>Male-headed</b>						
Households that owned pigs	42	10.1	89	21.4	328	30.6
Households that sold pigs			50	12.0	98	9.2
Total number of observations (N)	416		416		1,071	
<b>Female-headed</b>						
Households that owned pigs	3	8.8	5	14.7	121	31.9
Households that sold pigs			5	14.7	29	7.7
Total number of observations (N)	34		34		379	
<b>Overall</b>						
Households that owned pigs	45	10.0	94	20.9	449	30.9
Households that sold pigs			55	12.2	127	8.8
Total number of observations (N)	450		450		1,451	

Notes: (i) Figure in the table include frequencies and percentages; (ii) Statistics in the Table were computed by author based on UBOS 2009/10 round of UNPS survey.

It is therefore evident that the proportion of households engaged in pig rearing has increased in the last two decades, but this is more pronounced among female-headed households in the last decade. A similar pattern is, however, yet to be seen in household decisions to sell pigs.

The summary of proportion of households that owned and sold pigs between 1990 and 2010 across the regions of Uganda is provided in Table 7. The proportion of households that owned pigs increased from 10% in 1990 to 30.9% in 2010.

Table 7. Proportion of households that owned and sold pigs by region, 1990–2010

Particulars in the past 12 months	Different regions of Uganda					Overall
	Kampala area	Central	Eastern	Northern	Western	
	1990					
Households that owned pigs (%)		21.1 (19)	6.0 (15)	8.3 (2)	10.5 (9)	10.0 (45)
Total observation (N)		90	250	24	86	450
	2000/01					
Households that owned pigs (%)		37.8 (34)	18.0 (45)	20.8 (5)	11.6 (10)	20.9 (94)
Households that sold pigs (%)		26.7 (24)	8.0 (20)	12.5 (3)	9.3 (8)	12.2 (55)
Total observation (N)		90	250	24	86	450
	2009/10					
Households that owned pigs (%)	38.5 (5)	56.0 (177)	28.8 (105)	14.2 (59)	30.1 (103)	30.9 (449)
Households that sold pigs (%)	15.4 (2)	20.3 (64)	5.48 (20)	4.1 (17)	7.0 (24)	8.6 (127)
Total observation (N)	13	316	365	415	342	1451

Notes: (i) Statistics in the Table were computed by Author based on IFPRI 2001 and UBOS 2009/10 round of UNPS survey data; (ii) Figures in the parentheses denote frequencies

In 1990, a significant proportion of households (21.1%) kept pigs in the Central region of Uganda, followed by 10.5% in the Western region, 8.3% in the Northern region. The least number of pig-keeping households (6%) was in the Eastern region. It is clear that the number of households engaged in pig production increased substantially in the following 10 years. For example, the proportion of households owning pigs in 2000/01 is shown to have been highest (37.8%) in the Central region and least (11.6%) in Western region. The proportion of households that sold pigs was highest (26.7%) in Central region, when compared to 12.5% in Northern region, 9.3% in Western region, and 8% in Eastern region.

There has been shift in the number of households rearing pigs in the last decade (2001 to 2010). There was a significant increase in the number of households rearing pigs in the Eastern and Western regions, whereas the number of households rearing pigs reduced in the Northern region. The decline in the number of households rearing pigs in the Northern region can be attributed to residual effects of the war by the Lord's Resistance Army.

In the same line, Table 7 indicates that the proportion of households owning pigs in 2009/2010 was highest in the Central region (56%), followed by 30.1% in the Western region, 28.8% in the Eastern region and 14.2% in the Northern region of Uganda. In the Kampala area alone, 13 livestock-keeping households were interviewed. Out of these, only 5 (38.5%) households owned pigs, while 2 (15.4%) households sold some pigs. Still, the Central region had a large proportion (20.3%) of livestock-keeping households that sold pigs when compared to other regions.

## Consumption and expenditures: current status and trends

The production and consumption of meat and other foods of animal origin are among the six core livestock domains (Ciamarra et al. 2012). In addition to livestock prices, the other core livestock domains include livestock inventory, animal health and disease, livestock production, feed for livestock, and milk production. When it comes to pig production in Uganda, information on most of these domains is limited. In order to fill this gap, this situation analysis employed FAO food supply data, other available national data sets, and evidence from various studies. This information was used to describe the current (baseline) status and trends of various indicators of performance in pig value chains in Uganda. Combining FAOSTAT food supply data and parameters from other data sets was particularly useful in assessing the national undernourishment status. This section provides an overview on the extent to which there has been changes in pork consumption; the role of pork in overall household expenditure; changes in preference and policies that are in place.

## Different forms of livestock and pig meat products

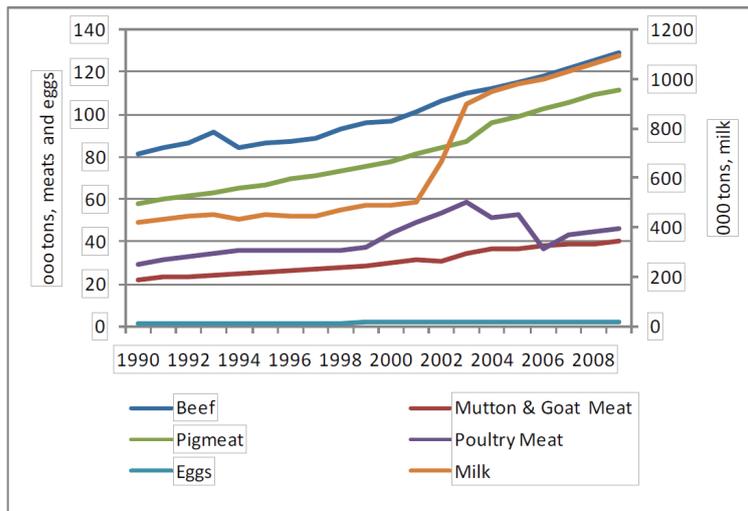
Jagwe et al. (2012) lists different forms of livestock products that are consumed in Uganda. These range from (i) beef (i.e. bone in large pieces of meat, chops for roasting or frying, ground or minced beef and offals); (ii) chicken (live birds, dressed chicken, frozen and fresh); (iii) eggs (loose eggs and packaged eggs); (iv) goat meat (large piece and chops); (v) mutton, (vi) pork and (vii) dairy products (raw milk, pasteurized milk, powdered milk, butter, ghee, and yoghurt). In the case of pork, there is a limited number of product forms, which include live pigs, large pieces (usually the thighs and chest) of pork, and pork chops that are cut from large pieces to allow easy cooking. Other pork products sold in the market include sausages, roasted or fried pork chops and ribs.

Livestock products in general, including pig products, are sold in different retail outlets in the country. These are abattoirs, roadside butcheries, roadside outlets, wet markets (mainly selling live animals), small retail shops, and supermarkets. The rich consumers buy livestock products in larger quantities at a time from outlets such as abattoirs, supermarkets and roadside butcheries all of which generally rank highly in terms of quality. Conversely, product quality scores of outlets such as small retail shops, ready-to-eat outlets and roadside outlets are relatively low and are mostly utilized by consumers in the lower income brackets.

## Consumption of pork and other livestock products

Over the last two decades, consumption of livestock products has been on the rise in Uganda with beef, pork and milk consumption registering the most significant growth rates as shown in Figure 9. Consumption growth rates for beef and pork averaged 2.4% and 3.4%, respectively; and similarly, from 2004 to 2010, the growth rate in milk consumption averaged 3.4% per year. The sudden increase in milk consumption over the period 2000–2003 (over 33%) was attributed to an outcome of the Dairy Industry Act, which made the registration of milk production and sales easier for producers (Mette et al. 2011). This was made possible by the establishment of the Dairy Development Authority (under the Dairy Industry Act) that implemented several reforms in the handling and marketing of milk including organization of the informal sector and facilitating formation and registration of member-based organizations of dairy stakeholders from the grassroots to national level.

Figure 9. Livestock product consumption in Uganda over the last two decades



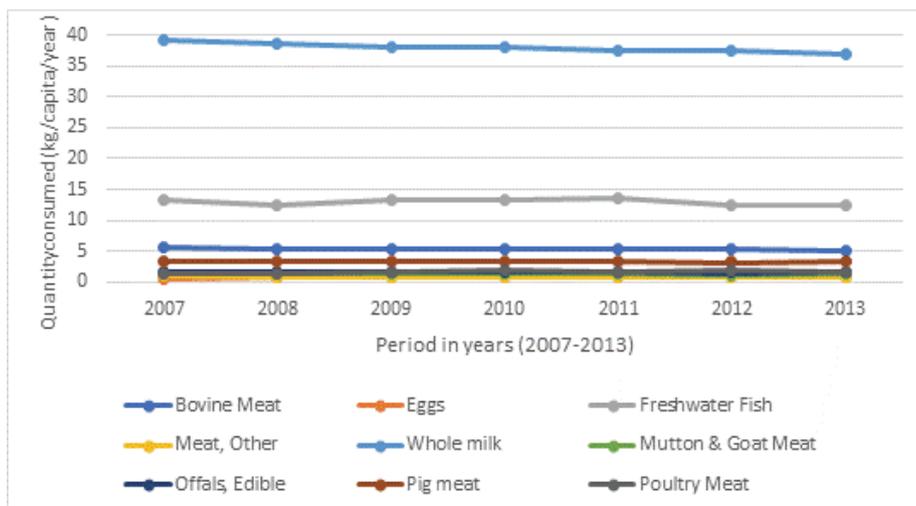
Source: Baker et al. 2013

Chicken meat consumption was on the rise until 2004 before declining drastically for two years and increasing again with an annual average rate around 4%. Eggs, goat meat and mutton are less consumed compared to the other livestock products, but they are experiencing a growing consumption pattern with average annual rates of 2.1% for eggs and 3.0% for goat meat, albeit starting from lower bases.

In the period between 2007 and 2013, the average per capita consumption of the various livestock in Uganda showed milk had highest per capita consumption, followed by freshwater fish, bovine meat, pig meat, poultry meat, edible offals, mutton and goat meat, other types of meat and eggs (Baker et al. 2013). As indicated in Figure 10, pork ranks fourth in its contribution to per capita consumption of animal-source foods and its consumption rate was steady between 2007 and 2013. In the 1960s, pork accounted for only 1–2% of the per capita consumption of meat in Uganda. Currently it accounts for at least one third of the 10 kg/year overall meat consumption in the country. Pork's annual per capita consumption is estimated at 3.4kg and is the highest in East Africa. Pork is consumed frequently in the Uganda, with consumption highest during periods of low food availability, hence increasing its potential to contribute to food and nutritional security (Tatwangire 2014). Spatial detail of pork consumption in Uganda is summarized in Figure A3 in appendix, which shows that the average pig meat consumption in Uganda is high (above 750 kg/km<sup>2</sup> per year) in urban areas of major districts that include Kampala, Entebbe, Kira, Jinja, Iganga, Busia, Mbale, Tororo, Soroti, Lira, Gulu, Arua, Hoima Fort Portal, Kasese, Mbarara, Masaka, Rakai, Kabale, Kisoro, Rukungiri and Bushenyi. Pork consumption, though popular, remains well below the levels needed to achieve adequate intake of the critical nutrients that meat can provide. Overall, the national per capita consumption of meat is still low (about 10 kg) compared to the 50 kg recommended by the FAO and WHO.

Efforts to meet local needs of animal protein may require a significant increase in livestock productivity by over 4.2% a year, from the current 3%. The failure to achieve this increase in animal population and supply of livestock products (including pig products) implies that the demand for beef and pork will overwhelm the country and may force the country to resort to beef imports that certainly will result in increased cost of living. Population growth, urbanization and gains in per capita income will result in an increased demand for livestock products. According to ASL projections, the aggregate consumption of all livestock products will grow threefold and about fourfold for beef, poultry and pork by 2050 (Figure 11). On an annual basis, demand will grow between 3.6% for milk and 4.8% for poultry and pork, which translate in major increases in volume terms. These increases in demand of livestock products represent a major opportunity for livestock producers to expand their business (FAO. 2018)

Figure 10. Trend of average per capita consumption of all livestock products in Uganda



Source: FAOSTAT (2016)

Figure 11. Current and projected consumption of livestock products, 2012–2050

	Estimated consumption, 000 tons			Growth, 2012-2050	
	2012	2030	2050	percentage	annual rate
Milk	1 330.5	2 766.8	4 615.5	247%	3.6%
Beef	185.3	445.7	931.8	403%	4.7%
Mutton & Goat	43.9	97.3	196.2	347%	4.4%
Poultry	61.0	146.2	316.4	419%	4.8%
Eggs	34.2	74.4	136.1	298%	4.0%
Pork	118.5	277.5	606.6	412%	4.8%

Source: Africa sustainable livestock 2050

## Expenditures on pork and other meat products

This section highlights the household allocation of total expenditure to food, and especially food of animal origin. It is, however, important to note that information on the allocation of household expenditure is largely limited in Uganda. One has to either compute it from the section of household expenditure of national household surveys or conduct an independent survey. Household budget surveys in Uganda were last conducted in 1989/90. Evidence from the 1989/90 budget survey showed that the average household expenditure on animal products ranged between 20–30%, but this appears not to have changed much in the last 20 years.

Bashaasha et al. (2012) employed a proportional piling method to evaluate the relative shares or percentage scores for different items (including food) that are purchased across households in six districts of Uganda. Results showed that the share of total expenditure allocated to food (including cereal and groceries) was 31.2% in Arua; 25.3% in Gulu; 25.5% in Kabale; 25.3% in Kasese; 31.6% in Mayuge and 30.6% in Rakai district. In case of food items alone,

the proportion of total food expenditure that was allocated to food of animal origin was 27.9% in Arua; 18.6% in Gulu; 21.5% in Kabale; 14% in Kaseses; 21.7 in Mayuge and 28.4% in Rakai district (Bashaasha et al. 2012). The other component of household food expenditure is allocated to staple cereals and tubers; staple pulses and oil products. This finding revealed that the average household expenditure on food items in Uganda is about 28.3%, while only 22% of this food expenditure is allocated to food of animal products.

There is a wide agreement that household expenditure on animal products in general has not changed much in Uganda from the level of the early 1990s. The van Campenhout et al. (2012) study computed the average budget shares of different crop and animal products using the UNHS survey data sets of 2005/06 and 2009/10 (Table 8). This study reveals some changes in the allocation of household expenditures to different food products, with a decline in cheap starchy foods such as cassava flour and maize flour, and an increase in the household budget allocated to meat products and eggs. However, the budget shares for pork (exclusive of consumption away from home) reduced slightly, from 6.26 to 5.77% between 2009/10 and 2005/06. During the same period, budget shares for beef remained unchanged; for goat meat this increased by 37%; for local chicken it increased by 10%; for local eggs it increased by 23% and that of milk reduced by 6%.

Table 8. Evolution of budget shares in household expenditure Uganda

Product	2005/06	2009/10	Change (%)
Beef	7.07	7.13	1
Cassava flour	6.18	4.83	-22
Cowpeas	1.85	1.85	0
Fresh cassava	1.44	1.3	-10
Goat meat	5.46	7.48	37
Groundnuts	1.65	1.61	-2
Irish potatoes	2.22	1.64	-26
Local chicken	2.41	2.65	10
Local eggs	0.88	1.08	23
Maize flour	5.75	6.02	5
Maize grain	9.66	2.69	-72
Matooke (kg)	2.99	2.6	-13
Milk	2.84	2.66	-6
Millet flour	0.86	1.04	21
Nambale beans	3.02	3.31	10
Nile perch	5.63	5.37	-5
Pork	6.26	5.77	-8
Sorghum flour	3.98	4.78	20
Super rice	3.71	3.85	4

Source: IFPRI report on the impact of food prices in Uganda (van Campenhout et al. 2012).

In the case of crop products, the biggest increase in the budget share is 21% for millet flour, 20% for sorghum flour and 10% for Nambale beans. Distinctively, the reduction in budget shares was highest (72%) for maize grains, followed by 26% for Irish potatoes, 22% for cassava flour and 10% for fresh cassava.

## Changes in preferences for different forms of the commodity

Income elasticity of demand and price elasticity of demand (i.e. percentage change in quantity demanded as a proportion of percentage change in either income or price) for animal products, including pork have been high (1.0–1.3) in Uganda since early 1990s. Jagwe et al. (2012) show that poor consumers in Uganda buy such animal products as beef chops, offals, ready-to-eat beef, sausages, live chicken, loosely packed eggs, pasteurized milk and ready-to-eat goat roasts. Conversely, consumers that are richer are the majority buyers of large pieces of beef; frozen and dressed chicken; ready-to-eat pork roasts; raw fresh milk; powdered milk; butter; ghee and goat chops. This study sheds more light on who buys pork in Uganda, and these are the relatively rich consumers. Besides, the study found that demand for pork would increase immensely if there was an increase in income of consumers. Enhancing incomes of potential poor consumers, reducing prices of the pork products, and improving the quality of pork and pork outlets can help boost the demand for pig meat.

There is an increase in consumption of ready-to-eat pork and other meat products. Sa et al. (2012) found that the majority of working class Ugandans prefer dining in restaurants to preparing meals at home, which calls for the need to include expenditure estimates on consumption away from home. Consequently, they spend more on ready-to-eat meat products and fast foods that include chips, deep-fried chicken, sausages, and deep-fried meat, including pork. According to Sa et al. (2012), this increase in consumption of fast and ready-to-eat food in Kampala is significantly influenced by changes in tastes, the convenience that these foods provide and the increase in disposable income. Conversely, consumption of fast foods is constrained by an increase in household size, education level and distance between workplace and restaurants.

## Factors influencing trends in consumption

The growth in demand for pig products can be attributed to such factors as (i) population growth, (ii) increasing urbanization, (iii) increased purchasing power and (iv) changes in consumption habits; given that more consumers prefer buying pig meat from outlets such as supermarkets and pork joints that are characterized by a relatively high level of hygiene and value addition (that includes ready-to-cook cut pork pieces/chops and prepared pork for immediate consumption). Population growth in Uganda is estimated at about 3.3% per year, one of the highest in the world. The number of people in Kampala, the capital city, increased from 450,000 in 1980 to 1.5 million in 2012 (Agriterra-EKN 2012). Currently, the city's population is estimated at about 1,659,000 people<sup>4</sup>. The large number of potential consumers in Uganda creates the need to improve productivity of smallholder pig production systems, if local supply of pig meat is to satisfy the growing demand for meat products. Demand for pork is further influenced by periods of festivals such as public and religious holidays (e.g. Christmas and Easter), sale of pigs to generate school fees prior to the beginning of school terms and the prevalence of diseases such African swine fever that curtails movement of pigs in the country.

## Demographic overview

Uganda has a total area of 241,038 km<sup>2</sup> of which 197,323 km<sup>2</sup> is covered by land. The majority (about 70%) of the country's population depends on agriculture for their livelihoods. Uganda's population has increased significantly in the last two decades. Currently, Uganda's has approximately 44.89 million people and has an average annual growth rate of 3.3% and average population density of 222 persons/km<sup>25</sup>. The number of persons/km<sup>2</sup> is highest (226) in the Eastern region; 176 in the Central region and 126 in Western region. The northern region has the lowest population density of 62 persons/km<sup>2</sup>. Pastoralists are mainly found in these low population density areas. Population density in Kampala district, the largest outlet for livestock products in the country, is estimated at 7,259 persons/km<sup>2</sup>. A spatial

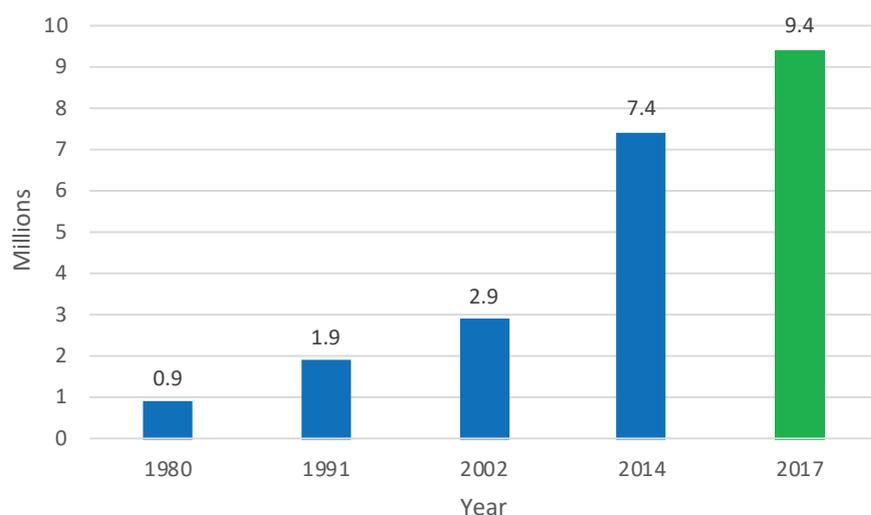
4. <http://worldpopulationreview.com/countries/uganda-population/>

5. <https://www.worldometers.info/world-population/uganda-population/>

distribution of human population in Uganda is summarized in the appendix (Figure A4), derived from estimates of the Global Rural-Urban Mapping Project, Version 1 (GRUMPv1).

Figure 12 shows that Uganda's urban population increased from less than 1 million persons in 1980 to about 3 million in 2002, representing nearly a threefold increase; and further increased to 7.4 million in 2014 (UBOS 2018). In the mid-2017, the projected population was 9.4 million. Currently, about 25.7% of the population lives in urban areas<sup>6</sup>. This high population growth rate in urban areas can be explained by the persistent rural poverty inducing rural out-migration to urban areas. The growth in human population and urbanization has boosted demand for food of animal origin such as pork, though this also has a bearing on the entire livestock value chains such as disease control, genetic improvement, livestock nutrition, advisory services, marketing and processing.

Figure 12. Trends in Ugandan urban population



There are regional variations in the distribution of the urban population. Table 9 reveals relatively low levels of urbanization in all the country's regions. This is with exception of the central region that had 25% of its population residing in urban areas in 2002. The high level of urbanization in the central region is attributed to Kampala City being the prime urban area nationally.

Table 9. Regional distribution of urban population in Uganda

Region	Urbanization level (%)			
	1969	1980	1991	2002
Central	14.4	15.5	21.3	25.3
Eastern	4.3	3.8	6.5	6.6
Northern	2.6	2.2	5.3	9.3
Western	2.1	2.9	4.0	6.8

Source: Uganda Bureau of Statistics 2006 (2002) population census report.

There are more people in the Central region, followed by the Western region and the Eastern region. Population is lowest in the Northern region (see Table 10). Population growth rates have been exceeding growth rates in agricultural output in the last 10 years, and this may be hindering efforts to alleviate poverty in Uganda.

6. <https://www.worldometers.info/world-population/uganda-population/>

Table 10. Total population by regions, and number of people living on less than USD1.25 and 2/day

Region	Total population (1000)	Poor people living on USD <1.25/day		Poor people living on USD <2/day	
		Total number (1,000)	% of poor people region	Total number (1,000)	% of poor people
Central	9,370	3,970	42.4	5,840	62.3
Eastern	8,720	4,810	55.2	6,900	79.2
Northern	6,350	5,570	87.8	6,100	96.1
Western	8,960	4,330	48.3	6,090	67.9

Source: Report on the targeting animal production value chains for Uganda (ILRI 2012) (also derived from CIESIN (2011) and Wood et al. (2010).

Poverty is defined as an economic condition in which one lacks both money and basic necessities such as food, water, education, healthcare, and shelter that are necessary to thrive. Based on the World Bank's recently revised international poverty line of USD1.25 at 2005 purchasing power parity (PPP) (Ravallion et al. 2009), and the USD2 (PPP)/day, the average daily amount of money a person lives on in Uganda is presented in Table 10. It can be seen that the proportion of poor people is highest (87.8%) in the Northern region, followed by the Eastern region at 55.2%, Western region at 48.3% and is least (42.4%) in the Central region. These results reveal that there can be drastic improvement in household purchasing power and changes in preference that favour consumption of animal products, including pork, when an area experiences an increase in population, urbanization and poverty reduction.

As elaborated in other sections, there has been an increase in demand for meat products in Uganda. And while demand is highest in urban areas, about 95% of all meat products consumed are retailed through a vast network of roadside and market stall butcheries. There has also been an increase in demand for the premium segment of meat products that now accounts for about 16% of the total inspected meat market in Kampala (Agriterra-EKN 2012), which is estimated to be around 2,500 tonnes of meat/year. There is no detailed information on the demand for ordinary and premium pork meat products in Uganda.

There is widespread agreement that demand for premium meat, including premium pork is growing due to, among other factors, increasing number of people in the upper middle-income class; modern hotels; new private companies; oil companies, and institutions. Table 11 provides a summary of average prices for the premium pork products in Kampala. Note that the premium price is highest (UGX24,000) for a kg of pork chops and pork roast in supermarkets. Arguably, this price was three times higher than the average price of the ready to roast pork chops (UGX 5,500 at the time) in the ordinary roadside butcheries and markets.

Table 11. Prices for retail cuts and processed meat at supermarkets in Kampala (May 2012)

	Supermarket (Nakumatt)				
	UGX/kg	USD/kg	Freezer	UGX/kg	USD/kg
Butchers stand, fresh meat					
Pork chops with fillet	24,000	9.60	Pork sausages	8,900	3.55
Pork roast	24,000	9.60			
Pork chops	19,900	7.65			
Pork minced	17,400	6.95			

Source: Adopted from Agriterra-EKN (2012); originally in the 2012 EU Beef Report and own survey.

It is evident from Table 12 that the price of pork and other meat products has increased drastically since 2001. The price of pork has more than doubled since 2004, from UGX2,500/kg to UGX5,500/kg in 2012. This can be attributed to an increase in demand that is exceeding the supply of pork and other meat products. According to FIT Uganda (2010), the average price of pork in Uganda was UGX4,040/kg in June 2009; this increased to UGX4,250/ kg for wholesale price and UGX4,770/kg for retail price in May 2010. The increase in the whole sale price of pork in 2010 was estimated to be 5.20% compared to a 1.93% increase of the retail price of pork in the same year. Noteworthy was the significant price differences across and within regions. For example, the price of pork was highest (UGX5,800/ kg) in Mbarara and least (UGX3,250/kg) in Kisoro (FIT Uganda 2010), yet the two districts are in the same Western region.

Table 12. Average price/kg of meat products for the period 2001–2004

Item	2001	2002	2003	2004
Beef	2,200	2,500	2,500	2,500
Goat meat	2,500	2,700	2,500	2,800
Pork	2,000	2,200	2,500	2,500

Source: Uganda beef producers' association (UBPA) 2005; in KIL (2006).

## Conclusions regarding the likely market growth scenarios

The business as usual scenario is likely to enhance domestic demand for pork, growth of informal markets for live pigs and pork. This will, however, be characterized by pork products with limited value addition, dominance of local traders at various stages of the value chain, and minimal participation and upgrading of women pig producers. There is need to include pro-poor development of pig enterprises on the policy agenda of the country, if domestic and regional demand of pork is to be met. This will not only lead to the growth of input and pig meat markets, but also the transformation of pig value chains.

The targeted flow of resources and technologies in the pig sector can increase the participation of poor smallholder pig farmers, including women. An increase in the supply of pork amidst high demand is therefore likely to increase growth of formal markets, production of good quality pork, and export of pork products in the neighbouring countries. The domestic and regional pork markets have the potential to continue growing for many years to come. What is important is the need to improve efficiency of farm-level productivity and performance of pig value chains.

# Production of pigs in Uganda

Pig production in Uganda is widespread across the country and is increasing at a high rate. It is estimated that about 1.1 million households (representing 17.8% of total households) are pig producers, with an average herd size of 2.8 pigs/household (UBOS 2009). There are, however, differences in the regional distribution of pigs as indicated in Table 13.

Table 13. Pigs and ruminant livestock population in 2008

	Pigs		Cattle		Goats		Sheep	
	Population ('000)	%						
Central	1,308	41	2,476	22	1,676	13	272	8
Eastern	700	22	2,489	22	2,500	21	319	9
Northern	341	11	1,642	14	2,696	22	569	17
Western	778	24	2,549	22	3,452	28	568	17
Karamoja	58	2	2,254	20	2,025	16	1,686	49
Total	3,184	100	11,409	100	12,450	100	3,413	100

Source: National livestock census report (2009).

The Central region has the highest pig population (40%), followed by Western (25%), Eastern (22%), Northern (11%) and the Karamoja (2%) regions (UBOS and MAAIF 2009). The regional distribution of cattle and goats is highest in the Western region, while the highest population of sheep is in Karamoja region. Figure A1 and A2 in the appendix present detailed information on the spatial distribution of proportion of households owning pigs and the corresponding distribution of pig numbers in Uganda.

Pig production is largely dominated by smallholders, who constitute more than 90% of the agricultural system in the country (World Bank 2017). Smallholders also dominate production in the agricultural sector (pig production inclusive) of Uganda with the exception of tea and sugar, which are primarily large-scale commercial crops (Matthews et al. 2007). Pig and crop production are important livelihood sources for smallholders and are ranked highest in terms of contribution to household income (Ouma et al. 2015). The money from pig keeping helps farmers pay school fees and meet household health needs. Other benefits include manure production and source of wealth (Ouma et al. 2015). Pigs are often preferred as they grow fast, produce 16–20 piglets per sow per annum, and are efficient transformers of various low-value feed resources, which are mostly considered “waste”, into high-value animal-source food, for sale or home consumption (Mutua et al. 2010). Pigs are also resistant to many diseases, and their unrestrictive feeding habits, allow them to eat various feedstuffs (Twinamasiko 2001b). For women, they are considered the key income generator, and equally for marginalized groups within some societies and cultures (FAO 2011).

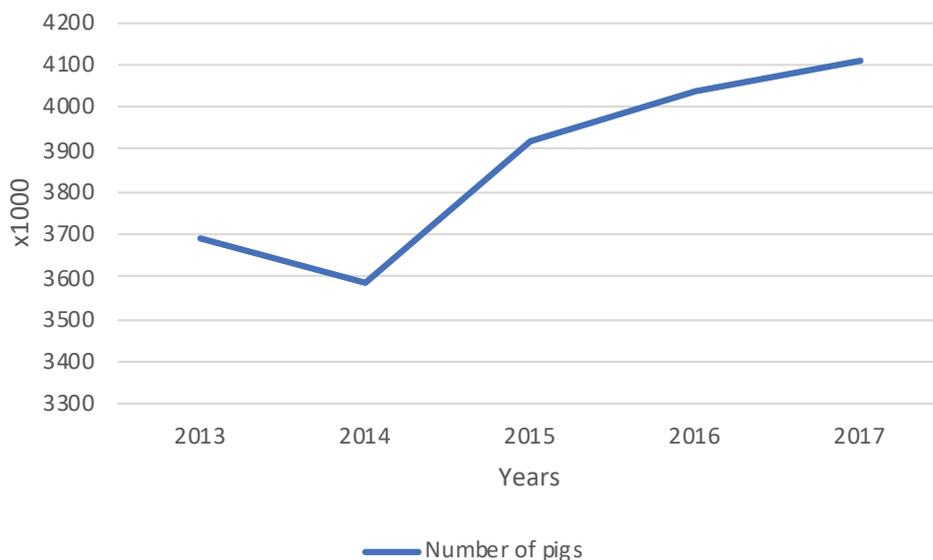
Smallholder pig farmers are classified into two categories: small-scale piglet producers, defined as those that own 1–3 sows and small-scale growers, defined as those having 1–4 grown pigs for slaughter (Ouma et al. 2015). The latter are the majority comprising 60–80 % of households. Commercial pig producers can be defined as those having more than four slaughter pigs at any given time. In 2014, Devenish Nutrition Ltd, an Irish-based firm, was able to establish that the largest commercial producer in Uganda had 60 sows (Devenish Nutrition 2014). Devenish Nutrition has since then established a UGX3.58 trillion model pig farm and feed mill in Hoima district (Uganda Investment Review 2016; Mugerwa 2017).

Pig management in the country is dominated by tethering and free range systems in rural areas and intensive/confinement systems in peri-urban and urban settings (Muhanguzi et al. 2012; Dione et al. 2014). Women are more involved in managing pigs at household level, but more importantly, pigs are raised in 31.9% of female-headed households<sup>7</sup>. Tethering pigs under the shade, or building low cost pens under the shade, providing water and ensuring frequent shift of tethering points at intervals of about 3 months can help to drastically improve productivity of smallholder farms and to minimize parasite infestation in the extensive system of pig production.

## Pig trends in Uganda

Except for a decline observed between 2013 and 2014 (Figure 13) the growth in pig population has registered an upward trend since 2008 reaching 4.0 million in 2016 (UBOS 2018). This number is projected to grow at an annual rate of 8% reaching 8.0 million by 2020.

Figure 13. Trends in the number of pigs in Uganda.



Source: Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), and Uganda Bureau of Statistics

As the number of pigs has increased steadily, so has the number of households engaged in pig rearing. And while this trend is widespread throughout the country, significant increase is taking place in the Central, Eastern and Western regions of Uganda. In 2005/06, about 0.8 million (18.3%) agricultural households out of the total 4.2 million agricultural households in the country reared pigs (UBOS 2007). It is this large number of pig rearing households that has increased pig production and pork consumption in areas and these regions.

Table 14 presents the regional distribution of households with pigs and the number of pigs, which concurs with the findings in Tables 4, 5 and 6. The number of agricultural households and number of pigs (and probably pork consumption) is shown to have been highest (43.2% and 48.9%, respectively) in the Central region of Uganda, followed by the Eastern region (24.3% and 22.6%), Western region (24.5 and 20.3%), and were least (8% and 8.1%) in the Northern region.

7. Computed based on UBOS 2009/10 round of UNPS survey.

Table 14. Number of households with pigs, and number of pigs in Uganda

Region	Agricultural households with pigs		Number of pigs UNHS 2005/06 ('000)	
	Number ('000)	Percentage	Number ('000)	Percentage
Central	329	43.2	835	48.9
Eastern	189	24.3	387	22.6
Northern	61	8.0	138	8.1
Western	187	24.5	347	20.3
Total	761	100	1707	100

Source: Uganda national household survey 2005/2006: Report on the Agricultural Module: 78–79

The average number of pigs owned and sold among livestock keeping households in rural and urban areas of Uganda is summarized in Table 15. It can be seen that livestock keeping households owned at least 0.8 pigs and sold on average 0.2 pigs. By contrast, male-headed households own 0.8 pigs and sold 0.3 pigs, while female-headed households own 0.7 pigs and sold 0.2 pigs on average. This distribution is not significantly different across male-headed and female-headed households.

Table 15. Number of pigs owned and sold by urbanization and sex of household head, 2009/10

Regional identifier	Number of pigs owned at the end of the past 12 months			Number of pigs sold within the past 12 months			
	Sex of the household head			Sex of the household head			
	Male	Female	Total	Male	Female	Total	
Rural	Mean	0.8	0.7	0.7	0.3	0.2	0.3
	Sd	1.7	1.3	1.6	1.2	1.0	1.2
	N	958	332	1,290	958	332	1,290
Urban	Mean	1.0	1.2	1.1	0.1	0.4	0.2
	Sd	2.7	2.5	2.7	0.8	1.4	1.0
	N	112	46	158	112	46	158
Total	Mean	0.8	0.7	0.8	0.3	0.2	0.2
	Sd	1.9	1.5	1.8	1.2	1.0	1.1
	N	1,070	378	1,448	1,070	378	1,448

Notes: (i) Figures in the table include means, standard deviations and frequencies; (ii) Statistics in the table were computed by author based on UBOS 2009/10 round of UNPS survey.

Table 15 further indicates that the number of pigs owned by male and female farmers is lower in rural areas compared to urban areas. However, when it comes to pig sales, male-headed households appear to sell more (0.3) pigs in rural areas than their male counterparts in urban areas. Conversely, it is the urban female-headed households that sell more (0.4) pigs than their female-headed counterparts in rural areas. These findings suggest that pig farmers in urban areas own a slightly higher numbers of pigs than rural-based pig keeping farm households, contrary to popular views about 'the many pig numbers on rural farms.' Furthermore, when it comes to the number of pigs owned and sold, and the percentage of pigs sold compared to the total number of animals owned, pig-keeping female-headed farm households are outperforming their male-headed counterparts. This is true whether households are in the rural areas or urban areas of the country.

Table 16 represents a summary of the average number of pigs owned and sold across the four regions of Uganda in 2009/10. These were computed based on livestock keeping farm households, which were 13 in Kampala area; 315 in Central region; 364 in Eastern region; 414 in Northern region and; 342 in Western region. The average number of pigs is highest (1.8 pigs) in Kampala, followed by Central region with an average of 1.6 pigs, the Eastern and Western regions have similar levels (0.7) of pig endowments, while the number of pigs owned is least (0.2 pigs) in the Northern region.

Table 16. Number of pigs owned and sold by region and gender in 2009/10

Regional identifier	Statistics	Number of pigs owned at the end of the past 12 months			Number of pigs sold within the past 12 months		
		Sex of household head			Sex of household head		
		Male	Female	Total	Male	Female	Total
Kampala area	Mean	0.3	3.0	1.8	0.0	0.6	0.3
	Sd	0.8	4.4	3.4	0.0	1.1	0.9
	N	6	7	13	6	7	13
Central without Kampala	Mean	1.6	1.4	1.6	0.7	0.5	0.6
	Sd	2.7	1.7	2.5	2.0	1.6	1.9
	N	227	88	315	227	88	315
Eastern region	Mean	0.7	0.8	0.7	0.2	0.1	0.2
	Sd	1.6	1.8	1.6	0.8	0.7	0.8
	N	277	87	364	277	87	364
Northern region	Mean	0.2	0.1	0.2	0.1	0.1	0.1
	Sd	0.6	0.4	0.5	0.6	0.6	0.6
	N	286	128	414	286	128	414
Western region	Mean	0.8	0.6	0.7	0.2	0.3	0.2
	Sd	1.9	1.2	1.8	1.0	1.2	1.0
	N	274	68	342	274	68	342
Overall		0.8	0.7	0.8	0.3	0.2	0.2
		1.9	1.5	1.8	1.2	1.0	1.1
		1070	378	1448	1070	378	1448

Notes: (i) Figures in the table include means, standard deviations and frequencies. (ii) Statistics in the table were computed by author based on UBOS 2009/10 round of UNPS survey.

In terms of gender differences, we see that male- and female-headed farm households in Kampala area own an almost equal number (0.3) of pigs. The number of pigs owned by female-headed farm households is 0.8 and is slightly higher than pig endowments (0.7 pigs) of male-headed farm households in the Eastern region. On contrary, it is in the Central region (without Kampala), Northern, and Western regions that male-headed farm households appear to own more pigs than their female-headed farm households.

The average number of pigs sold/household in 2009/10 is highest in the Central region (0.6 pigs); whereas in the other regions, including Kampala, the average number of pigs sold range between 0.1–0.3, a level that is considered low, possibly due to underreporting. The average proportion of pigs sold to total pigs owned is found to range between 20% in Kampala region; 38% in Central region; 29% in Eastern region; 29% in Western region and 50% in the Northern region. This proportion may represent the right situation of pig sales for a typical smallholder pig producer that is not a commercial grower or fattener. Still, female-headed farm households sell more pigs than male-headed farm households in the Kampala area and Western region of the country.

The regional distribution of the number of pigs owned and sold has not changed much since year 2000. Table 17 shows that the average number of pigs owned per household was highest (2.2) in the Central region, followed by 1.6 pigs in the Eastern region, 1.4 pigs in the Western region and was least (1.1 pigs) in the Northern region. In terms of pigs sold, this was highest (2.5 pigs) in Central region and least (1.0 pigs) in the Eastern region.

Table 17 further reveals that in all regions of the country, male-headed farm households dominate female-headed farm households in the number of pigs owned and sold. This gender bias is reducing especially in Kampala area and in the Eastern region of Uganda. There is need to understand the major constraints faced by women pig farmers in the country, especially in the Central, Western and Northern regions of the country.

Table 17. Number of pigs owned and sold by region and gender in 2000/01

Regional identifier	Statistics	Number of pigs owned at the end of the year			Number of pigs sold in the past 12 months		
		Sex of household head			Sex of household head		
		Male	Female	Total	Male	Female	Total
Central region	Mean	2.3	1.3	2.2	2.6	1.7	2.5
	Sd	2.1	1.2	2.1	3.3	1.6	3.1
	N	35	6	41	35	6	41
Eastern region	Mean	1.7	0.3	1.6	1.0	0.5	1.0
	Sd	1.9	0.5	1.8	2.1	1.0	2.0
	N	61	4	65	61	4	65
Northern region	Mean	1.1	.	1.1	1.7	.	1.7
	Sd	1.1	.	1.1	2.8	.	2.8
	N	7	0	7	7	0	7
Western region	Mean	1.5	0	1.4	1.8	0.0	1.7
	Sd	1.9	0	1.9	2.8	0.0	2.8
	N	16.0	1.0	17	16	1	17
Total	Mean	1.8	0.8	1.7	1.6	1.1	1.6
	Sd	1.9	1.1	1.9	2.7	1.4	2.6
	N	119	11	130	119	11	130

Notes: (i) Figure in the table include means, standard deviations and frequencies. Computed by author based on IFPRI 2001 data on policies for improved land management in Uganda.

## Regional distribution of pig ownership by education level

The distribution of the number of pigs owned was computed by education level of household heads in all the four regions of Uganda and Kampala region. Results of this computation are displayed in Table 18 for the 2000/01 data set and Table 19 for the 2009/10 data set. Regional distribution of pigs in relation to education level of household heads appears to have changed drastically since 2000. Table 18 shows that pig farmers in the Central region had the highest number of pigs (2.2) in 2000/01, when compared to 1.6 in the Eastern region, 1.4 pigs in Western region and 1.1 pigs in the Northern region. Households with primary and secondary education owned relatively fewer pigs than households with no formal education. In the past decade therefore, households with more years of education and a relatively higher level of income have increased their participation in pig rearing. It is now the relatively more educated and economically better off pig farmers that own more pigs than farmers with no formal or few years of education. Piggery is now seen as a “good business” although the number of animals may not point to a high level of commercial orientation.

It is also clear from Table 19 that there has been an increase in the number of pigs owned with every increasing level of education of household heads. Overall, households with no formal education have few (0.5) pigs, while those with the university education have the highest number (1.5) of pigs. This trend of pig ownership is true in all regions, particularly in Central region, where we find a relatively high level of urbanization and the largest proportion of pig farmers. Education level and the extent of urbanization in a region may therefore have a positive influence on the number of pigs kept by a household.

Table 18. Average number of pigs owned by education level and region in 2000/01

Highest level of education attained by household head	Statistics	Different regions of Uganda					Total
		Kampala	Central	East	Northern	Western	
No formal education	Mean	0.0	1.0	0.6	0.2	0.6	0.5
	Sd	0.0	1.5	1.1	0.6	1.7	1.2
	N	2	60	71	119	78	330
Primary education	Mean	2.3	1.5	0.8	0.2	0.8	0.8
	Sd	2.1	2.3	1.8	0.5	1.6	1.7
	N	4	180	202	213	199	798
Secondary education	Mean	0.0	2.7	0.8	0.2	0.9	1.1
	Sd	0.0	3.6	1.4	0.6	2.9	2.5
	N	2	53	56	54	47	212
Tertiary college/diploma	Mean	0.7	0.9	0.7	0.1	0.8	0.6
	Sd	1.2	1.4	2.0	0.3	1.0	1.4
	N	3	19	31	26	17	96
University/postgraduate education	Mean	6.0	2.7	0.0	0.0	0.0	1.5
	Sd	8.5	4.6	0.0	0.0	0.0	3.8
	N	2	3	5	2	1	13
Total	Mean	1.8	1.6	0.7	0.2	0.7	0.8
	Sd	3.4	2.5	1.6	0.5	1.8	1.8
	N	13	315	365	414	342	1449

Notes: (i) Figures in the table include means, standard deviations and frequencies, (ii) Very few households, whose heads had attained university or postgraduate education in 2000/01 owned pigs, (iii) Computed by author based on IFPRI 2001 data on policies for improved land management in Uganda.

Table 19. Average number of pigs owned by education level and region in 2009/10

Highest level of education attained by household head	Statistics	Central region	Eastern region	Northern region	Western region	Total
No formal education	Mean	3.5	2.1	.	0	2.2
	Sd	4.9	2.4	.	0	2.7
	N	2	7	0	1	10
Primary education	Mean	1.9	1.0	1.0	1.6	1.4
	Sd	1.4	1.1	0.8	2.3	1.4
	N	26	30	4	10	70
Secondary education	Mean	2.6	1.7	1.3	1.3	1.9
	Sd	2.8	1.3	1.5	1.2	1.8
	N	12	26	3	6	47
Tertiary college/diploma	Mean	2.0	6.5	.	.	5.0
	Sd	0.0	6.4	.	.	5.2
	N	1	2	0	0	3
Total	Mean	2.2	1.6	1.1	1.4	1.7
	Sd	2.1	1.8	1.1	1.9	1.9
	N	41	65	7	17	130

Notes: (i) Figures in the table include means, standard deviations (sd) and frequencies (n), (ii) Statistics in the table were computed by the author based on UBOS 2009/10 round of UNPS survey

## Pig ownership and household welfare in Uganda

In this section, we compare the distribution of pigs that were owned and sold across livestock keeping households in different quartiles (25%) of income. The question is whether households with varying levels of welfare significantly differ in the number of animals owned and sold. Results in Table 20 show that the average size of a household was 7.3 adult-equivalents<sup>8</sup> in 2000/01, whereas it was only 4.7 adult-equivalents in 2009/10. There is no clear explanation for the reduction in household size in a 10-year period. It could be attributed to the limitation of relatively small data set in 2000/01 and problems of field sampling.

Table 20. Distribution of pig ownership, sales and slaughter by quartiles of household income/adult-equivalents, 2000–2010

Particulars Income quartiles (in 2000/01)	Quartiles	Household adult-equivalent	TLUs	Owned	Sold	Slaughtered
Very poor (25%)	1	7.3	1.2	1.1	0.4	0.0
Less poor (25%)	2	7.9	1.5	1.8	1.0	0.1
Rich (better off) (25%)	3	7.7	1.6	2.1	1.9	0.1
Very rich (25%)	4	6.3	2.2	1.8	3.1	0.1
Total		7.3	1.6	1.7	1.6	0.1
Income quartiles (in 2009/10)						
Very poor (25%)	1	4.6	0.7	0.8	0.2	0.0
Less poor (25%)	2	4.9	1.1	0.7	0.3	0.0
Rich (better off) (25%)	3	4.8	1.2	0.6	0.3	0.0
Very rich (25%)	4	4.5	1.6	1.1	0.3	0.0
Total		4.7	1.2	0.8	0.2	0.0

Notes: (i) Statistics in the table were computed by the author based on UBOS 2009/10 round of UNPS survey; TLUs denotes tropical livestock units; (ii) Livestock and TLU<sup>9</sup> equivalent are cows = 0.5, ox = 0.5, sheep = 0.10, goats = 0.10, pigs = 0.20, donkeys = 0.5, chicken birds = 0.01, other birds (turkey, ducks and pigeons) = 0.03, and rabbits = 0.20.

A unique correlation seems to exist between the tropical livestock units (TLUs) and household welfare. The number of TLUs and the number of pigs owned or sold increase with household income. Livestock keeping households in the very rich income quartile owned the largest (2.2) TLUs in 2009/10 and 1.6 TLUs in 2000/01; a finding that reveals an increase in the number of livestock endowment in the past 10 years. And while it is the “rich” (i.e. households in quartiles 3) that owned the highest number (2.1) of pigs in 2000/01, we see that this changed in 2009/10, where it is the very rich households in quartile 4 that reported owning the highest number (1.1) of pigs, followed by the very poor households (with 0.8 pigs), the less poor (with 0.7 pigs) and lastly, the rich households with the average of 0.6 pigs.

Although, a strong positive correlation is observed to have existed in 2000/01 between the number of pigs sold and household income level, this changed in 2009/10 (see Table 20). Unlike households in the very poor income quartile, households in all other quartiles (2, 3 and 4) appear to be selling similar average numbers of pigs. The number of pigs slaughtered has also reduced drastically, from the average of 0.1 pigs in 2000/01 to almost zero in 2009/10, a further confirmation that pig farmers prefer to sell live pigs compared to already slaughtered pig carcasses. Nevertheless, the number of pigs owned/household appears to have declined in the last 10-year period, regardless of income level.

8. Adult-equivalents are scales that are used to control for age-gender differences in nutritional (food) requirements of members within a household as determined by health experts. In this study, (i) the scales for male members ranged from 0.25–0.60 for age <1–5 years; 0.63–0.73 for 6–10 years; 0.78–0.98 for 11–15 years; 1.00 for 16 years; 1.02 for 17 years; 1.00 for 18–29 years; 0.99 for 30–59 years; 0.86 for >=60 years; (ii) the scales for female members ranged from 0.23–0.54 for <=1–5 years; 0.57–0.67 for 5–10 years; 0.71–0.88 for 11–15 years; 0.89 for 16 years; 0.87 for 17 years; 1.00 for 18–29 years; 0.87 for 30–39 years; 0.86 for 40–59 years; and 0.77 for >=60 years.

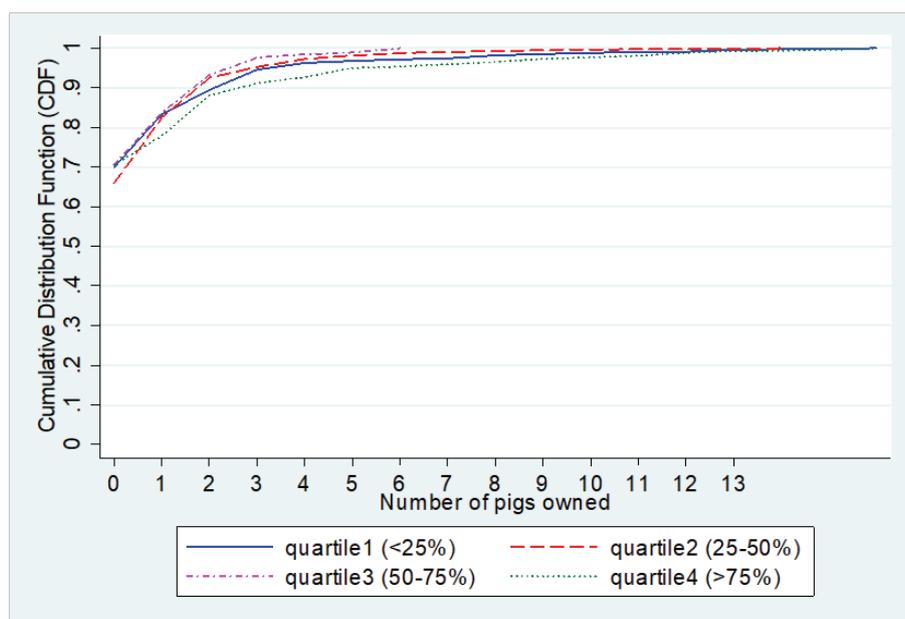
9. We computed TLU equivalent for livestock species based on FAO weights for sub-Saharan Africa (see Jahnke 1982) and the Compendium of Agricultural-Environmental indicators 1989-91 to 2000 (Statistics Division, FAO, November 2003).

## First-order stochastic dominance analysis

The first-order stochastic dominance analysis (FOSDA) is conducted to assess the distribution of the number of pigs owned across households in different quartiles of income and expenditure. The two measures of welfare are standardized to household size in terms of adult equivalents in order to ensure a meaningful comparison. According to Levy (1992), the FOSDA utilizes the cumulative density function (CDF) to evaluate the statistical differences in the variable of interest. The FOSDA of a dominant category of households has a lower cumulative density when compared to the dominated category of households. Graphically, the CDF curve of the dominated quartile is located to the left of the CDF curve of the dominating alternative quartile. This is based on the assumption that households maximize expected utility and therefore have preference for more numbers of pigs to less.

Figure 14 presents FOSDA results for the number of pigs owned by households in the four quartiles of income/adult-equivalent. The CDF for the number of pigs owned among households in the richest income quartile is on the extreme right of the alternative poorest three income quartiles. This suggests a first-order stochastic dominance of households in income quartiles 1, 2 and 3 by households in quartile 4. The number of pigs owned is therefore statistically highest for the richest 25% of the households. We see that the CDF curves for each of the 3 lower quartiles cross each other. This implies that households in lower quartiles (i.e. 25% of the poorest, 25% of the less poor, and 25% of the rich) appear to own pig numbers that are not statistically different. There is no statistical dominance across households in the poorest three income quartiles.

Figure 14. The first-order stochastic dominance analysis (FOSDA) for households, comparing the number of pigs owned in the four welfare quartiles of income/adult-equivalent, 2009/10



Figures 15 and 16 are based on primary data set in 2000/01. They display the FOSDA for the distribution of pig numbers owned across households. And while the CDF plot in Figure 15 is based on welfare measure of household income/adult-equivalent, the CDF plot in Figure 16 is derived from the expenditure/adult-equivalent.

The two figures (15 and 16) of the FOSDA reveal a different pattern of dominance from the one in 2009/10. Households in the richest three quartiles (quartile 2, 3, and 4) are dominating the ones in quartile 1 (the poorest 25%). There is no clear dominance in terms of the number of pigs owned among households in quartiles 2, 3 and 4. This finding shows that although there has been an increase in the number of pigs reared and the number of people owning pigs in the country, this increase appears to have been more pronounced among the richest 25% and poorest 25% of households.

Figure 15. The first-order stochastic dominance analysis (FOSDA) for households, comparing the number of pigs owned in the four welfare quartiles of income/adult-equivalent, 2000/01

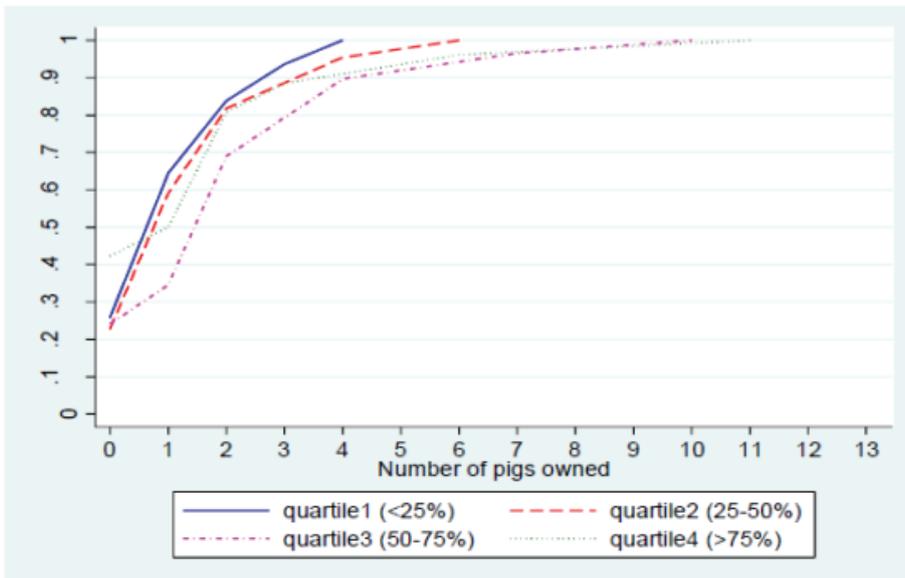
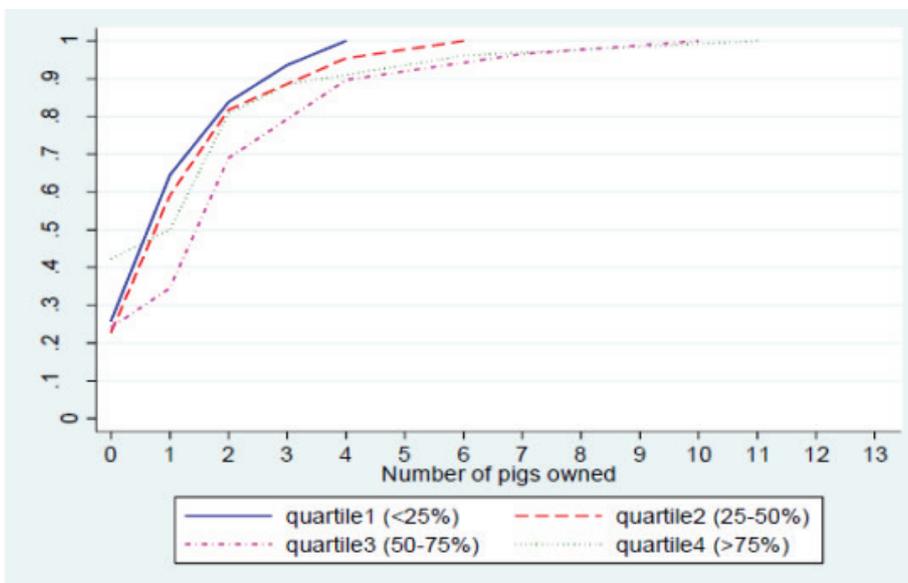


Figure 16. The first-order stochastic dominance analysis (FOSDA) for households, comparing the number of pigs owned in the four welfare quartiles of expenditure/adult-equivalent, 2000/01



## Pig production systems

Pig production in Uganda typically occurs on smallholder farrow-to-finish (i.e. farrowing, growing and finishing), farrow-to-wean and finishing (fattening) operations. Smallholder farrow-to-finish and finishing operations normally have 1–4 slaughter pigs at any given time and make up 60–80% of farming operations, while farrow-to-wean operations are few and normally have 1–3 sows (Lule 2017).

## Farrow to wean

In this pig production system, a parent stock of pigs is kept, which gives birth to piglets that are reared up to weaning, then sold to finishers for fattening and slaughter. Breeds kept in this system must be on demand in the farmer's locality and farmers must follow the basics of scientific breeding in order to meet market requirements (Mulindwa 2016). However, this is not always the case. The farmer should be knowledgeable about the different pig breeds and their potential in terms of meat quality/quantity and litter size. In case the piglets are not bought, which may happen, there should be a plan in place to grow the pigs until marketable slaughter weights.

## Farrow to finish

This system of pig production, piglets are raised, weaned, grown and fattened in one unit. Unlike other systems where piglets move to other operators at each major stage of their development, here they are grown until marketable slaughter weight at the same farm. The marketable products are pork or live pigs to slaughterhouses. The farrow to finish production system is recommended in localities where markets for piglets is limited.

## Fattening (wean to finish)

This is a pig production system in which weaned-off piglets are continuously bought and grown for pork. After the sale of the existing stock, the farmer orders new piglets to continue the farming cycle. No parent stock is kept on farm. Like farrow to finish system of pig production, the fatteners also target to sell pork or live pigs. Hence, stocking quality pigs is paramount to meeting market demand requirements in terms of quality and quantity.

## Systems of management

This section presents a pig production profile with key features including organizational strategies, level of employment, income generated and gender issues. The majority of pigs in the country are produced under the subsistence system, but a few commercial units exist (Twinamasiko 2001b). Pig production in Uganda is characterized by quick turnover and is therefore appropriate for smallholders who operate using small short-term loans. Pig keeping in Uganda is categorized in three basic management systems: (i) intensive, (ii) semi-intensive, and (iii) extensive (small-scale subsistence) management systems.

## Intensive pig management system

In the intensive system, pigs are kept housed all the time in a small place where they are provided with feeds, water and protection from extreme weather (Mutetikka 2009, Pezo and Waiswa 2012). While this system is characterized by higher demand for labour and other inputs, it is considered to provide higher farm output that is vital for commercial production. This system accounts for a small proportion of pig production in Uganda (less than 10%). There are few farm units in the country that keep up to 100 pigs.

The system requires significant capital, management skills and aggressive marketing arrangements. The system allows the farmer to ensure easy selection of breeding stock, faster growth of pigs, effective control of diseases/internal parasites, good hygiene in the pens, minimum mortality rates of piglets (due to crushing, starvation, chilling and cannibalism by sows when starved), easy harvesting of manure and market supply of live pigs.

## Semi-intensive pig management system

This system of pig production is where pigs are partly housed and partly kept outdoors on the pasture (Mutetikka 2009). Semi-intensive pig management is rare in Uganda, but can be found in areas where the price of pork is highly remunerative. The fact that pigs are confined to a limited space in this system provides opportunities to improve feeding, growth rate, disease control, control of heat stress, enhancement of mating (boars become active when not housed full time) and to have better quality animals (Pezo and Waiswa 2012). Pig farms that adopt this system may

have to invest in more inputs such as compounded feeds and mineral supplements, high amounts of labour and can enjoy relatively high farm output.

## Extensive (small-scale subsistence) pig management system

The extensive pig production system is the simplest and most common system in Uganda (almost 90% of the country's pigs are kept in this system). Pigs are kept outdoor, on pasture all the time. It can be the free range scavenging type where pigs are allowed to freely move around the homestead as they feed on their own, or the tethered type where pigs are tied on the rope to limit their movement to a specific space. Some feed (waste food and crop residues) are usually provided to tethered pigs and labour input is needed to keep moving the animals from one place to another (Pezo and Waiswa 2012). This system is often practiced by the very poor, who invest in a low-cost/low-output farming system that characterizes subsistence production in Uganda's livestock subsector. Pig management in this system is often poor and there is no breeding program (Twinamasiko 2001b), while routine management procedures (e.g. teeth trimming, deworming and general hygiene) are rarely practiced at all in this system. There is also little information regarding the structure and composition of the extensive pig management system in Uganda.

## Scale of production

Based on the scale of production, pig farms can be classified as industrial, large farm and smallholder/subsistence farms.

### Industrial pig farms

There are few larger modern pig farms in Uganda that practice intensive pig production (more than 500 pigs) for commercial sale. These farms are mostly found near Kampala and provide pork to the formal markets that includes commercial butcheries, larger restaurants and hotels and meat/pork processors.

### Large-scale pig farms

There are also few large pig farms in Uganda that keep more than 30 pigs. The majority are considered medium-scale pig producers who keep between 5–30 pigs. They are often organized in small groups and supported by NGOs, government and donor programs (Mutetikka et al. 2009).

### Smallholder pig farms

Smallholder farms (farms with less than 5 pigs) are widespread in the peri-urban and rural areas of the country. Most of these farms have on average 2–5 pigs, which are often kept under poor management conditions. The pig industry has suffered hindrances from lack of foreign and internal investments (MAAIF and NAADS 2011), but despite this, the smallholder pig farmers in the country that have continued to sustain pig farming. The nature of smallholder farm systems in Uganda is complex given the varied mix of animals and crops found in them, and the highly diversified income sources that household members engage in. The system is associated with low costs of investment but it provides meat for home consumption and for sale to the majority rural poor.

Smallholders pig production is frequently associated with improper feeding, poor productive performance, slow growth and inferior carcasses (Twinamasiko 2001b). The poor disease control on smallholder farms can lead to higher risk of disease spread (especially the internal parasites) between pigs and humans.

Smallholder pig farmers may also engage in breeding animals to produce piglets that are sold to other farmers that specialize in growing and fattening pigs. According to Pezo and Waiswa (2012), understanding the determinants of success and failure of this type of specialization at farm level can help identify the needs at different times that can trigger efficiency in marketing pig products.

## Factors influencing trends in production

Several factors are widely considered to have influenced pig production in Uganda. Many small-scale producers are increasingly choosing to participate in piggery as a reliable source of income and storage of wealth. Consequently, the share of households that keep pigs has increased across the country. This increase can be attributed to the country's growing local market for pork (even in rural areas), price of pork that is still largely affordable to many consumers, use of a more highly motivated family labour in most poor households, low cost of hired labour, flexibility to sell pigs when economic needs arise, good climate that supports pigs in the extensive systems, access to suitable land that allows the production of cheap local feeds and access to the necessary veterinary services in some areas.

But pig production continues to face constraints that include pig diseases (particularly African swine fever) and parasites, poor breeding, lack of capital for investments, limited access to advisory services, insufficient research, lack of organized marketing and absence of processing industries.

Urbanization, population and purchasing power in Uganda have increased. These have, in turn, boosted demand and consumption of pig meat and other livestock products. The market for pork though still disorganized, has increased and continues to increase in urban areas (Twinamasiko 2001b). Unlike at homes where pork consumption is still small, the demand for ready-to-eat pork in social places known as "pork joints" is increasing. This is true whether such social places are in urban or rural areas. An improvement in the pork market has contributed to enhanced production. However, the market price is still not good enough to encourage high-quality pork production even though gourmet industries and butcheries are mushrooming in Kampala, the main city. The consequent demand for more live pigs and for quality pork cuts has contributed to a significant growth of pig production.

Lack of good breeding stock and planned breeding schemes for smallholder pig farmers has resulted in a high level of inbreeding, thus leading to small litter size, poor growth rates and small animal size, especially in the so-called "local pigs". Most pigs are small in size, and this is the case even on farms with good management practice. In this regard, there is need to put more emphasis on the selection of good piglets for reproduction; improvement of breeding programs, and eventually the use of artificial insemination (AI) with selected boars to boost yields and minimize genetic disorders.

Productivity of pigs tends to reduce during the dry season due to the poor feeding. Given that most pigs in smallholder households in Uganda are fed on kitchen and farm wastes (e.g. cassava leaves, sweet potato vines and banana peelings) seasonality becomes a crucial issue. Any improvements on feed quality and quantity will lead to an upgrade of the pig value chain. The formulation of complete rations including sweet potato silage is a solid technical achievement towards addressing the nutrition challenge in the value chain.

It is therefore important to explore ways of ensuring that farmers learn how to formulate improved pig diets using available crop residues and by products such as maize bran, rice bran, banana fruits, banana peelings, brewers' and distillers' grain, soybean meal, cotton seed meal, fishmeal and sugarcane molasses. Strategic supplementation of basal diets can also be made using sweet potato vines, yam and cassava leaves, banana stems, pawpaws, pineapples, pumpkins, tomatoes and some grasses. The use of commercial feeds on intensive and semi-intensive farms is increasing, and this is further contributing to an increase in growth rates and piggery productivity in general, but their utilization should be strategic in order to reduce costs of production.

For many years, social and religious affiliation has been a serious constraint for pig production. In many Muslim-dominated communities, pig production is not encouraged. The increase in commercial production of pigs is, however, changing these cultural and religious attitudes slowly in many parts of Uganda. There is an increase in the number of smallholder households rearing pigs, which are now more than one million. The work of NAADS and other stakeholders in promoting pig production has also contributed to the increase in total output of pig meat.

# Import and export of live animals and meat products

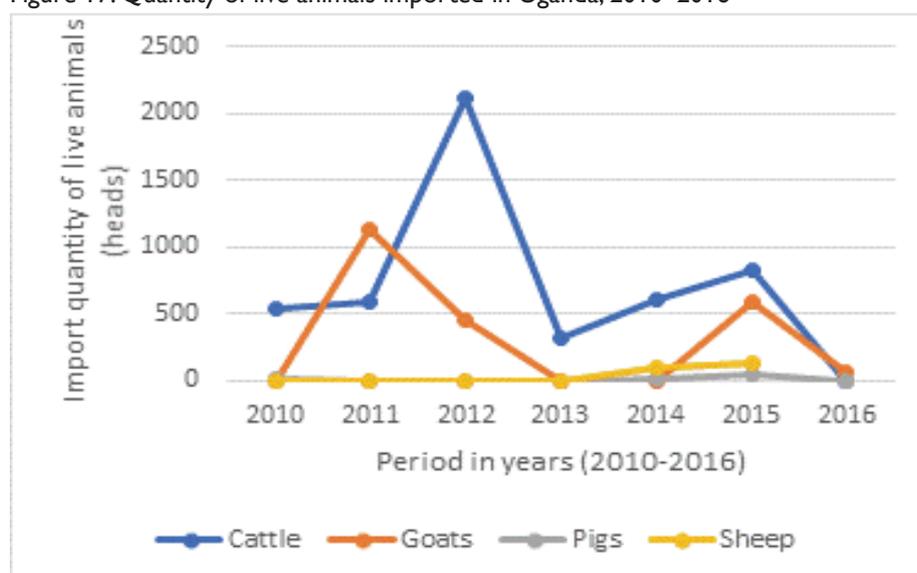
Livestock trade in Uganda is limited. The value of livestock imports in general is almost nonexistent (FAO 2005). The official export trade constitutes a small portion of the value of trade in the country, amounting to no more than 1.5% of the total export value (IGAD 2013). Informal cross-border livestock trade does take place, but it is considered insignificant in increasing the share that livestock contributes to national exports. Uganda is a net exporter of livestock products and live animals. Livestock exports are dominated by dairy products and eggs (worth USD80 million), with meat and meat products (worth USD6.2 million) playing a minor role (FAO 2019).

The level of exports of live animals and meat products is still low, and this is probably due to high domestic demand, poor quality of meat products, lack of export standard abattoirs, and the low levels of production as a result of various livestock diseases and other constraints. Nevertheless, the potential for regional trade and exports to the neighbouring countries is high (Omamo et al. 2006). Uganda exports live animals and meat products to various countries including Kenya, Tanzania, Rwanda, Southern Sudan and the Democratic Republic of Congo (DRC) (Agriterria-EKN 2012). The number of live pigs exported is low.

## Trends in level of import and export

Import data from FAOSTAT (2016) shows Uganda registered cattle imports of slightly above 500 heads in 2010 and 2011 (Figure 17). An increase of imports was registered in the following year (2,117 heads) and a sharp decline (315 heads) thereafter. The trend was repeated in the subsequent years. There is almost nonexistence of imports of other types of livestock in the year 2010. There was a similar trend in imports of goats with the highest imports reported in 2011 of 1,131 goats. The highest imports of pigs were reported in 2015 of about 45 heads.

Figure 17. Quantity of live animals imported in Uganda, 2010–2016



An increase in cattle and goats export was observed between 2012 and 2014 followed by a decline in the subsequent years (Figure 18). Pig export were reported in 2010 and 2013 with only 172 and 8 heads respectively. Sheep exports were almost nonexistent.

Figure 18. Quantity of live animals exported out of Uganda, 2010–2016

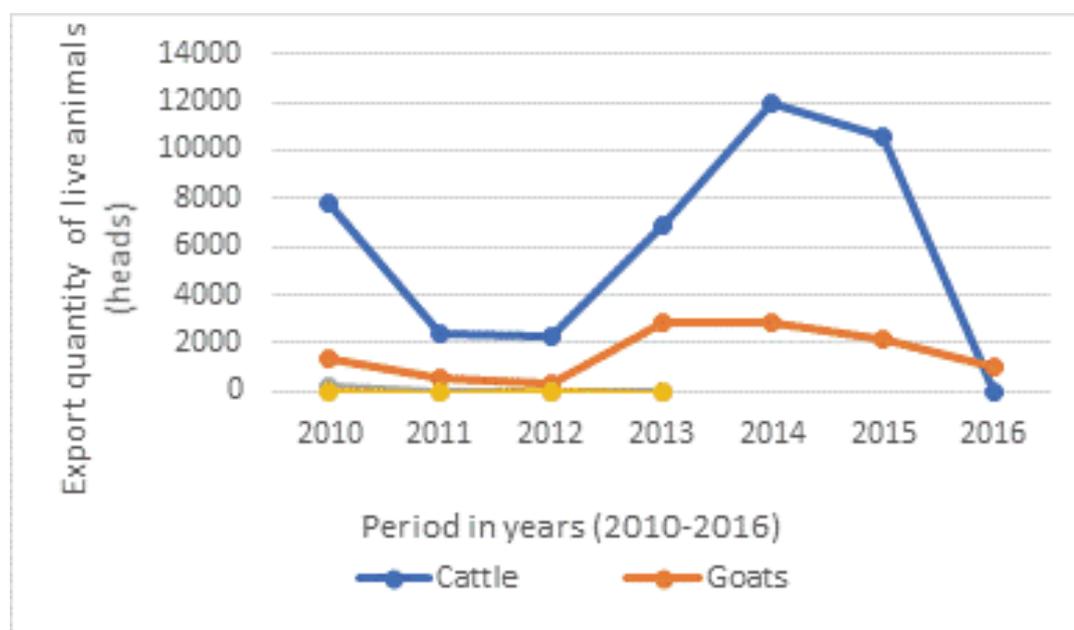


Table 21 presents further comparison of imports and exports of live animals. The current trend is not far from that of 2009. The net imports show that, in 2018, more cattle and goats were exported than imported. A few pigs were imported but none exported. The net imports for animal products shows that dairy led in dairy and dairy product exports (Table 22). FAOSTAT data also showed that there were more exports than imports of pig meat (Table 22). There was an increase in the net imports of pork, poultry meat and sausages.

Table 21. Net imports of live animals in Uganda, 2018

Item	Imports	Exports	Net imports
Chicken (1000 Head)	4,421	569	3,852
Cattle (Head)	824	10,609	-9,785
Goats (Head)	585	2173	-1,588
Pigs (Head)	45	0	45
Sheep (Head)	133	0	133

Source: FAOSTAT, FAO Statistics Division 2018 | 27 June 2018, (a negative number implies exports).

Table 22. Net imports of animal products in Uganda, 2015

Item	Import quantity (t)	Exports quantity (t)	Net imports (t)
	2015	2015	2015
Cow milk, whole, fresh	1,195	6,730	-5,535
Cream Fresh	3	458	-455
Chicken meat	259	101	158
Duck meat	1	23	-22
Cattle meat	0	6	-6
Sheep meat	5	0	5
Pig meat	80	167	-87
Turkey meat	10	0	10
Sausages of pig meat	920	0	920
Oils, fats of animal	285	285	0
Total quantities			
Animal fats + (Total)	348	286	62
Bovine meat + (Total)	40	232	-192
Butter + (Total)	79	1,709	-1,630
Canned meat net + (Total)	1,056	18	1,038
Cheese and curd + (Total)	93	27	66
Eggs in the Shell + (Total)	26	364	-338
Eggs liquid, dried + (Total)	1	91	-90
Meat offals fresh + (Total)	1		1
Meat poultry fresh + (Total)	270	125	145
Meat sheep fresh + (Total)	5		5
Milk dry + (Total)	555	6902	-6,347
Milk equivalent + (Total)	6,768	81,486	-74,718
Milk fresh + (Total)	1,235	15,426	-14,191
Offals edible fresh + (Total)	0	33	-33
Other meat + (Total)	1		1
Ovine meat + (Total)	5		5
Pig meat + (Total)	1010	167	843
Poultry meat + (Total)	424	150	274
Sausages + (Total)	920		920

Source: FAOSTAT, FAO Statistics Division 2018 | 27 June 2018 (a negative number implies exports)

## Factors influencing trends

Local and regional demand for pork has increased as a result of changes in tastes, and rising incomes and human population. The informal nature of pig trade, including lack of cooling transport facilities, means that pork quality is still not adequate to meet the standards of export markets. As a result, almost all the pork produced in the country is consumed in the domestic market, and usually sold the same day animals are slaughtered. Production and consumption of other livestock meat such as bovine meat is reducing, whereas pork consumption is increasing.

## Niche markets

The market for live pigs, piglets and pig manure is more pronounced in rural areas and at farm level. The market for adult pigs for slaughter is bigger in collection centres (wet markets) in urban areas. Traders transport pigs from rural areas to collection centres, which are also directly linked to slaughterhouses. Pig carcasses and pork pieces are sold to consumers from butcher shops located along the roads, supermarkets, and ready-to-eat pork joints. There are also unreported pig/pork sales taking place (informally) across the borders especially between the county and South Sudan and DRC.

## Informal versus formal trade

Most of the transactions of live pigs and pork products take place in the informal markets that include on-farm exchanges, informal slaughter places, roadside butcheries and informal ready-to-eat pork joints. Recently, formal markets have started dealing in good-quality premium products for rich consumers. These formal markets include organized shops that sell fresh cuts, fresh pork, and frozen pork products. Nevertheless, informal trade dominates the pork market.

# Inputs and services

## Inputs and services: animal health

This section focuses on key animal health constraints and access to veterinary service. The incidence of pests, vectors, and diseases in the livestock sector in Uganda is high. Several diseases are known to affect pigs in the country including, among others, African swine fever (ASF), foot and mouth disease, helminthosis, scabies, mange (i.e. skin disease characterized by intense itching and caused by mites), coughing, diarrhoea, and foot rot.

Controlling these diseases and vectors is one of the priority areas of Uganda's Agriculture Sector Strategic Plan (ASSP 2015/16–2019/20). Several strategies are employed to ensure animal health including among others: recruitment and training of personnel, building capacity for diagnosis, establishing a traceability system and enforcing quarantine regime, strengthening surveillance and reporting, enforcing standards, creating awareness, and increasing support to local governments (GoU 2011).

### Structure of animal health sector

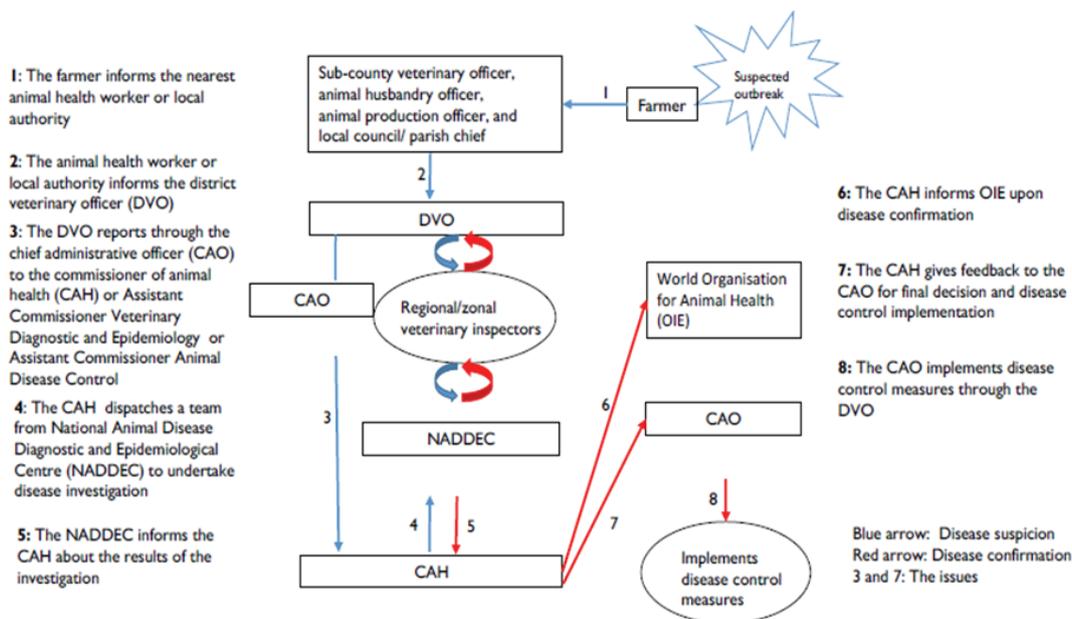
The Ministry of Agriculture, Animal, Industry, and Fisheries (MAAIF) is responsible for overseeing the animal health infrastructure in Uganda. Details of the macro structure of MAAIF are summarized in Figure A5 in the appendix. Under MAAIF, the Directorate of Animal Resource is responsible for livestock development. The directorate has three departments, namely (i) animal production, (ii) animal health and (iii) entomology. The Commissioner of Animal Health (CAH) has the mandate of overseeing activities on disease control, veterinary inspection and regulation (see organizational structure of Animal Health Department in the appendix, Figure A6). Government veterinary inspectors and officers in MAAIF and in the local governments (district level) work together with other agricultural extension workers from NAADS and NGOs to ensure improvements in animal health. Veterinary authorities are mandated to physically inspect pigs and other animals to ensure that they are free from diseases, vectors and pests.

The private veterinary service providers, drug shops, and community-based animal health service providers (includes farmers that operate legally in the Karamoja region) supplement the work of government veterinary officers in reaching out to pig and other livestock farmers. They provide farmers with information on disease control and drugs to treat pig diseases. Furthermore, the big pharmaceutical companies (e.g. Coopers, Eram, Norbrook etc.) are also active in disease control by supplying animal drugs.

### Management structure of livestock disease outbreak

The Animal Diseases Act, CAP 38, 1918, which was revised in 2006, provides guidelines for handling epidemic diseases, such as ASF. These include steps for reporting and confirming the disease; regulation of the movement of animals, carcasses, hides and skins; the powers of relevant officers; compensation of farmers; the declaration of infected areas; and relevant legislation and regulations, including the type of offences and penalties for transgression. The legislation outlines the obligations of farmers to notify the nearest veterinary authority about sick animals, the duty of veterinary personnel and other stakeholders to report any suspected disease to the CAH within 24–48 hours and the authority bestowed upon veterinary officers in districts for animal health diagnosis. The structure of the disease management in Uganda is presented in Figure 19.

Figure 19. Current management structure of livestock disease outbreaks in Uganda



Source: Dione et al. 2017

This management structure potentially places district veterinary officers (DVO) in a difficult situation, since they are only indirectly responsible to the CAH. The Local Government Act of 1995 that established local authorities at district level decentralized the chain of command in all technical departments, including making the chief administrative officer (CAO) the technical head of the district. The CAO is responsible for supervising and coordinating all delegated government services (Local Government [amended] Act 2015). DVOs are likely to be discouraged from implementing disease control measures that conflict with political decisions or which may lead to a loss of income to the district (Dione et al. 2017). The law further weakens the district veterinary command structure by turning district local government bodies into corporate entities. Consequently, this may lead to a delay in reporting disease outbreaks to the CAH and, as such, indirectly jeopardize disease control efforts. Streamlining the reporting structure, particularly in the case of disease, would significantly improve the management of the outbreaks such as ASF (Dione et al. 2017).

## Major disease constraints: morbidity, mortality and control strategies

Major pig diseases and pests in Uganda are summarized in Table 23. Respective pig disease clinical signs, treatment and control options are also presented in the table:

Table 23. Common diseases and pests of pigs in Uganda

Diseases—impact	Clinical signs	Treatment	Control/prevention
African swine fever (ASF)—can kill an entire flock	Fever, dullness, loss of appetite, huddling together, incoordination of movement, coughing, discolouration of skin to bluish, fluid eye and nose discharges, gasping, vomiting, and bloody diarrhoea	There is no treatment for ASF and no known vaccine for the disease. Only control measures can be used.	Control of ticks to reduce transmission from wild to domestic pigs. Restrict movement of pigs or meat from affected areas to avoid exposure to susceptible pigs. Slaughter all pigs in the affected farms followed by disinfection of premises

Diseases—impact	Clinical signs	Treatment	Control/prevention
Foot and mouth disease—can be transmitted to/from cattle, goats, sheep	Fever and vesicles on the coronate and sometimes on the lips and tongue	Advisable to, including vaccination	Slaughter of pigs in the affected houses, and use of vaccination
Gastrointestinal and pulmonary parasites—reduce productivity	Poor growth rate and poor performance of pigs. Coughing in the case of lung worms	Anthelmintics such as Levamisol and Piperazine	Deworm pigs every three months after weaning
Mastitis, metritis, and agalactia (MMA)—inflammation of the udder caused by different types of bacteria	Sows fail to release milk after farrowing. The udder may be swollen and painful	Use antibiotics and oxytocin	Good hygiene in the pig pen
Piglet anaemia—often appears mostly in piglets of 3 weeks of age	Pale mucous membranes and skin, dullness and diarrhoea	Give ferrous sulphate injections or oral formulation	Put red soils in pig pen or give iron injection to young piglets
Swine erysipelas—could result in mortality of pigs	Sudden death, loss of appetite, red and bluish appearance of the skin and ears. Diamond shaped skin lesions which may become necrotic	Use penicillin as the drug of choice	Clean the pen and disinfect. Treat the in contact pigs with penicillin
Lice—reduces productivity	Lice will be seen in the folds of the skin especially in the neck and at the base of the ears	Use insecticides, Ivermectin/Ivomec and tactic-acaricides	Routine spraying or tactic treatment with acaricides
Parakeratosis—reduces productivity	Similar signs to those of mange, but with no itching and scratching	Give zinc formulations like zinc carbonate or zinc sulphate	Ensure that there is enough zinc in the diet
Footrot—lameness in finishing pigs, sows or boars	Some form of defect or penetration of the wall of the hoof that leads to painful and swollen claw and cracks at the sole hoof junction. Walking on tip toe, with “paddling” or “goose-stepping” gait, and reluctance to rise and move and sitting on their haunches	Paring septic hoof lesions to expose the seat of the problem, bandaging, and also amputation. The surface of exposed, cleaned lesions may be sprayed with antibiotic, e.g. tetracycline or dusted with an antibiotic wound powder. Injecting the animal with a course of antimicrobial such as tetracycline or ampicillin by injection	Improving hygiene and management, especially floor quality by reducing moisture and resurfacing rough floor. Paring septic hoof lesions to expose the seat of the problem. Pigs should be run through foot baths containing 5–10% formalin 2–3 times a week where problems have been experienced with infection. Ensure that the biotin level of the ration is adequate, particularly in the gilts of the herd
Salmonellosis—health problem to the public and can be fatal to pigs	Fever, discoloration of skin and death	Treatment with antibiotics	Biosafety
Trichinellosis—a zoonosis	Heavy infestation causes diarrhoea, muscle pain, and respiratory failure	None	None
Tuberculosis—a zoonosis	Depends on system affected	Not advisable	Not advisable
Cysticercosis—a zoonosis	Muscle pain in heavy infestation	None	Prevent and control with vectors

Note: Adapted from Twinamasiko (2001a) and MAAIF and NAADS (2011).

## Morbidity, mortality and case fatality

In September 2012, the Livestock Data Innovation Project (LDIP) of the International Livestock Research Institute (ILRI) conducted a focus group discussion (FGD) with pig farmers in Wakiso and Mukono districts. Farmers estimated the relative morbidity and mortality of the five most important pig diseases (i.e. ASF, worms, mange, coughing and diarrhoea) using the proportional piling technique. The results of this estimation indicated a total morbidity (from all five diseases) of about 31%, while that of mortality from all the five diseases was about 23%.

The main pig health constraint in the country is the frequency of ASF outbreaks, for which there is no vaccine at the moment. Mortality rate as perceived by smallholder farmers in Uganda is currently 20.8% (Dione et al., 2014) and can be as high as 100% in a naïve pig population. It is followed by helminthosis, diarrhoea, mange and coughing, with case fatality levels of approximately 75%, 50%, 40%, and 25%, respectively. Unlike ASF that is responsible for most of the morbidity and mortality in Uganda, morbidity of each of the other diseases ranges from 2–5%, while their mortality level is estimated to range from 1–3%. However, in Uganda there is need for more research to quantify the impacts of the most common diseases in different pig production systems.

Apart from the frequent outbreaks of ASF and presence of other diseases, lack of human resource to enforce quarantine and lack of diagnostic capacity of government veterinarians also leads to increased morbidity and mortality from pig diseases.

## African swine fever

African swine fever (ASF) has been the main threat to the development of the pig sector in Uganda and the rest of Africa since 1994 when the disease reemerged on the continent. It is endemic in Uganda with outbreaks occurring throughout the year. The disease is highly contagious and has mortality rate of near 100% in infected herds. In fact, every year ASF outbreaks are reported in most pig rearing districts, causing on farm mortality of up to 100% (Dione et al. 2014). Although it is well known that humans are not affected by ASF, the consumption of pork coming from diseased pigs is not recommended because disposed bones and meat residues could be the source of infection for other animals. Nevertheless, there are people in Uganda who choose to disobey the quarantine imposed by veterinary service providers in areas affected by ASF. There are extreme cases where infected pig carcasses are smoked for cheap sale instead of being buried. Such behaviour interferes with the effective control of the disease spread (UN 2012).

Poor management and husbandry practices play a crucial role in increasing the risk of transmission of highly infectious diseases such as ASF (Dione et al. 2015). Given there is no vaccine and effective treatment for the disease, the only prevention and control strategy available is implementation of biosecurity measures on farms and along the pork value chain. On farm, these measures include ensuring proper hygiene, cleaning of the pig pen, disinfection, processing swill feed, farm fencing, control of farm visits, disease reporting among other activities. The adoption of such measures by farmers has been found to considerably reduce the spread and emergence of new diseases on the farm (Ribbens et al. 2008). Unfortunately, pig farmers (particularly smallholders) in Uganda are constrained by insufficient knowledge of husbandry practices and pig management (Dione et al. 2014). Currently, the only means of ASF control carried out by government is compulsory slaughter and restricting the movement of potentially infected pigs. The lack of a functional livestock disease surveillance mechanism in the country has compounded the problem of disease control. In case of disease outbreaks, lack of compensation for culled animals demoralizes farmers in reporting disease incidences. Lack of human resource to enforce quarantine and lack of diagnostic capacity of government veterinarians has led to increased morbidity and mortality (Kang'ethe et al. 2017). In addition, poor biosecurity and poor breeding practices also contribute to disease transmission. Lack of awareness/information and incentives to adopt improved management practices are all factors leading to the spread of diseases.

## Factors influencing trends in animal health services use

Although diseases are one of the major constraints for improving pig production in Uganda, farmers are increasingly becoming aware of the increased availability and accessibility of veterinary services. Several animal health services providers are available in all the districts of Uganda. These include government veterinary services, community-based animal health service providers, drug shops and private veterinary services. Noteworthy is that the most frequently used providers are drug shops, that often help pig farmers to treat their animals. Drug shops are frequently the source of the much needed information on animal health for pig farmers.

With the exception of ASF, the other main pig diseases are easily preventable. However, according to farmers, some of the factors that contribute to poor control of the diseases are (i) high cost of veterinary services, (ii) high cost of veterinary drugs, and (iii) presence of fake, expired and ineffective drugs in the market<sup>10</sup>.

## Inputs and services: genetics

This section provides a summary of breed composition of the national herd and access to improved genetics. Most pigs available are not distinct breeds and are often cross breeds introduced in the 1960s from other countries (FIT Uganda 2010 and ILRI 2011), whereas the so-called “local pigs” are declining. A MAAIF (2011) report indicates an increase in the production of semen (consignments) and other outputs at the Uganda National Animal Genetic Resource Centre and Data Bank (NAGRC & DB).

Until recently, there had been no commercial breeding services for pigs in Uganda. An Irish-based company—Devenish—has now put up a pig breeding unit in Hoima district. The company runs a model pig farm producing breeding sows and boars of the Large White and Landrace breeds. The breeding stock, which is sourced locally, has been improved through artificial insemination (Devenish Nutrition, 2014). The investment offers great opportunity for improved breeds and increased productivity. Elsewhere, the Sanyu Pig Breeding Farm that started operations in 2018 is a key potential player in the industry. Other private sector players include Vetline Services which offers AI services and Breeds, Feeds and Meat Ltd that provides semen as an external service to farmers.

The selection of pig breeds by farmers is often based on various characteristics, namely the ability to grow faster, produce a large litter (number of piglets born), and nature of feed requirement compared to the types of feeds farmers have. The latter is particularly important given that pig feeds represent about 70% of the total cost of production (MAAIF and NAADS 2011), which compels farmers to use feeds economically. Uganda currently lacks a pig registration scheme of known breed-types that can allow pig keepers to select pig breeds of their preference. The registration and certification of all animal breeds, breeders and breeding centres though mandated under the Animal Breeding Act of 2001, is yet to be put in place for pigs.

## Mating methods and availability of replacement animals

In Uganda, the use of AI in pigs is still limited. Farmers rely on natural mating using the breeds available in their farms or within the neighbourhood. Although most farmers recognize the importance of selecting carefully the sows and boars for mating to minimize inbreeding, upgrade their animals and control diseases; many times the unavailability of high-quality boars limits the selection of options. Moreover, the level of inbreeding is high in smallholder pig farms in Uganda, thus affecting overall pig productivity.

In Uganda, there is limited availability of high-quality pigs for both large-scale and small-scale pig producers. The majority of farmers are not aware of any national institute or private sector players that produce good pig breeds;

<sup>10</sup> Information gathered by ILRI's Livestock Data Innovation Project in FGDs conducted with pig farmers in Mukono district in August 2012.

therefore, the farmers rely either on their own replacements or work with their neighbours. Some get improved animals from prominent farmers in the neighbourhood or those distributed by NAADS, but the coverage of both options is limited, and the cost of improved animals could also be a big constraint for smallholder pig farmers.

Pig farmers therefore face significant constraints in genetic improvement of their stocks; the major ones include limited access to good pig breeds that can ensure high productivity and good income; limited access to information on traits that characterize high productivity of pigs; lack of new replacement females in any of the government institutions and the lack of, and inability to keep, records and mating practices. There is the lack of sustainable organizational structures for breeder and producer groups in order to facilitate their access to affordable breeding animals. And while these constraints are responsible for low pig productivity in the country, they also seem to be aggravated by lack of capital on farms, and limited access to adequate information and training.

## Structure of animal genetics sector: public and private sector, major actors

There is no well-defined structure of pig genetics and breeding in Uganda. Though the public structure is almost non-existent, the private sector involvement in this type of business is yet to take-off, at least compared to dairy cattle. Besides the companies previously noted (Devenish, Sanyu Pig Breeding Farm and Vetline Services), there are reports of few people privately importing exotic sows and boars of the Camborough breed type<sup>11</sup> from South Africa. These are breeding piglets imported for sale to farmers without proper regulation to ensure they meet the requirements of the Uganda Breeding Act (GoU 2001). The Act recognizes the role of the National Animal Genetic Resources Centre and Data Bank in the promotion, regulation and control, marketing, import and export, and quality assurance of animal and fish genetic materials, and also provides for the implementation of the national breeding policy. According to the Act, no pig or other animal breed should be imported or exported out of the country without a permit from the Commissioner of Animal Health and Entomology. This is to ensure that the animal is free of disease agents and other prohibited hereditary defects.

## Composition of national herd: exotic/crossbred/indigenous

There is limited information on the type of specific breeds and breeding practices in different pig production systems in Uganda. Pig breed-types are considered at the level of local, exotic and crossbred (specifically between local and exotic), since pig farmers cannot generally assign exotic animals into more defined breed types such as Large White, Landrace, Camborough etc. (Muhanguzi et al. 2012; Ouma et al. 2015). The most common exotic breeds reared are Landrace and Large White, which are commonly used for upgrading the local breeds. For breeding, most farmers obtain breeding services for their pigs from boars owned by other farmers within their villages (Ouma et al. 2015). This is attributed to the fact that most farmers cannot afford to keep their own breeding boars and other options such as AI are not yet well developed for pigs. The combination of extensive breeding and poor nutrition in Uganda may be the cause of the reducing average size of pigs when compared to their parent stock (Twinamasiko 2001b). In terms of colour, pigs in Uganda can be white, black, or black and white. This is in contrast to the black colour of the indigenous (local) pigs.

<sup>11</sup> A triple cross of Large White × Duroc × Landrace.

The domestic pig herds in Uganda are a mix of European breeds that were introduced to the country. Most of the animals are cross-breeds between these different exotic breeds, while others are kept as pure breeds (Twinamasiko 2001b). Several exotic pig breeds can adapt well to the local conditions, but some require better management and nutrition to achieve their potential. Details of these pig breeds are summarized in Table 24.

Table 24. Different pig breeds, performance traits, and breed constraints in Uganda

Pig breed	Performance traits and constraints
Landrace, originates from Denmark	White in colour, superior growth rate, high-quality carcass. Large size animal with long body; has strong legs; have many teats (more than 12); can litter up to 14 piglets; adaptable to local weather, and face conformation appealing to buyers. Has long ears pointing out to the front.
Large White, originates from Yorkshire in England	White in colour, large size animal but short in length, late maturing, good mothering ability, large litters up to 16 piglets, fast growth, many teats (10–12), requires large amount of water and feeds, conformation of face not appealing to the buyers, and pork is light coloured and somewhat fatty.
Hampshire breeds, originate in Britain	Black, meatiness, good carcass quality and high meat yield
Duroc	Dark red, fast growth rate, good mothering ability
Wessex saddleback, originates from Britain, Camborough	Very large animal resultant of the triple cross of Large White × Duroc × Landrace, good growth rate, many teats (16–18), farrows up to 18 piglets, good mothers. They are aggressive animals, piglets are delicate and require a lot of care, adversely affected by the weather, notably on their skins, high feed requirements therefore do not grow well when fed locally available feeds, pork light in colour and somewhat fatty
Various cross-breeds (local and exotic)	Variety of colours (white and black), hardy, adaptable to local weather, large litters 8–12 piglets/litter, grows fast, small in size, average mothering ability, and produces the best quality of pork (dark and soft) for the market.
Local breeds	Are used to eat locally available feeds, therefore are cheap to rear, are well-adapted to the local weather, resistant to diseases, have 10 teats, have hard skins, are small animals, grow slowly, produce 5–8 piglets in a litter, pork has a high fat content, are aggressive and stubborn, and never seem to eat and get satisfied.

Source: Adapted from Twinamasiko (2001a); Mutetikka (2009); and ILRI focus group discussion of pig farmers from Mukono district.

Little is known about the pig herd composition in the country. However, a study conducted in Wakiso district (Central Uganda) shows that about 67% of pig farmers keep cross-breeds, 28.1% keep exotic (Landrace/Large White) pigs, while only 4.4% keep local breeds (Muhanguzi et al. 2012). Cross-breeds of the local breeds with Landrace and Large White constitute the most dominant breeds, followed by exotic breeds and lastly local breeds.

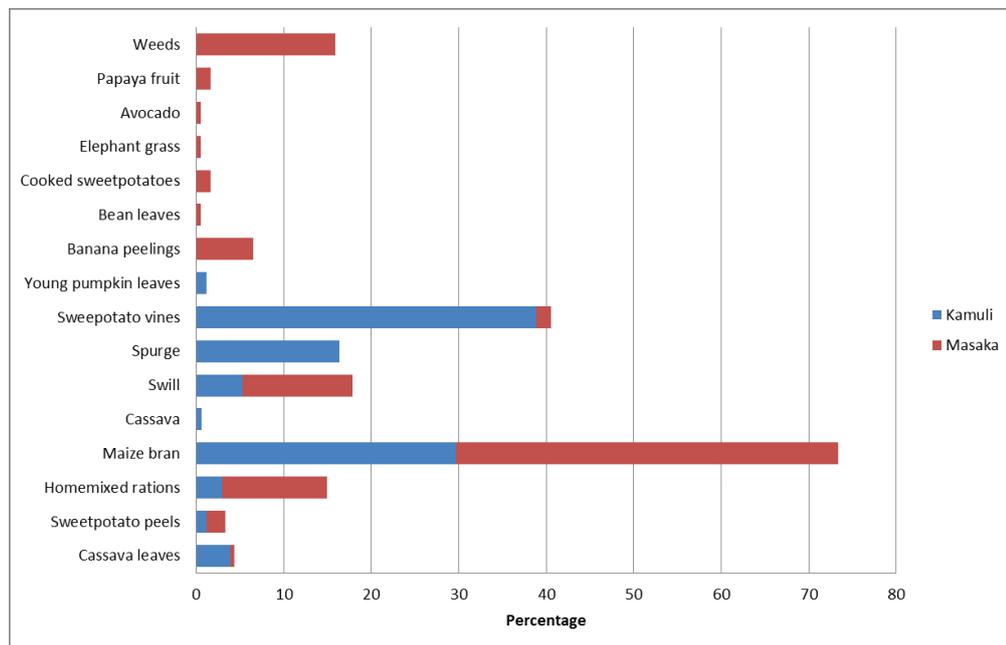
## Inputs and services: feeds

This section highlights the conditions of pig feeding practices and the feed sector in Uganda. Research evidence shows that the cost of feeds accounts for 60–70% of the total variable cost of producing pigs in the country (Mutetikka 2009; Lule et al. 2014). The high cost of feeds is an important constraint, and clearly justifies optimal use of feeds. The other major feed constraints include poor-quality commercial feeds on the market and lack of knowledge on low-cost locally prepared feed rations despite the abundant cheap local feed ingredients on farms (Pezo et al. 2014; Ouma et al. 2015; Lule and Lukuyu 2017). These constraints were exacerbated by strong seasonal effects that result in fluctuations in feed quantity, quality and price (Pezo et al. 2014). Feedstuffs of animal origin are usually richer in high-quality proteins but are more expensive than those of crop origin. Therefore, to increase feed efficiency there is need to compound cheap and affordable feed resources on farms.

Most pig farms in Uganda, especially those that operate close to major urban areas, practice intensive pig production, where pigs are confined in pens throughout and fed indoors. The pig house or structure is often made of a concrete floor, wooden walls and a roof with corrugated iron sheets. In the rural settings, however, a substantial proportion of pig farmers practice the semi-intensive and extensive pig production system, where pigs are partly or fully allowed to scavenge for feeds. Tethering pigs is common particularly during the cropping season, to avoid damage on growing crops. However, the adoption of intensive (total confinement) system of feeding is increasing, a development that can be attributed to such factors as land scarcity and improvement in access to information about the commercial production of pigs.

A variety of feeds are available to pig producers, ranging from commercial concentrates, agro-industrial by-products, restaurant leftovers, and home-grown and wild forages as shown in Figure 20 (Lule and Lukuyu 2017). However, utilization of these feeds by farmers is largely dependent on cost, availability and knowledge on how to properly use them. The more commonly used feeds include maize bran obtained from local millers, crop residues such as banana and cassava peels, sweet potato vines, cassava leaves, fishmeal, which is locally known as silver fish (“mukene”), own kitchen waste, restaurant wastes (swill), cut-and-carry green forages and farm weeds (Mutetikka 2009). The feed types used by farmers varies depending on the season (Lule and Lukuyu 2017). During the dry seasons, there is a higher reliance on purchased and collected feeds (Figure 21)<sup>12</sup>. In the rural areas, pig farmers mostly rely on sweet potato vines, maize bran, weeds and cassava leaves to feed pigs in the dry season. Other feed types used in small amounts include home mixed rations, swill and cassava roots. In the urban areas, maize bran is more commonly used, constituting nearly half (45%) of the pig diets, followed by home mixed rations, swill and sweet potato peels. Mixing home-made feeds during the severe feed shortage was found a likely coping strategy for farmers.

Figure 20. Local pig feed resources in Masaka and Kamuli districts

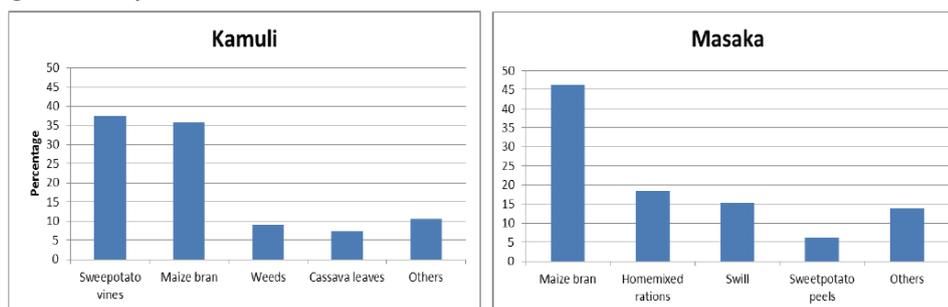


Source: Lule and Lukuyu (2017)

In the wet season, the most common feeds used are produced on farm. Feeds of sweet potato vines (22%), weeds (18%) and banana peelings (4%) contribute almost half of the total pig diet (Figure 22). However, maize bran remains a dominant feed even during the wet season. These findings corroborate Carter’s and others (2015) who also ranked the most important feed used by pig farmers as banana peels, sweet potato vines and maize bran.

<sup>12</sup>The study areas in Kamuli and Masaka districts were characterized as rural and urban settings, respectively.

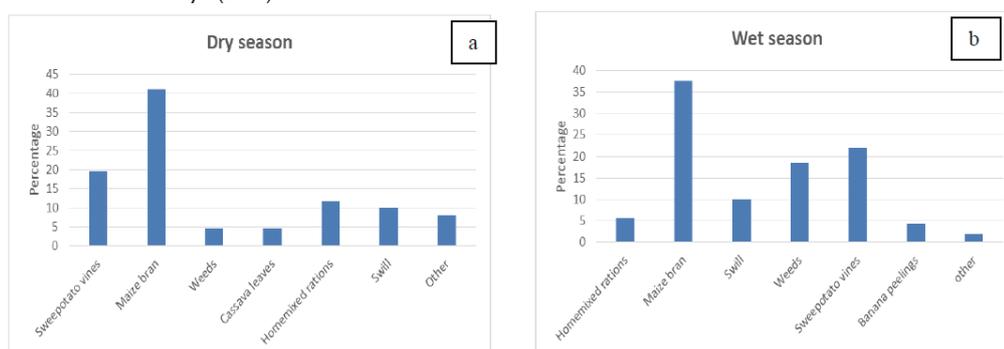
Figure 21. Dry season feed resources in Kamuli and Masaka districts



Source: Lule and Lukuyu (2017)

Figure 22. Feed resources in the dry and wet seasons

Source: Lule and Lukuyu (2017)



Although some vitamins can be obtained from the feeds, vitamins can also be provided to animals as part of the “vitamin-mineral premixes”. Minerals are derived from lake shells (“busonko”), bone ash, common salt, soil, and vitamin-mineral premixes. Water is also supplied to pigs, but in many cases is neither clean nor provided in enough quantities and frequencies.

Proteins for pigs are obtained from feedstuffs of animal and crop origin, and these include: fish (mukene) meal, blood meal, poultry waste, fish processing waste, soybeans, beans, cottonseed cake, and sunflower cake. Energy is particularly obtained from carbohydrates (starch and sugars) from feedstuffs such as cereal grains (i.e. maize, sorghum, millet, wheat etc.); cereal processing by-products (maize bran, wheat bran, rice bran); roots and tubers (cassava, sweet potatoes, yams); fruits (banana, jack fruits, avocado), cane molasses and animal fat.

## Structure and feeding practices in the pig feed sector

Three different types of commercial (compounded) pig feeds are utilized in Uganda, namely creep feed; grower feed, and sow and weaner meals. Creep feed is for piglets that are two weeks old and before they are weaned; this commercial feed is highly digestible, rich in protein (20–22%) and is often formulated with powdered milk.

Grower feed is used to feed pigs after weaning and contains 14–16% proteins. Sow and weaner meal is fed to breeding animals such as gilts, sows and boars. These feeds can be obtained from local manufacturers or produced at farm level.

Care should be taken when selecting and mixing various feed ingredients at farm level (Mutetikka 2009). It is crucial to avoid or reduce to a minimum the use of high-cost cereal grains that tend to be expensive due to a greater demand by humans. Unlike soybeans, most crop-specific feedstuffs contain low levels of protein. It is also important to minimize certain substances in feeds that inhibit proper digestion in pigs. This can be achieved by either roasting or boiling some plant-specific feedstuffs such as soybeans, beans and cabbages.

The structure of the commercial pig feed sector comprises mainly private feed producers, the majority of whom are small-scale operators in the informal market. The formal market is dominated by large-scale producers of compounded feeds and suppliers of ingredients to small-scale feed compounders. The feed market is not well regulated, and this has encouraged some commercial farmers to produce their own feeds on farm.

Pig farmers complain of poor-quality feeds that are supplied by small-scale producers and traders who use poor quality/inadequate proportions of various ingredients. Farmers are lured into buying “cheaper feeds” that are of poor quality. Consequently, most large-scale producers such as Unga feeds are scaling down the production of compounded feeds and concentrating on the supply of ingredients to small-scale feed producers. The extent to which the existing market is shared between small-scale and large-scale feed producers should be ascertained. There is also need to conduct research on the gender dimensions that exist or characterize the operation of formal large-scale and informal small-scale feeds, fodder, forage and seed marketing in Uganda.

Information on feed production and pig feed sales in Uganda is limited, and it is non-existent when it comes to the disaggregation by gender and production system. What is clear though is that pig farmers face feed shortages during most periods of the year because there is lack of an all-year-round stable feed supply and poor implementation of feed quality control measures (Tatwangire 2014). This is especially the case during the dry season when the demand for purchased feeds is greater; hence the price of commercial feeds tends to increase. During this period, opportunistic traders take advantage of the ignorance of farmers to sell poor-quality feeds. There is need to regulate and enforce standards, and supervise the actors in the feed industry. Currently, most farmers use whatever animal feeds are available on the local market, and rarely practice any form of feed preservation. Pig farmers need to be trained and encouraged to choose well-defined feeding strategies and good quality feeds to increase pig productivity.

The majority of pig farmers provide feeds to pigs once or twice a day. It is uncommon to find farmers providing feeds *ad libitum*. Labour to feed and care for pigs is mainly provided by women and children (Pezo et al. 2014; Lule and Lukuyu 2017; Dione et al. 2019). Poor pig growth rates (average daily weight gain) have been reported, particularly among the smallholder pig producers, due to inadequate amount and quality of feeds offered to the animals. As shown in Table 25, the average daily weight gain (grammes) of pigs are way below those recorded in an on-station trial carried out in Uganda by Carter (2015) that found weight gain of up to 412g on a silage-based diet and 200g on a forage-based diet.

Lack of financial capital and access to information leads to use of poor-quality feeds and bad feeding practices. Most of the feeds in the commercial market are adulterated and of poor quality due to inadequate feed ingredients. Most smallholder farmers are not aware of suitable feed ingredients and/or their proper formulation to produce good-quality compounded feeds. This has not only increased the price of available feeds, but also reduced the productivity of pig farmers that have adopted improved pig breeds. It is widely agreed that improved breeds cannot perform well on locally available feeds.

Table 25. The average daily weight gain (g) of pigs in Kamuli and Masaka districts

Bi-weekly measurements	Kamuli		Masaka		T-Value
	Mean	Std. err	Mean	Std. err	
1	54.4	10.9	99.5	11.2	0.006
2	83.4	20.02	104.7	11.1	0.404
3	51.6	8.1	119.6	13.9	0.000
4	127.6	25.9	106.5	14.1	0.506
5	68.4	28.2	112.8	21.4	0.220
<b>Average</b>	<b>77.1</b>	<b>8.3</b>	<b>108.6</b>	<b>6.5</b>	<b>0.133</b>
<b>FCR</b>	<b>23.4</b>		<b>9.3</b>		

Source: Lule and Lukuyu (2017)

## Trends in production of crops used for feeds and sale of commercial feeds

The low availability of local feedstuffs in pig production particularly in the dry season has become a dire and big constraint for farmers. This is especially the case in urban and peri-urban areas where production of these feedstuffs is limited. Farmers are increasingly adopting the use of food residues from hotels and food leftovers in homesteads. The situation is further exacerbated by competition between animals and humans on farm-produced food, especially during the dry season when food is scarce. Consequently, the use of commercial feeds in the country is becoming more important, partly due to limited access to locally produced feedstuffs. However, the problem of inadequate formulation and adulteration of compounded feeds limits pig productivity. To address feed constraints, farmers' capacities in feed formulation and maximizing of feed resource availability need to be built up so that pig producers can meet the feed requirements of animals year-round and in a profitable manner. There are knowledge resources that have been developed and are available on animal feeds, and these include sweet potato silage making<sup>13</sup> and locally formulated diets,<sup>14</sup> among others.

The stiff competition and politics between small-scale and large-scale producers has created negative outcomes on feed production. For example, large-scale feed producers are scaling down the production of compounded feeds as earlier mentioned, to instead concentrate on the supply of feed ingredients to small-scale feed compounders. Whether this is a strategy by large companies to squeeze small-scale feed producers out of the market, or a sign of failing feed sector is unclear. At the same time, research is needed to come up with ways of protecting pig farmers from being victims of input traders who sell ineffective and adulterated inputs, including animal feeds. New investments in commercial feed production by the private sector will increase the availability of quality feed.

The cost of commercial feeds has been fluctuating, thus affecting consistent feeding practices. The cost of other inputs such as drugs, acaricides and building materials is also on the increase, which affects the potential profitability of piggeries. Labour costs have also been increasing, yet they comprise about 15% of total farm production costs (Mutetikka et al. 2009), this is particularly true in the case of commercial piggeries which demand labour to feed the pigs and clean the pens.

## Inputs and services: knowledge systems

This section discusses farmers' access to information on pig technologies, markets and innovation capacity. It is well known that smallholder pig farmers in Uganda have limited access to extension advice and veterinary services. Since the implementation of the National Agricultural Advisory Services (NAADS) program in 2001, agricultural extension service has been hotly debated in the country. Conceived as a demand-driven and largely publicly-funded approach with services provided by the private sector, the NAADS program targets the development and use of farmer institutions (Benin et al. 2011). The institutional arrangement was intended to enable the easy identification and flow of farmer extension needs, but in practical terms, it never worked (Barungi et al. 2016). Furthermore, NAADS was supposed to create better linkages among researchers, advisors and farmers<sup>15</sup>, but this was not effective as well. The government was running a parallel system of extension services with traditional extension services conducted by district veterinary officers, and NAADS providing core extension services. It was clear that NAADS had no mandate to engage in the diagnosis of animal diseases, improvement in animal health, regulation of food safety and treatment of diseases.

13. <https://cgspace.cgiar.org/bitstream/handle/10568/82747/RTB-Endure-Sweet-potato-silage-Manual-for-Smallholders-Farmers.pdf?sequence=1&isAllowed=y>

14. <https://livestockfish.cgiar.org/2015/03/27/uganda-pig-feed-benefits/>

15. MAAIF (2000). Master Document of the NAADS Task

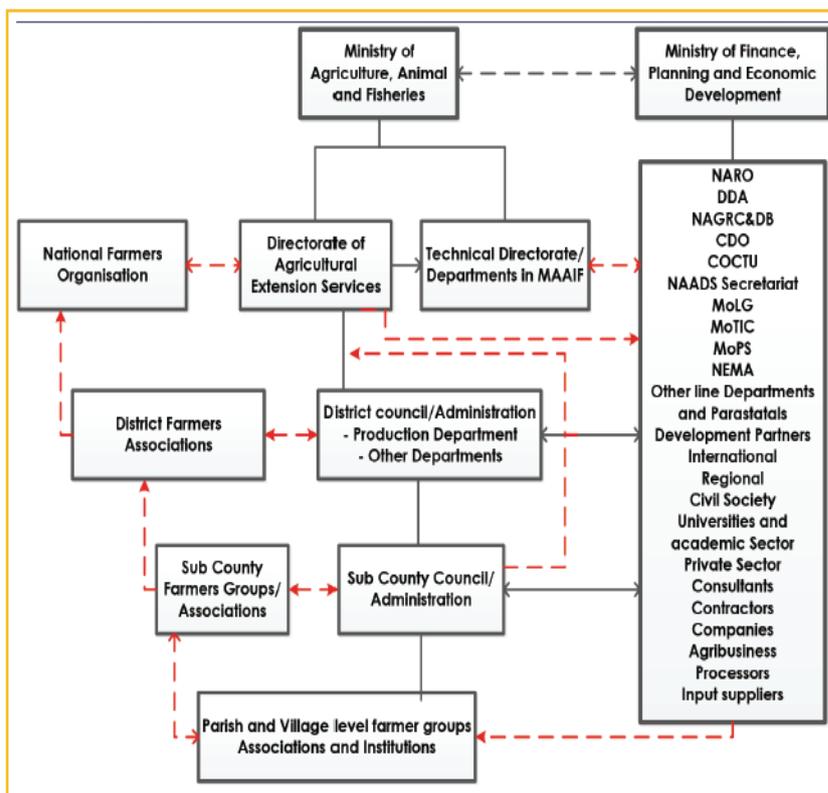
Following the NAADS' failure to adequately address farmers' needs, in 2014, agricultural extension service delivery was transferred back to MAAIF under the newly created Directorate of Agricultural Extension Services (DAES). NAADS was instead assigned the role of input distribution and strategic interventions, including promotion of agribusiness and value addition technologies. A new extension approach dubbed "single spine" was adopted in the same year (2014) with the mandate to harmonize and coordinate all extension service delivery in the country including addressing inefficiencies associated with its predecessor systems.

The government extension service through the NAADS programs, veterinary officers in the districts, fellow farmers and some NGOs provide pig farmers with vital information and training on modern pig farming practices. The information ranges from selection of breeds, feeding practices, disease control to general pig husbandry. The Ministry of Agriculture in conjunction with NAADS distributes written manuals on pig and other livestock husbandry best practices to farmers, in addition to having demonstration farms. However, record keeping is low in smallholder pig farms, except for those who keep exotic breeds and cross-breeds. These are in most cases large-scale farms, which use the records to keep track of performance of different breed types, disease incidences, treatment costs, litter size and sales, among various other data.

## Current structure of knowledge sector: research and development and public extension capacity

The single spine extension system adopted by the government appears to have no key distinctions with the traditional extension system that MAAIF run parallel with the NAADS program. Both are supply driven and primarily depend on the local extension staff as the key providers of extension services at the district and subcounty level. The new approach is a clear shift from the demand driven approach undertaken by the NAADS program and puts government back at the centre of providing public extension services. The new institutional framework for agricultural extension is summarized in Figure 23, comprising institutions at the national and local government levels.

Figure 23. Organogram of the national agricultural extension system in Uganda



Source: MAAIF, 2015

## National level

The major institutions engaged in public agricultural extension in Uganda include MAAIF, NAADS, NARO and the private sector. The DEAS under MAAIF, more specifically, is principally mandated to coordinate the public and private agricultural extension service delivery at national, local government and other non-state levels (MAAIF 2016a). The DAES is also responsible for formulation of policy, regulations, standards, strategy and work plans for Uganda's agricultural extension system and capacity building for agricultural extension workers.

Other institutions that play a key role in agricultural extension at the national level include the Uganda National Farmers' Federation, which advocates for favourable policies for farmers and empowers farmers through knowledge on recommended farming practices and inputs; the Parliament of Uganda which provides oversight and budget support; the Ministry of Trade, Industry and Cooperatives, which provides market information; the Ministry of Finance, Planning and Economic Development, which provides financial resources for agricultural extension services; the Ministry of Water and Environment, which provides meteorological information; and the Ministry of Gender, Labour and Social Development, which mobilizes communities for uptake of extension services. The country's universities, colleges and training institutions also offer training and development of agricultural extension workers, and research institutions such as NARO provide technical support and promote adaptation and use of appropriate technologies.

## Local government level

At the district level, the major institutions engaged in public agricultural extension include the production and marketing departments, Office of the district Chairperson, Office of the district chief administrative officer, and the OWC (Operation Wealth Creation) office. The Department of Production and Marketing is responsible for coordinating delivery of agricultural extension services, supervising agricultural extension workers at subcounty level, and delivery of agricultural extension services up to farm level as well as planning and budgeting for the services within the districts.

At the subcounty level where actual delivery of extension services mainly occurs, there is at least one agricultural extension worker in charge of crops and another in charge of livestock. The agricultural extension workers are charged with providing agricultural extension services to farmers within their respective subcounties. They are also charged with working with farmers to plan and prioritize agricultural enterprises and technologies, and to verify agricultural inputs delivered at subcounty level. In addition, the technical staff are supposed to supervise and quality-assure private service providers, community-based facilitators, NGOs and other non-state actors involved in agricultural extension service delivery.

## Linkages between research and extension

Reviews done under the Uganda's Poverty Eradication Action Plan found that the low productivity of Ugandan farmers was attributed to poorly functioning farmer-extension-research linkages and the consequent failure of the research and extension systems to respond to the real needs of the farmers. Research, extension, education and farmer institutions that constitute an effective extension system operate largely independent of each other and do not coordinate their actions in problem identification and solving, which is essential for the transformation of smallholder subsistence farmers into the desired commercial farmers (NAEP 2016). In addition, some extension service providers operate without harmonized standards, ethics and their messages are rarely updated or sufficiently regulated. To address this fragmented nature of extension services, the National Agricultural Extension Policy (2016) provides for a more coordinated, harmonized, regulated pluralistic service with multiple providers addressing diverse needs. Knowledge sharing between universities, research centres and extension agents has been institutionalized through creation of research advisory committees and other platforms to allow for joint stakeholder planning, review and priority setting meetings both at national and zonal/regional levels. However, weak research-extension-farmer linkages remain a challenge despite the efforts to improve coordination and collaboration. This is partly attributed to limited appreciation of the significance and applicability of coordination by many actors, which results in unnecessary competition, duplication, poor information sharing and problematic relationships (Kuteesa et al. 2018).

## Investment in pig research and extension services

Following the adoption of the single spine agricultural extension system, the government approved recruitment of 5,000 extension workers and increased funding to the sector on condition that 30% of releases went to district level activities and 70% to subcounty level activities. According to the Ministerial Policy Statement FY 2018/19, MAAIF has so far recruited 3,854 (77%) extension workers at district and subcounty levels out of the initial target of 5,000 extension workers. This puts the current ratio of extension worker to farmer at 1:1,800, compared to the recommended level of 1:500. Hence the coverage of extension beneficiaries is still low and the provision of extension and advisory services inadequate. Transport for extension staff to visit communities on a regular basis is equally limited, although it is being addressed by procuring and distributing motorcycles to the district Local Governments (DLGs). In an ILRI study, the most common sources of extension services to pig farmers, besides NAADS, were NGOs (VEDCO and World Vision), other farmers (sharing of information) and animal health service providers (Ouma et al. 2015).

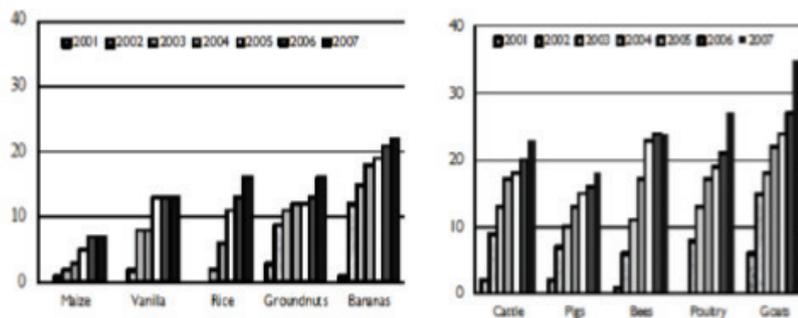
Little is known about public investment in pig research and gender bias in Uganda. Very few studies have been done on pigs. The interest in pig research is increasing, especially at the major universities. However, there are no records on the level of resources allocated to different types of livestock research, the number of research and extension personnel that are actively involved in the promotion of piggery, and the time devoted to the sensitization of pig producers. The NAADS program is helping to strengthen the institutional capacity and human resource skills of many farmers, including pig producers to potentially demand and manage the delivery of agricultural advisory services and to meet their local production and market conditions. The program encourages farmer participation in demonstrations, but also promotes interventions that reduce farmer constraints in the areas of liquidity constraints, feeds, practices and information.

Benin et al. (2011) assessed the impacts of and returns to Uganda’s public spending in agricultural advisory services. They found that a total of 36 enterprises (29 crop and 7 non-crop enterprises) were being promoted by NAADS. However, not all the enterprises were being promoted by NAADS in each subcounty. Figure 24 indicates major crop and livestock enterprises that are widely promoted by the agricultural advisory services based on the number of subcounties involved in the enterprise promotion. Figure 25 further shows variation of the number of technology development sites (TDSs) established and the number of farmer groups directly benefiting from TDSs for major enterprises promoted.

According to Benin et al. (2011), the major crop enterprises that are widely promoted at farm level include bananas, groundnuts and rice, followed by vanilla and maize. In the case of livestock and related enterprises, these include goats, poultry and bees, followed by cattle and lastly pigs. It is therefore clear that piggery is among the least promoted livestock enterprise in the country. However, this is beginning to change with some districts, for example Masaka and Hoima, choosing to allocate resources to piggery, and have the pig enterprise prioritized in their local government plans (Ouma et al. 2017a).

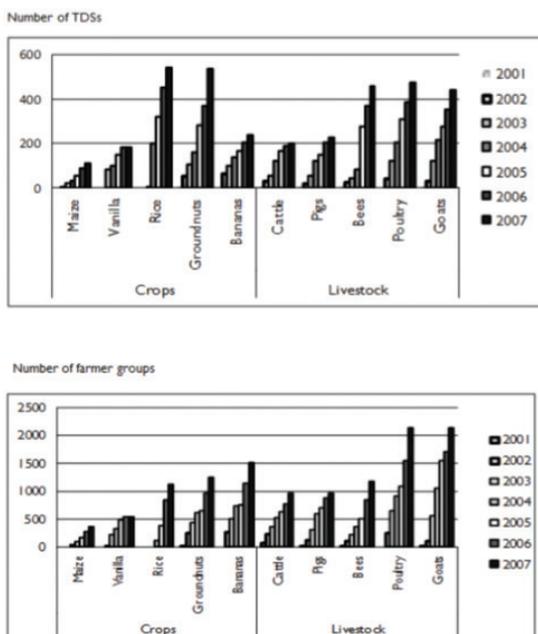
Bashaasha et al. (2012) examined the extent to which households in six districts of Uganda access various information and extension services that are important for pursuing their livelihood strategies. The results from the cross-sectional survey data analysis from the study are summarized in Table 26.

Figure 24. Promotion of major crop and livestock enterprises (number of subcounties in which promoted), 2001–07



Adapted from Benin et al. (2011)

Figure 25. Number of technology development sites (TDSs) established for major crop and livestock enterprises and number of farmer groups benefiting, 2001–07



About 42% of the households included in the study reported having access to extension services from NGOs, other development partners and the government through local governments and NAADS programs. Access to extension services is highest in Rakai district, followed by Arua, Mayuge, Kabale, Gulu and is least in Kasese. It is evident that the most provided information relates to HIV/AIDS incidence, HIV treatment, care for HIV/AIDS patients, followed by plant protection, types of seeds, crop agronomy, planting time, and the use of fertilizers. Only 21.8% of the households received information about the use of animal feeds, 19.5% received information on the use of veterinary drugs, about 17.7% received information on the marketing of their produce, while only 4.8% had access to information on AI. Farm households receive on average less livestock related advisory services when compared to crop and health-related information (Bashaasha et al. 2012). It is therefore vital to increase farmers' access to information on animal health, feeding and food safety issues etc., if the livestock production, including piggery, is to improve in the country.

Table 26. Access to various types of information and extension services in six districts of Uganda (2012)

District	Arua	Gulu	Kabale	Kasese	Mayuge	Rakai	Overall
Total number of observations	63	63	63	62	67	63	444
Has access to extension services	33	25	26	24	28	50	186
Type of information provided	(52.4%)	(40.3%)	(41.9%)	(38.7%)	(42.4%)	(79.4%)	(41.9%)
Types of seeds	82.8	69.6	30.8	25.0	28.6	33.3	45.0
Plant protection	80.0	56.5	26.9	22.7	50.0	36.0	45.4
Use of fertilizers	73.3	32.0	7.7	8.3	53.6	36.0	35.2
Planting time	80.0	60.0	15.4	8.3	53.6	38.0	42.5
Crop agronomy	76.7	54.2	30.8	25.0	40.7	38.0	44.2
Animal feeds	36.7	44.0	15.4	8.3	14.3	12.0	21.8
Veterinary drugs	33.3	37.5	26.9	8.3	7.1	4.0	19.5
Artificial insemination	16.7	12.0	0.0	0.0	0.0	0.0	4.8
Market information	36.7	29.2	11.5	12.5	14.3	2.0	17.7
HIV/AIDS	65.5	60.0	46.2	58.3	78.6	76.0	64.1
HIV treatment	65.5	56.0	36.2	41.7	64.3	76.6	56.7
Care for HIV/AIDS patients	63.3	56.0	46.2	37.5	64.3	71.4	56.5
Nutrition and food utilization	46.7	28.0	19.2	33.3	32.1	40.8	33.4

Note: Figures in parentheses are percentages

Source: Bashaasha et al. (2012)

## Factors influencing trends in farming knowledge provision and access

Farmers' quest for labour saving technologies such as the use of pesticides as opposed to manual weeding is playing a significant role in determining farmer participation in the NAADS program. The type of income source also plays a key role in influencing whether farmers demand specific knowledge provision from the NAADS. This is true for farmers that derive their major income from livestock and those who rely on non-farm enterprises for most of their income (Benin et al. 2011). The longer an extension services program operates in the community, the less likely farmers will continue participating directly in the program. This is attributed to the lack/limited receipt of grants (by the farmer), increasing cost of participation relative to benefits from any grants, and failure of their preferred enterprise(s) to be selected among the three promoted/prioritized enterprises in the area (i.e. subcounty).

There is minimal evidence from Uganda that agricultural extension services induce participants to establish new enterprises and to adopt improved technologies, contrary to popular perceptions. Indirect participation in agricultural extension programs was found to increase exposure and demand for agricultural advisory services compared to direct participation (Benin et al. 2011). It is not always the case that direct participation in programs that promote access to

advisory services leads to adoption of a new and improved crop or livestock enterprises, technologies or practices. However, direct participation is shown to induce greater average effect on livestock productivity than on crop productivity; in terms of increasing livestock and livestock product sales.

A 2011 study in Uganda showed that NAADS interventions failed to improve farm output, productivity and income of farmers in Iganga district (Okoboi et al. 2011). There are concerns that such factors as implementation weaknesses, poor monitoring and evaluation processes, nepotism and the lack of transparency may have affected the selection of NAADS beneficiaries and enterprises in many districts of the country. Desired levels of adoption can be achieved if farmers' needs drive knowledge delivery to farmer groups without the interference from politicians and NAADS coordinators. This study also showed that farmers should receive incentives to access inputs from reputable input traders and be enabled to access other prerequisites for financial and credit services. Otherwise, participating farmers can only adopt technologies that only require additional labour and skills, but which do not necessarily increase productivity and commercial production.

Distance from areas with improved credit services and markets have played an important role in stimulating demand for advisory services. While households located in urban and peri-urban areas (also characterized by better markets and services) can easily access information on their own, those located far from markets need to be targeted with programs that can support technology adoption and interventions that increase commercial production of livestock, including pigs.

From a gender perspective, gender inequalities are a key determinant in influencing women's participation and access to agricultural advisory services. In the MFPED Budget monitoring and accountability unit (BMAU) Monitoring Report for 2017/18, gender inequalities in access to extension service were widespread across the country. For example, in Kiryandongo district in western Uganda, out of 202 farmers who benefitted from sensitization meetings, training and field days, only 39 (19.3%) were female and 163 (80.7%) male, while in Nakapiripirit district in northern Uganda, 26 (43%) of the 60 farmers who benefitted from development of commodity value chains were female, while 34 (57%) were male. Women's participation in these extension activities was reported to be constrained by lack of productive assets such as livestock and land, hence limiting their participation in project training sessions. Also, the method of communicating about training and meetings that was mostly done in town centres and bars which are not frequented by women and implementation of some project activities in the morning when women are engaged in household chores and farming (BMAU Monitoring Report FY2017/18) prevented many of them from participating. The findings are corroborated in the ILRI smallholder pig value chain assessment in Uganda which found that few women accessed extension services compared to their male counterparts. This inequality was worse in some rural value chains; where none of the women had access to any extension service (Ouma et al. 2015).

## Inputs and services: credit

The role of the financial sector in enhancing efficient reallocation of resources is well known. This section provides an overview of farmer access to and use of credit in Uganda. It is widely agreed that smallholder producers in rural areas have no access to adequate credit, especially for livestock production including piggery. Yet improved access to financial services can foster pro-poor investment and growth through increased mobilization of savings and the use of savings deposits as a source of investment capital to rural enterprises. The government of Uganda recognizes the need to promote rural finance and the importance of financial inclusion in poverty eradication. Since the 1990s, it has initiated a number of agricultural financing initiatives to improve access by farmers to agricultural financing. These include the Cooperative Societies Programme (1992), the Poverty Alleviation Fund (1996), the Entandikwa Credit Scheme (1996), the Poverty Eradication Action Plan (PEAP) 2004/5–2007/08, the Plan for Modernization of Agriculture (PMA), the National Agricultural Advisory Services (2001), the Rural Microfinance Support Project (2003), the Microfinance Deposit Taking Institution Program (2003), the Rural Financial Services Program (2005), Prosperity For All (2008) and more recent, the Agricultural Credit Facility and Microfinance Support Centre Ltd (MSCL). Though

these initiatives are measures in the right direction, the International Labour Organization (2018) notes that initiatives that foster financial inclusion are unlikely to overcome the structural deficiencies emanating from the financial sector, including in its biased allocation of credit towards sectors that are unlikely to generate fast accelerations in productive employment as well as in the high cost of its credit extension.

The credit market in Uganda is small and largely informal. There are about six types of financial institutions that operate in Uganda. They include the central bank, commercial banks, credit institutions, insurance companies, development banks and foreign exchange bureaus (SNV and DEMIS Consults Limited 2010). The financial service providers are categorized into four groups, namely (i) Tier 1 (includes commercial banks); (ii) Tier 2 (credit institutions); (iii) Tier 3 (micro-deposit-taking institutions, MDIs), which include fully regulated MFIs that serve small and micro enterprises with a broad range of financial services targeting low income and economically active poor, and (IV) Tier 4 (all other financial institutions and associations that are not regulated by the Bank of Uganda [BoU]). These providers operate in a financial infrastructure that is generally underdeveloped. They include savings and credit cooperatives (SACCOs), village savings and loan associations (VSLAs), Community-Based Organizations (CBOs), money lenders and NGOs.

All microfinance institutions are coordinated under the Association of Microfinance Institutions of Uganda (AMFIU). As part of the effort to eradicate poverty, the Government of Uganda has been using microfinance institutions to provide credit services to people in rural areas. However, the level of penetration of this credit service provision is low. The formal financial system in Uganda to a large extent rations out the rural poor, which affects their performance.

## Structure of financial sector providing credit to farmers

In Uganda, the financial system includes all financial institutions, financial markets and financial instruments, as well as the legal, political and institutional frameworks that govern them. Only 20% of the farm households have access to financial services, and most depend on semi-formal and informal institutions that are not regulated by the BOU. Although these institutions make up the backbone of the rural financial sector in Uganda, they are weak and unable to guarantee reliable credit access and good returns for poor people's savings.

The financial market is also constrained by the failure of most financial institutions including commercial banks to expand access to credit to smallholder farmers. This is further exacerbated by unfavourable economic performance indicators such as volatility in price and exchange rate in the recent past. Extension of credit to the private sector by banks (as a share of GDP) in Uganda remains low and has stagnated over most of the last decade (ILO 2018). For agricultural credit, the bulk of it is allocated to large-scale farmers, leaving out small-scale farmers, who collectively constitute more than 90% of the agricultural system (World Bank 2017). Nevertheless, demand for credit continues to increase amidst the low levels of credit to the private sector, including the agriculture subsector.

Smallholders are usually required to meet the requirement of collateral and minimum balances on their account before receiving credit. It is therefore not surprising that about 62% of all Ugandans (whether in farm or non-farm occupation) have limited access to financial services, while the majority (42%) of Ugandans that receive credit rely on informal financial services channels (GoU 2012). According to the Economic Forum Global Competitiveness Report (2016–2017), in terms of the affordability of financial services index, Uganda ranks 120 out of 138 countries, with a steady decline in its position over recent years (World Bank 2017). As of 2015, only 44% of the population had bank accounts, a rise from 20% in 2011, and this is mainly attributed to the introduction of mobile money services (Bank of Uganda 2015). The majority of Ugandans are therefore unable to save in a bank or acquire a bank loan. The use of formal financial services is limited.

In summary, the financial market in Uganda is characterized by the coexistence of formal and informal financial service providers. The formal financial markets comprises commercial banks, development banks and credit institutions and the informal sector includes MFIs, MDIs, VSLA, SACCOs and ROSCAs. Farm households that are rationed out of the financial market rely more on sources of family and friends for credit. They are also some that use secret hiding places to save money and accumulate savings.

## Access of pig farmers to credit

When it comes to the agricultural financing (both short-term and long-term loans), the agricultural sector is noted to receive only about 10% of the total lending capacity. The sector therefore suffers from a lack of appropriate financial capital that is vital in spurring meaningful farm investments. Consequently, smallholder pig farmers have limited access to credit from financial institutions. These institutions do not value piggeries as collateral to secure a loan. Pigs are considered risky due to the incidences of serious disease outbreaks that can easily wipe out herds. Pig farmers can only access credit from microfinance institutions (MFIs) based on collective responsibility and membership. Each farmer has to pay an entrance fee into an MFI. Loans are then given out depending on farmers' ability to repay as determined by the MFIs' managers. Currently, eligible pig farmers are required to have at least 30% of the value of the loan. The magnitude of the loan depends on the individual savings of the farmer into the group fund and their security credentials such as land endowment. Muhanguzi et al. (2012) found that about 20% of pig farmers in Wakiso district were unable to access loans.

## Penetration of credit services, volume of loans and recovery rates

There is an increase in the number of Ugandans that access financial services. According to the latest FinScope report on Uganda, the number of Ugandan adults with access to both formal and informal financial services increased from 57% in 2006 to 78% in 2018. However, in the case of pig farmers, there is a low level of access to credit. There is need for detailed information on the proportion of pig producers, pig traders and pig processors that use credit in their investment. This information is currently not available.

What is clear is that the continued perception of farming as a high-risk business limits access to credit and loans from commercial banks. The situation is further complicated by the fact that most pig farmers do not have collateral to use in order to secure credit from microfinance institutions. However, since the launching of the Rural Financial Services Program, the number of SACCOs<sup>16</sup> across the country has increased to over 2,800 (GoU 2012). According to 2015 census carried out on Tier IV institutions (SACCOs), 1,100 SACCOs of those registered were found active (functional). The inactive and closed SACCOs were equally high (45%), with the northern and eastern regions most affected, yet they have the highest poverty levels. Regarding the membership, governance and management of the SACCOs; women's representation at all the three levels was about 30%. Despite the potential of SACCOs to enhance financial access for the low-income population especially the smallholder farmers, their functionality has been met with a lot of challenges. These include poor governance and management practices, human resource capacity constraints that are worsened by high staff turnover and inadequate supervision and monitoring of SACCOs, hence creating room for ineffective operations (BMAU Briefing Paper 15/16).

There are about 180 microfinance companies and related NGOs in Uganda. The government also recognizes the role of self-help groups (SHGs), including the rotating savings and credit associations (ROSCAs), and village savings and loan association (VSLAs) in serving the financially excluded. Despite these initiatives, the level of penetration of this credit service provision is low.

16. SACCOs are legal bodies registered under the Uganda Cooperative Statute of 1991 and Cooperative Societies Regulations of 1992. SACCOs are economic institutions doing business in order to grow, survive and become sustainable.

Results from the survey data by the Global Findex database/Gallup World Poll, with more than 150,000 randomly selected adults aged 15 and above in 2011, reveal that 20.5% of Ugandans have an account at a formal financial institution such as bank, credit union (SACCOs) and microfinance institution (GoU 2012). Furthermore, about 7.7% of Uganda's rural population uses an account at a formal financial institution for business purposes. The proportion of the population with an account at a formal financial institution is about 25.8% in men compared to 15.1% among women, and it is also higher (26.9%) in urban areas than is the case (20.2%) in rural areas (GoU 2012).

The majority (46.5%) of Ugandans receive credit from family or friends followed by 9.4% from store credit (money borrowed by purchasing goods on credit or paying in installments), 8.9% from a formal financial institution, 4.6% from a private money lender, and lastly 4.2% from employer (GoU, 2012). These statistics are further supported by findings (see Table 27) from an FAO study in the six districts of Uganda with the highest population size.

Table 27. Access to credit services and sources of credit in six districts of Uganda, 2012

	Arua (N= 63)	Guru (N= 63)	Kabale (N=63)	Kasese (N=62)	Mayuge (N=67)	Rakai (N=63)
Received credit	27(42.86)	31(49.21)	35(55.56)	40(64.52)	34(50.75)	37(58.73)
Source of credit						
Banks	4(14.81)	3(9.68)	7(20.00)	4(10.00)	3(8.82)	1(2.70)
Microfinance	1(3.70)	-	5(14.29)	-	8(22.86)	6(16.22)
Lenders	-	-	3(8.57)	-	4(11.43)	2(5.41)
Self-help groups	14(51.85)	17(54.84)	3(8.57)	3(7.50)	5(14.29)	20(54.05)
Relatives and friends	2(7.69)	-	4(11.43)	15(38.46)	9(25.71)	14(37.84)
NGOs	1(3.70)	-	-	-	-	-
ROSCAs	5(18.85)	9(29.03)	11(31.43)	14(35.90)	-	-
SACCOs		1(3.33)	7(20.00)	6(15.79)	10(28.57)	4(10.81)

Note: The figures in parentheses are percentages; ROSCAs denotes the rural savings and credit associations (ROSCAs); SACCOs represents savings and credit cooperative organizations.

On average, about 48% of all sampled farm households receive credit services from various sources. The proportion of farm households that receive credit ranges from the highest (64.52%) in Kasese to the least (42.86%) in Arua. Most farm households access loans from self-help groups, followed by ROSCAs, and then commercial banks in that order.

Findings from the focus group discussions by Bashaasha et al. (2012) further suggest that banks and microfinance institutions are the most active financial institutions in the peri-urban and urban areas. They include BRAC (Uganda), FINCA (Uganda), Centenary Development Bank (CERUDEB) and Finance Trust (Uganda) in Arua district. These institutions provide farmers with business start-up capital and sometimes small consumption loans. Access to credit in the rural areas is mostly through informal and lower tier microfinance institutions such as the self-help associations, ROSCAs, and SACCOs. In particular, SACCOs are transforming livelihoods in urban areas. Informal institutions or lower tier microfinance institutions mostly provide relatively small loans to individuals, groups and institutions. Besides these financial institutions, some NGOs including CREAM are extending credit to poor households.

## Factors influencing trends in credit use

Access and use of financial services among the rural poor (including smallholder pig farmers) continues to face unsupportive service providers in the rural sector. The transaction cost for credit in the traditional financial system is too high due to, among others reasons, paper work, long distance from the farms to the bank offices, and cost of making several visits before loans are approved. Most traditional financial institutions hold back their services due to

the fear of losing their investments in the rural sector, which is largely agriculture based. For them, the uncertainty that comes with the business plays a key role in accessing their services. Policies and rules of engagement that can help ensure credit access amidst the negative effects of natural calamities, insurgencies, and price risk may help improve the level of credit access and use among smallholder farmers in Uganda.

In SACCOs, factors limiting credit use include stringent requirements that discourage SACCO members from borrowing including high interest rate of 12-13% per annum, delays in loan processing (on average one and a half months) among others. In eastern and northern Uganda especially, the low number of SACCOs supported by MSCL is attributed to stringent requirements that include requiring clients to have significant savings and capital before they can access loans (MFPED Semi-Annual Budget Monitoring Report for Financial Year 2018/19). Addressing these challenges calls for reassessing the role SACCOs to make them the key financial inclusion tool in rural areas.

## Value addition and marketing

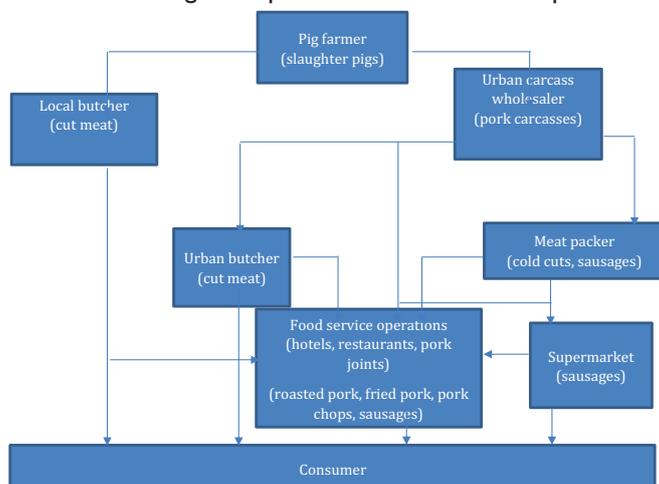
Value addition in the live pigs and pig meat products is largely limited in Uganda. About 98% of pigs are sold as live animals and are slaughtered for pork that is consumed with limited or no value addition (Mutetikka et al. 2009). In contrast, the potential for value addition on the pig meat products is vast in the country. These pork products include fresh/fried/roasted pork, pork sausages and minced pork that is often consumed by affluent consumers. Other semi-processed pork products range from pork chops, pork ribs, pork roast, pork shoulders and other products.

The lack of processing is not exclusive to the pig value chain but applies to most agricultural commodities and products in Uganda where less than 5% of all agricultural commodities are processed (GoU 2011). The level of productivity, processing, and upgrading of actors along the chain is still low in terms of the production technology that is used, access to market information and linkages (organization and structure) between various stakeholders, especially those that provide a supportive service to pig producers and upcoming processors.

## Processing and marketing: pork value chain structure

There are two major domestic pork value chains in Uganda: the cut meat value chain and the sausage value chain. Bacon, ham and other processed products are for the most part imported products. Figure 26 shows the main actors (excluding brokers, input and service providers) in the pork value chain and the products they sell. This simplified representation of the value chains does not capture the multiple and at times dynamic roles of the value chain agents. Given the relatively short nature of the value chain, agents integrate backward and forward (Ouma et al. 2017b; Mtimet et al. 2018). For instance, some carcass wholesalers own butcheries and pork joints, some butchers own pork joints, and carcass wholesalers who do not necessarily own butcheries but have backyard slaughter facilities may offer retail quantities and prices depending on market conditions. Also, some pig farmers such as Clara Anzoo Aya in Moyo district are involved in retailing pork (Okudi 2018). About 90% of slaughter pigs are bought by local butcheries in the vicinity of smallholder pig farms (Nyapendi 2007; Lule 2017), while the rest are bought by wholesalers that transport, slaughter and sell them as carcasses in urban Kampala. From Figure 26, six market segments<sup>17</sup> (excluding input and service providers) can be distinguished that characterize the pork value chain in Uganda.

Figure 26. Main actors in Uganda's pork value chains and the products they sell



<sup>17</sup>The term segments refer to the different nodes of the value chain rather than subgroups of consumers.

## Carcass wholesalers

In Kampala, the only licensed wholesale outlet for pork carcasses is the Wambizzi abattoir in Nalukolongo (Batte 2012). All pigs procured by carcass wholesalers operating in Kampala are slaughtered here. The abattoir is owned by about 20 individuals and charges a slaughter fee of UGX8,000 (USD2.22) per pig, equivalent to the wholesale price per kilogram of meat at the abattoir. From an industrial organization perspective, the abattoir is a monopoly provider of slaughter services in the capital city. The abattoir has been a monopoly since 1971, which might be an indication of the existence of barriers to entry into pork production. Fortunately, it appears existing barriers are ancillary rather than primary, and most likely include economies of scale, uncertainty and high initial, yet irreversible, investment costs.

## Processed/packed meat wholesalers

The top six buyers of pork carcasses from the Wambizzi abattoir are presented in Table 28 and include one of two wholesalers of processed/packed meat, namely Fresh Cuts (U) Ltd. The other is Ponders Ltd, the packer of the Snowman's brand of sausages. The Fresh Cuts' company dominates the market for packaged retail cuts and processed meat and it owns Quality Cuts Butchery, its own retail outlet. The company covers about 85% of Kampala's processed meat market and is estimated to have a daily output of 11 tonnes (t) of fresh meat (6 t of beef; 3 t of pork, 2 t of chicken). Fresh Cuts procures all carcass supplies on contractual basis from carcass wholesalers and supplies sausages to retailers including supermarkets and food service operations. The only other main competitor to Quality Cuts/Fresh cuts operations in the market is Farmer's Choice. Packed/processed pork products are targeted towards high-end consumers that are willing to pay a premium for consistently high-quality products.

Table 28. Ranking of the top six buyers of pork from Wambizzi abattoir

Rank	Agent
1	Pork joints and pubs
2	Fresh Cuts (U) Ltd / Quality Cuts Butchery
3	Other butcheries
4	Supermarkets
5	Hotels
6	Private organizations and individuals

Source: Roesel et al (2016)

## Butcheries

Butcheries are perhaps the most common retail segment for cut meat in both rural and urban markets. Majority of butchers procure live pigs and carcasses themselves (Ouma et al. 2017b) and sell cut meat to food service operations and directly to final consumers for cooking and consumption at home. Because of the small-size nature of most butcheries, purchase prices offered by butchers for live animals and carcasses are spot prices. Two forms of cut meat are sold by urban butcheries: one without the skin (somewhat lean), known locally as "special" meat, which sells for about UGX13,000/kg and unskinned, which sells for UGX10,000–11,000/kg.

## Supermarkets

Supermarkets are an important outlet for sausages and other processed pork products. The target clientele of supermarkets are normally the relatively high-income households. The proportion of supermarkets in Uganda's food retailing industry continues to grow, and so is the competition in this segment. Currently, all pork products sold in supermarkets are national brands. It remains to be seen if the ongoing competition among supermarkets will reach a point where private labels begin to emerge, as has been witnessed for some food products in Kenyan supermarkets.

## Pork joints

Pork joints are a popular and perhaps uniquely Ugandan phenomenon in the consumption of food away from home (FAFH). They are pork eateries that are usually associated with pubs where people of various ages and socio-economic status go to socialize and watch football games as they eat roasted or fried pork. They are found in rural, peri-urban and urban areas, and in both the affluent and less affluent city suburbs and are busy throughout the week. In 2012, Kampala alone had a total of 158 pork joints and butcheries in the four divisions of the city (Kungu 2015). Since then, the number of pork joints alone is believed to have doubled in Kampala and greater Kampala to about 350. As such, it is unsurprising that they are the primary pork retailers among food service operations, and the top buyers of carcasses from the city's only abattoir. On average, a typical pork joint sells more than 100 kilograms (about two pigs) per day (Mulindwa 2016).

## Hotels and restaurants

This segment of food service operations largely caters to middle- and high-income households, travelling workers and tourists. Only two per cent of urban households with a per capita expenditure of about USD1 per day consume pork served in hotels and restaurants (Nyapendi 2007). Pork products are procured from various sources depending on the size and market niche of the hotel/restaurant.

## Quantities, prices and their trends

The analysis of pork quantities and prices in the different market segments begins with a look at trends in aggregate farm supply and prices of pigs. While sufficiently long historical farm supply data is available, data on prices is not. The same applies to aggregate price and quantity data for other segments. Thus, there is need for in-depth studies to quantify the volume of live pigs, pork products and related inputs that are handled at each node of the value chain. This evidence can then be used to shed light on the magnitude of prices, margins, market shares and gender disaggregated employment, all of which are not well understood.

## Farm prices and quantities

According to FAOSTAT data (2018), there has been a steady increase in farm supply of pigs over the last three decades. The upward trend in farm supply has been consistent with the rise in prices of slaughter pigs, which could be in response to the increase in demand resulting from human population growth, urbanization and increases in purchasing power. The price of pigs ranges from UGX6500–7000/kg of live weight in districts near Kampala; in rural areas this can be low to about UGX4500/kg live weight. Farm prices are largely determined and imposed by the traders since farmers do not sell pigs on weight basis (Ouma et al. 2017b). The visual weight estimates of pigs are made by the trader because farmers do not have equipment to weigh animals. Some farmers use a measuring tape to compute the pig weight, while the majority rely on visual estimation of pig weight. An adult pig weighs between 60–70 kg, for improved or exotic breeds, pig weight can be up to 80–100 kg. Unless there is a disease outbreak, farm-gate prices of pigs are stable throughout the year. Payment is by cash, and rarely are there delays in honoring payments.

## Wholesale prices and quantities

Wholesalers including processors are middle-of-the chain agents. Slaughter pigs or carcasses are their input and pork supply their output. The live weight of a slaughter pig is normally over 50 kg in Kampala and the average carcass weight is about 40 kg, implying a technical (conversion) coefficient of at least 0.7. The wholesalers' decisions regarding quantities to supply depend on farm price of slaughter pigs and retail price of pork. Table 29 shows wholesale prices of carcasses in Kampala and Wakiso districts. Between 2015 and 2017, prices increased by about 7% and 15% in Kampala and Wakiso, respectively. The low increment in Kampala is probably due to the relatively high competition in the market that exerts downward pressure on prices.

Table 29. Carcass wholesale prices in Kampala and Wakiso

Year	Kampala (UGX/kg)	Wakiso (UGX/kg)
2017	8,000	7,500
2016	7,500	6,500
2015	7,500	6,500
2014	6,500	No recollection
2013	6,500	No recollection

### Retail products, quantities and prices

The main retail pork products are cut meat (sold in butcheries, pork joints, supermarkets, hotels and restaurants) and sausages (sold in supermarkets, hotels and restaurants and as street food). Prices of meat sold by peri-urban and urban butcheries have increased by the same magnitude over the last five years from UGX8,000/kg to UGX11,000/kg. For pork joints, there is no standard unit of measurement used, hence to a certain degree, they are not price takers. The same can be said of other food service operations. Regarding quantities sold from these meat outlets; in Kampala for instance, about 90% of carcasses from Wambizzi are sold to pork joints and butcheries, while the remaining 10% go to restaurants, hotels and supermarkets.

## Pork demand attributes

In a study by Heilmann et al. (2015), butchers in Kampala revealed that their clients are mainly concerned with cleanliness of the butchery, trustworthiness of the butcher and freshness of the pork – always preferring meat from a pig slaughtered on the same day the purchase is made. In another study by Mtimet et al. (2013a), quality of pork and other meat products sold in abattoirs and retail outlets, including supermarkets and food service operations in both urban and rural areas of Uganda was found to be considerably high. That is, these outlets do not simultaneously sell high- and low-quality products. The study also revealed that irrespective of the level of income and market segment, most consumers demand for safe products, although premiums for safety and organoleptic attributes remain unknown. Carcass wholesalers, however, like to purchase pigs in good health, with a relatively thin layer of fat, between 6 and 12 months of age, and preferably castrated males (Mtimet et al. 2013b). Prices were found strongly associated with these attributes; that is, wholesalers are willing to pay premiums for these quality attributes.

The lack of information on consumer preferences for different organoleptic attributes of raw pork is probably due to the fact that Ugandans typically consume pork as food away from home (FAFH). Pork cuts for home preparation and consumption are expensive relative to other types of meat. This is an opportunity for the industry to innovate and influence consumer tastes and preferences in a way that favours at-home consumption of pork. A starting point might be to increase animal productivity in terms of output of lean meat per animal. Consumer expenditures on pork for home consumption can be analysed to reveal their preferences for different quality attributes.

## Food safety

This section presents highlights key public health strategies that are relevant to the pig sector in Uganda. The public is increasingly becoming sceptical about the quality of pork and other meat products in the country. Substandard pork easily finds its way into the market in the country and several illegal slaughter places continue to operate without supervision. Ensuring consumer confidence in pork products requires promoting quality and safe pork in the country. Quality assurance standards in the pig production process have not yet been embraced. Nevertheless, pig meat, which includes pork and pork products such as bacon, ham, and pork sausages; is widely believed to be safe to eat, if it is well handled and cooked at temperature of at least 70°C (158°F). Proper cooking of pork destroys most of the disease-causing bacteria and infections that may be in the meat.

Daily consumption of pigs (pigs slaughtered/day) in Kampala is between 500 - 1000 pigs, but the total number of slaughter slabs/places is unknown. Wambizzi is the only licensed pig abattoir, which meets minimum meat handling and slaughter standards and slaughters up to 100 pigs daily. The abattoir is owned by the Wambizzi Cooperative Society Ltd and is involved in pig rearing, pig slaughter, processing and distribution of pork and pork by-products. There are other three (identified) pig abattoirs coming up (outside of Kampala) that meet meat handling and animal slaughter standards. They are owned by Breeds, Feeds and Meat Ltd, Nakifuma Farming Company Ltd and Sanyu Pig Breeding Farm, and are all located in Wakiso district. Pig Production and Marketing Uganda Ltd, a private company, already operates a slaughterhouse in the district which according to its director, Christopher Mulindwa, slaughters an average of 50 pigs per day

The level of hygiene in pork abattoirs and pork joints in Kampala is poor. Even Wambizzi, the licensed pig abattoir, has been subject to several pork safety concerns raised by KCCA. To a large extent, this is attributed to poorly designed and constructed slaughter areas that lack adequate space, poor handling of animals, contamination from an unhygienic environment, and inadequate disinfection of equipment and chopping stumps. Besides, the display of pork in some butcheries leads to pork contamination due to exposure to dust, excessive heat, rain, flies, vermin, unauthorized people and other contaminants.

The transport of live pigs in the country has improved somewhat but there are some traders who still use inappropriate vehicles and cages. Noteworthy is that inflicting unnecessary pain and suffering on live animals, including pigs, is illegal in Uganda. It violates the Animal (Prevention of Cruelty) Law of 1957. It is therefore a requirement that all loading and off-loading facilities be equipped with ramps of minimum slope to ensure ease and safety of loading. Often, pork and pig carcasses are transported in open pickup trucks, in sacks placed on bicycles, motorcycles, and in boots of cars, all of which are prohibited by law.

The negative effects of the failure to observe the recommended carrying vehicles and the proper loading and off-loading facilities are well known. These can stress pigs and lead to poor quality pork after slaughter. However, KCCA and other local governments are committed to the improvement of pork quality and taste.

A performance review of abattoirs, butcheries, and the transport of live and slaughtered animals is underway, and this is expected to improve the situation in the future. Consumers would then be able to demand the pork of their choice. All pork is supposed to bear an official stamp confirming that it is from approved slaughter places.

## Structure of the public health sector relevant to pork products

The Directorate of Animal Resources in MAAIF has three departments: (i) the Department of Production (ii) the Department of Animal Health and (iii) the Department of Entomology as indicated in Figure A6 in the appendix. Stakeholders that are mandated to ensure good quality pork include pig farmers, traders in live pigs, traders in feeds, veterinary personnel, public health personnel, operators of butcheries and pork/meat transporters. They have the interest and power to influence the level of slaughterhouse hygiene and pork handling hygiene.

In terms of operations, the veterinary and public health officials in local governments work together to improve the quality of pork and meat. In the case of KCCA, the two departments (Veterinary and Public Health) have one head, and work together to improve food safety in the city. There are plans to relocate existing abattoirs and slaughterhouses to suitable locations, preferably outside central Kampala and wetland areas. Currently, the focus is more on regulating the informal slaughter places, in order to support the operation of the new upcoming modern abattoirs.

### Major pork safety problems

Meat inspectors often deal with problems of zoonoses such as TB, anthrax and various pig diseases. The other major problem they encounter is contamination. The meat inspection code (based on the MAAIF and FAO manual) is employed to detect these and other meat safety problems. However, inspectors the lack of authority to punish culprits, which is a leading cause of demoralization among meat inspectors.

Pork safety problems in Uganda include the tapeworm, whose prevalence is estimated at between 1–3%, depending on location. Tapeworms are more prevalent in areas with poor handling of sewage and absence of latrines. According to the senior DVO of the KCCA, contamination of slaughterhouses and pork in Kampala is prevalent. Seasonality and inadequate and use of poor-quality water, some of which is contaminated with *E. coli* causes diarrhoea in humans and animals and other public health challenges. The other challenge is the rise in the use of the antimicrobial substances in the livestock sector, potentially leading to development of resistance to pathogens and high risk of contamination among humans through consumption of contaminated products (Uganda business case report, 2019). Slaughter places operate under poor standards, while most butcher shops are not free from dust and flies. Moreover, pig carcasses are often transported in sacks that may also contribute to pork contamination. The lack of refrigeration facilities in slaughterhouses, trucks that transport carcasses and in butcheries creates further challenges in case pork is not sold quickly on the same day. These challenges are further exacerbated by lack of clean water in slaughter places. Nevertheless, there has been an improvement in the level of inspection, and this has helped to reduce food safety issues associated with pork handling and consumption.

There is wide agreement among veterinary and medical doctors that the increasing incidences of neurological diseases such as epilepsy, madness and blindness in Uganda may be caused by eating poorly cooked pork, especially from pigs that are reared in unhygienic conditions. Most pigs in Uganda are kept and managed under poor housing and feeding practices, which leads to pig infection with a parasite called *taenia solium* (pork tapeworm) that causes a neurological diseases (cysticercosis) in humans (Waiswa et al. 2009). However, there is need for research on the problem in the country.

Overall, there is limited information on the level of incidence, prevalence, morbidity, mortality rates and qualitative characterization of corresponding impacts of food safety problems in Uganda's pig sector. The few studies that have been done are of limited scope. Detailed studies on key issues of pig production, pig health, food safety, marketing and value addition are needed.

## Factors influencing public health

There is more focus on regulating slaughter places in urban areas than providing incentives to promote capacity in urban pig production. Currently, the regulation of the abattoir health and pork hygiene is conducted based on the Uganda's Public Health Act<sup>18</sup> and Kampala Ordinance rules (GoU 1962; GoU 2003; GoU 2006). Ordinance rules provide guidelines on ensuring good quality pork and pork products. They define conditions upon which slaughterhouses and butcher's shops can acquire licences and be effectively regulated. Some of the regulations require that pigs be slaughtered only in licensed slaughterhouses; all pigs and pig carcasses be inspected by an authorized veterinary health or medical officer before they are released for public consumption; and that they are stamped/ marked to certify they are fit for human consumption. All persons involved in the handling, transport, and sale of pork should also be registered to avoid unwanted exposure to contamination. Nevertheless, the situation is so dire that even the licensed Wambizzi abattoir in Kampala would not qualify to operate, if the public ACT was fully enforced. DVOs in the KCCA and municipal councils conduct livestock and pork/meat inspection based on the Public Health Act and ordinances. They have the power to close down illegal pork slaughter and trading places.

Certainly, results would be different if the government was to combine this regulation enforcement with other win-win interventions that create and build capacity for those involved in pig slaughter and sale operations. Providing the necessary incentives to proprietors of poorly run slaughter places as opposed to closing them may help improve the informal slaughter services in this country.

Wambizzi abattoir, like most traditional slaughter places in Uganda, has a weak management system, when compared to the new slaughter companies such as the Uganda Meat Industries. Decisions need to be made on shifting most slaughter places to suitable places that can allow minimum contamination of pork. Furthermore, Wambizzi abattoir's operations should be modernized to limit the negative influence and exploitation of traders that currently control its supply chain. This implies that slaughter companies should be able to recruit and pay workers and to ensure that the existing quality controls and procedures are followed. Currently, workers in slaughter places are hired and paid by traders of live animals, a factor that gives the traders too much power and many of them, as a result, circumvent quality controls requirements.

Most slaughter companies operate under tight budgets, but this is not the major cause of poor-quality meat and pork in Uganda. The problem seems more centred in the lack of empowerment and support from existing government policy. For example, disagreements and power struggles between officials in the Directorate of Animal Resources at the MAAIF and officials in the local governments lead to vetoing of lower-level decisions. This not only leads to demoralization but also undermines the regulation and improvement of pork/meat safety. It is essential that the right support is provided in time and at all levels of the regulation structure in order to ensure improvement in pork quality for consumers.

Meat inspectors and regulators in local government claim not have the support of police and courts of law. For example, veterinary officials in KCCA are now hesitant to take on powerful unregistered and illegal slaughterhouses on issues of poor hygiene performance because, they say, when these cases are brought to court they are suspended or vetoed by superiors.

The level of awareness among pig producers and traders on issues of pork safety is low and is a big concern for pork consumers. This is attributed to poor enforcement of rules and standards, even when relevant policies are clear. Only a few meat inspectors are available to conduct ante-mortem examinations, visual inspection of meat organs and lymph nodes, and further testing of pork in the laboratories. Clearly, experts in meat inspection are overstretched, and capacity building in this regard is low.

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18. In Kampala City, the Public Health (Meat) Rules (GoU 1962), ceased to apply in 2006. They were replaced with the Local Government (Kampala City Council) (Meat) Ordinance, 2006. This Ordinance is currently used to regulate the operation of traders in live animals, slaughterhouses, pork/meat transporters, butcheries and ready-to-eat pork joints.

## Competitiveness of the pig sector

The competitiveness of the overall pig sector and the main pig value chains is high. This is true even when piggery is not included among priority enterprises for commercial development and investment. Piggery in Uganda is increasingly becoming recognized as an enterprise with great potential, given the increase in production and consumption of pork. This potential is driven by a combination of population growth, rising incomes, changing preferences, urbanization and changing production systems. The popularity of, and demand for, processed pork products, pork roast in pork joints, street pork (informal street food), and high-quality food in the formal sector are growing.

Pig keeping among smallholders, especially women, in the country is also growing. Evidence of this is seen in the increase in the number of pigs and proportion of households involved in pig keeping. This is true whether farm households are poor or relatively better-off. Besides, there is an increasing number of agents along the pig value chains who are involved in activities such as input trade, trade in live pigs, trade in piglets, pork processing and pig and pork transport. Interventions that can contribute towards adding value on pig products can therefore increase incomes and boost employment for many people in the country.

The proportion of female-headed households in the livestock sector that also engage in smallholder pig production has increased in the last two decades, from about 10% in 1990 to 15% in 2000 and to 32% in 2009/10. It is often argued that young people are not interested in traditional agricultural production as the returns are modest and take time.

Land and capital are also a requirement in the business start-up, something that youth usually have no or limited access to. The pig value chain in Uganda shows that primary production can be an attractive option for youth. This is because pig production requires only a small plot of land, little capital and gives relative quick and attractive returns. Gender dynamics are also seen to affect the youth. In urban areas most business activities related to the pig value chain are value-adding services. Majority of them (slaughtering, trade, pork joints) are deemed typical male activities. Some young women are interested in roasting and spicing of meat but such activities are often considered “inappropriate” for girls and young women (Wouter 2017). Despite poor access to markets and associated exploitation from traders that act as middlemen, smallholder systems are relatively more competitive than modern piggeries. This is attributed to use of commercial mixed feeds that increase productivity in peri-urban areas and use of crop residues and forages in rural areas that reduce the cost of production. Piggery is therefore a useful instrument of poverty reduction and gender mainstreaming.

Like other animal-source foods, pork is a source of good-quality protein. There are concerns about its fat content that may make it a non-healthy food. Contrary to widespread popular the belief that pork as white meat has great nutrition value for people who want to eat healthy food, is not yet scientifically supported.

## Comparative and competitive advantage vis-à-vis the world market

The pig sector in Uganda faces major challenges that continue to constrain its competitiveness including shortage of skilled workers in areas for adding value and a weak legal and regulatory framework, which is compounded by poor enforcement of food safety requirements. In addition, the extremely limited access to financial services for most Ugandans, particularly smallholder pig farmers and medium sized business enterprises also limits the sector’s growth (Agriterra-EKN 2012). Ultimately, all these reduce the country’s competitive advantage when compared to the rest of the world. Despite these constraints, pig production in Uganda is thriving with high demand for pork that is, however, restricted to mostly serving the domestic demand, and to some extent regional demand.

The amount of pig/pork exports is low and there is need for detailed studies that can quantify the extent to which there are significant relationships between domestic prices, import prices and structures of import (and export) taxes. When it comes to the exporting and importing of live pigs and pork products, little is known about border prices and domestic resource costs. In the case of disease outbreaks, the resulting sanctions on the consumption of pork also reduce the competitiveness of the pig sector in the country.

## Current structure of prices and margins across the main value chains

The structure of prices and margins across the main pig value chains nationally is not well understood. The main value chains include: (i) rural-to-rural value chains, (ii) rural-to-urban value chains, and (iii) urban/peri-urban to urban value chains. Research is needed to understand the performance of the pig value chains in terms of who among the value chain actors is benefiting more, who is constrained and which stage contributes the highest share of value added. This can be assessed by undertaking a financial analysis from the perspective of individuals that also highlights their financial costs and benefits based on market price. Conversely, an economic analysis can be conducted from the perspective of the society based on shadow prices and opportunity costs.

## Conclusions: growth scenarios and interventions required to grow the sector

The pig subsector is vulnerable to outbreaks of new infections and diseases, which reduce the number of pigs, their productivity and the quality of pork and pig meat products. Efforts to boost the growth of the pig sector should focus on different stages of the value chain. These include practices for increasing production and productivity, improvement in transport and marketing conditions for live pigs and pork, ensuring good quality pork products, and hygienic processing and packaging for distribution in the local and regional markets, among other measures.

At the same time, interventions are needed that eliminate negative effects related to:

- Lack of capital on farms and limited access to information/training on pig husbandry
- Poor farm management practices especially in areas of animal feeding and animal health
- Pig diseases such as helminthiasis, scabies, mange, coughing and diarrhoea that affect productivity and may result in high mortality especially in piglets.
- Outbreaks of African swine fever
- Expensive veterinary services
- Availability of ineffective drugs and adulterated animal feeds in the market
- Limited access to productive high-quality pig breeds for different production systems
- Poor structure of the pig industry in which traders dominate the supply chain
- Poor organization of farmers who are unable to take advantage of collective marketing to upgrade
- Low farm productivity as a result of existing technical and management problems

- Limited women's participation in market value chains, particularly the formal markets
- Poor transport and marketing infrastructure that increases transaction costs
- Limited value addition on pork and pig meat products
- Poor prioritization of pig enterprises in the Uganda Agricultural Sector Strategic Plan (ASSP)
- Pork safety problems associated with zoonoses (e.g. tapeworms, TB and anthrax) and contamination

The country is likely to enjoy high growth in pig production if there is more focus on improving access to affordable credit, training, extension services, veterinary services, better infrastructure and access to improved pig breeds. The routine interventions in the control of animal diseases are contributing to the improvement of pig production systems in areas where the service is available. The private input and veterinary services provision is growing at a slow pace compared to the demand from smallholders who are seeking reliable veterinary services and high-quality animal feeds.

There is increased awareness and public demand for addressing hygiene and contamination of pork at different levels of the value chains. These measures will lead to improvements in pig abattoirs, quality of pork available and the competitiveness of the pig sector. At the same time, the market of live pigs, pork and pork products is segmented and needs to be improved to reward quality and supply to the poor. Meat inspectors require support to overcome demoralization due to lack of authority to punish culprits of illegal and unhygienic pig slaughter. More enforcement of existing regulations is needed.

Evidence from the 2009/10 UBOS data reveals that the number of pigs reared is more pronounced among the richest 25% and poorest 25% of households. This shows that improvements in piggery enterprises have the potential to improve the welfare of a wide spectrum of smallholders in the country.

Pig production is becoming an enterprise for both the rich and the poor, including the vulnerable groups. In the coming years, Uganda is likely to see more large-scale investments in pig production. However, the number of smallholder pig producers in the rural and peri-urban areas will continue to increase. Growth in domestic and regional demand for pork is likely to remain higher than growth in local production of pigs. The business-as-usual scenario of pig production will not satisfy the local demand for pork and pork products in the coming years. New measures are needed to promote improvements in the pig value chains, particularly for the smallholder pig producers.

# Value chain governance

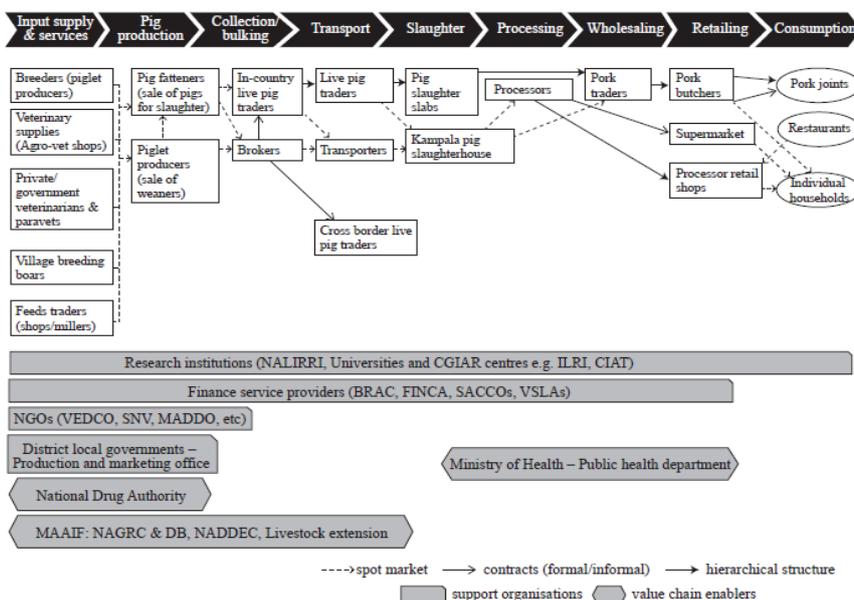
The governance of value chains ensures that interactions between actors along a value chain are organized rather than random. This is achieved when there are well-specified parameters requiring, in this case pork products, pork processing and logistic qualification along the value chain, and encompassing bundles of activities, actors, roles and functions (Kaplinsky and Morris 2002). Ultimately, the governance of the value chain influences its effectiveness. In the pork value chain, a good innovation through value addition creates a new pork product that provides greater returns (profit) from the price of that pork product than is required to meet the cost of the innovation. This in turn triggers an inducement for other pig farmers and actors to replicate and seek to acquire part of the profit in the local market.

Stimulating production and income generation for the poor therefore is largely driven by opportunities to add value to pork products. These opportunities are typically set within complex webs of actors and activities which require a range of technical and institutional strategies, including governance. Given that the key features of value chains include the need to understand trust, cooperation, governance, market power, innovation, knowledge and intervention points (Webber and Labaste 2010), there is need for a detailed study on smallholder pig value chains in Uganda. Also important is the need to map value chains; the relative importance of different stages or segments of different activities and interactions that generate costs and value; characterize the embedded sociocultural context, and the dynamics of gender in the pig sector.

## Smallholder pig value chain governance

The pig value chain in Uganda is not well regulated and typically operates under informal market arrangements. The market is dominated by men at all nodes, including live pig trading, processing, slaughter and pork retail. At the production node of the value chain, most relationships are based on spot market governance structures. Figure 27 shows the different nodes, major actors and their specific roles in the pig value chain in Uganda. There are several intermediaries between the production and consumption nodes, which tends to lengthen the chain. Though the value chain looks complex, barriers to market entry are almost non-existent/low, and there are generally no standards to adhere to (Ouma et al. 2017b). The value chain is characterized by limited availability of end market information on prices and there is lack of transparency in transactions performed.

Figure 27. Uganda pig value chain map



Source: Ouma et al. 2017b

## Pig supply

According to Ouma et al. (2017), the pig suppliers are mostly several smallholder farmers who sell pigs for slaughter to several intermediary parties (traders and collectors) through uncoordinated spot market transactions. The transactions are based on oral agreements and usually supported by personal relationships and trust. The quantities sold on average by farmers are 1–2 pigs at a time, twice a year to local traders or collectors working within larger traders' business networks. The prices received by farmers are determined by the traders based on visual estimates, irrespective of the transaction costs (incurred by the farmer), labour and capital investment (put into production).

## Live pig trading

The live animal market involves collection of pigs from individual pig farmers and bulking for sale to larger traders located in urban areas, neighbouring districts and to some extent neighbouring countries. The sourcing of pigs from farmers is mainly carried out by village brokers, who then supply to traders under informal contractual arrangements. Pig traders are key in the value chain. They collaborate through informal groupings and collude in setting both producer price of pigs and pork retail price, making them rather powerful actors in the chain (Ouma et al. 2017b). The traders also use the informal groupings to share information on pig product prices and other market conditions. Unlike the farmers who are largely concentrated at the production node, the live pig traders are vertically integrated, performing several functions in the value chain under single ownership (Ouma et al. 2017b). At the retail node, they are involved in operating pork butcherries and pork joints while also carrying out pig slaughter functions. Some of them even purchase pigs directly from farmers. The vertical integration is dominant as only 7–25% of pig traders are involved in sale of live pigs to other traders (Ouma et al. 2017b).

## Pig slaughter

Uganda has only one recognized and regulated pig slaughter facility (Wambizzi) located in the capital city, Kampala. In the absence of other designated slaughter facilities for pigs elsewhere, traders improvise backyard slaughter premises that are neither regulated nor subjected to meat inspection. Hygiene standards at these backyard premises including pork handling are often poor. Much as quality standards for handling of meat exist, they neither adhered to nor enforced by the relevant authorities. The code of hygiene practice for meat as prescribed by Uganda National Bureau of Standards covers hygiene provisions for raw meat, meat preparations and manufactured meat from the time of live animal production to the point of retail sale (UNBS, 2019). It is upon the competent authority with legal power, which in this case is the veterinary and public health department in local governments, to set and enforce the regulatory meat hygiene requirements, and take final responsibility in verifying that slaughterhouses operate in ways that meet requirements. About 90% of the pork consumed in the country is obtained from unsupervised backyard slaughter premises operated by pig traders yet enforcing standards and ensuring food safety standards in these premises has been weak. The slaughter areas are usually situated closer to retail outlets probably to minimize transport cost and also avoid the fast deterioration of the meat, given many traders lack cooling facilities.

## Processing

The major processor of domestically produced pork is Fresh Cuts (U) Ltd and the major importer of processed pork products into Uganda is the Kenyan company Farmer's Choice. Fresh Cuts (U) Ltd neither operates its own pig farm nor is it vertically integrated with carcass wholesalers. Instead, the company procures all carcass supplies on contractual basis from carcass wholesalers and mainly relies on the legal pig slaughterhouse in Kampala. It would seem that Fresh Cuts enjoys market power in procuring carcasses for domestic processing. But the market power is more apparent than real, considering that most carcasses end up in other market segments. The company supplies sausages to retailers including supermarkets and food service operations and owns a retail outlet (i.e. Quality Cuts) that is highly popular among high-income pork consumers. Fresh Cuts has been managed to penetrate some export markets including Rwanda, DRC and South Sudan. Anecdotal evidence suggests consumption of pork products in these countries is equally growing, and this presents potential growth for Ugandan pork exports.

## Input supply

The input suppliers comprise livestock feed traders, veterinary service providers and breeders. The relationship between the input suppliers and smallholder farmers is mainly on spot market basis (Ouma et al. 2017b). The commercial use of some of these inputs by smallholder farmers is limited probably due to high input cost and the lack of market information regarding the benefits, and price and quality of the inputs. Nonetheless, the quality of inputs in the market is widely reported as poor, particularly the feeds, and to some extent the animal drugs. To make matters worse, there is no quality assurance and regulation of the wider veterinary drug input system in the country. Though there are policies to govern input supply such as the Animal Feeds Policy (2005) and the National Drug Policy, they have not been implemented effectively.

## Externalities

This section discusses the current perspectives and knowledge about issues that may be associated with growth of the pig sector and smallholder pig production in particular. Pig farmers and the other stakeholders would like to have sustainable production and productivity of pork products to respond to the rising demand for them. This implies that for the country to enjoy positive outcomes of sustainable growth in pig enterprise, there is need for a consistent supply and use of reliable and high-quality inputs for pork production and environmental impact reduction must be integrated in these interventions.

No doubt, the recent increase in the domestic and regional demand for pork and pork products has been accelerated by an increase in human population growth, urbanization, purchasing power and change in tastes and preferences among consumers. Despite this high demand for pork, farm-level productivity of pork is low. And while there is potential for increasing the production and productivity of smallholder pig farms through the adoption of improved practices, vital resources in terms of feeds, forages and water are increasingly getting threatened by climate change.

## Environmental impacts

Smallholder pig value chains in Uganda are embedded in the environment which provides a basis of all essential inputs, energy and the capacity to dispose emissions and waste. Economic activities and particularly agricultural production are all based on environmental resources, including land, forages and water. In Uganda, the National Environment Policy is clear on the need for sustainable social and economic development through innovations that maintain environmental quality and resource productivity in the long-term. The aim is to enhance basic aspirations of social progress of value chain actors, growth in economic performance and ecological integrity.

Interventions are needed to boost the farm-level productivity of pigs and household or individual-level consumption of pork. Technologies that reduce greenhouse gas emissions (GHGs), pollution of water sources and climate change need to be disseminated and targeted to the poor farm households. An increase in pork production can change the balance of required animal-sourced foods in the country and can also trigger a reduction in potential negative environmental impacts. There is need therefore for carbon neutral pig value chains that reduce the eco-footprint of pork, and pork products, and the promote the sustainable use of natural resources (Faße et al. 2009). In this regard, a detailed pig value chain analysis can provide information on input-output flows of pork products at each stage and the associated environmental effects of products, which are currently not well understood.

## Waste management and impacts on ecosystem health

Generally, poor manure management practices are associated with the depletion of a minimum of 40 kg per ha of major soil nutrients due to intensive production. Pig farming, like other animal enterprises, generates waste that includes waste feed, water, faeces and urine. These need to be well managed to minimize waste emissions and degradation of the environment. Ultimately, waste management or effluent disposal helps to reduce nuisance from bad odours and flies; reduce pollution of water resources; prevent multiplication of disease-causing agents in areas surrounding pig farms and keep the environment clean. This is important whether pig farms are located in urban, peri-urban or in rural setting. Pork tapeworms are more prevalent in areas with poor handling of sewage and where latrines are not available or poorly used (Waiswa et al. 2007) and they are a serious zoonosis that can cause epilepsy in humans.

The lack of adequate labour and technology to handle and dispose pig waste at farm level is widely reported as a problem. Farmers who have provisions to collect pig manure often apply it directly to the garden, empty the waste in a pit on daily basis and utilize it for biogas production.

Noteworthy is that pig waste can be an important source of nutrients for crop production but can also have negative impacts on the ecosystem health. It is known that good management practices could help minimize wastage of compound feed through spillage and contamination. The use of appropriate amounts of water, well-designed creep areas and feeding troughs could help to reduce feed wastage (Mutetikka 2009). Furthermore, feeding pigs the right amount of easily digestible feed, two times a day, is also a way of reducing feed wastages. However, in the case of fibrous feeds, animals usually chew them and leave some sort of bagasse by-product that are cleaned from the corrals. All these wastes can be controlled when animals are raised in well-designed corrals, either cemented or elevated pens. But most pigs in smallholder farms are raised on either ground floor and often more frequently tethered or even roaming around, where the collection of feed wastages and manure is such a big challenge.

## Impacts on climate change: Greenhouse gas emissions

The emission of GHGs in the pig-related enterprises is not well understood in Uganda. A study is urgently needed to quantify and compare variations in climate change across different livestock enterprises, including piggery. Nonetheless, the National Environment Policy, the National Land Use Policy, and the National Adaptation Plan of Action 2007, though silent on specific issues of pig enterprise, are being implemented to ensure sustainable social and economic development that can enhance environmental quality and resource productivity in the long-term. The aim is to promote “green” (organic) pork and other meat value chains and to recognize differences in Uganda’s agroecological endowments and potential. Furthermore, there are efforts to improve efficiency through optimal use of improved breeds—usually cross-bred animals—that can easily adapt to the local conditions, and provide affordable feedstuffs and appropriate management to prevent damage of natural resources.

# Pig development strategies and activities

There are no well-defined development strategies and activities for pig development in Uganda. Only NAADS activities have a component of distributing piglets and providing training and advisory services to farmers in selected districts. Few districts chose piggery as one of the main three enterprises to be promoted under the NAADS program in the country. There are also other NGOs, such as Volunteer Efforts for Development Concerns (VEDCO), which are involved in supporting pig producers with the necessary inputs and training. The current policy environment does not favour the development of pig enterprises and related value chains, at least at the same level it does dairy.

Pig enterprises development is also not yet fully aligned within the national development plans and strategies for poverty reduction. This is evident from all policy documents, which are silent on pig farming, and from the fact that pigs are not among the major enterprises selected for strategic investment and promotion in the country. Nevertheless, pig production has continued to grow and is now attracting the attention of policymakers and other stakeholders as an instrument for poverty reduction and economic growth.

## Synthesis from review of pig development activities

The pig sector in Uganda has for long been ignored in almost all development interventions in the livestock sector. There is hardly any documentation on current and past pig-related projects in the country. Only two past projects were found to have a component that targeted pig enterprises. These were (i) the Livestock Disease Control Project, which aimed at reinforcing animal disease control capacity and animal healthcare delivery in conjunction with private sector participation, and the Meat Master Plan Study (1998), which focused on the development of cattle, sheep and goats, pigs, poultry and rabbits within the traditional smallholder and modern commercial sectors with emphasis placed on their economic potential (Kasirye and Denormandie 2012). The project helped to produce an overall, strategic and comprehensive plan that defined the perspectives for sustainable development of the meat industry and local demand and for export over a period of 20 years. In the current ASSP 2015/16–2019/20, as much as pig meat is prioritized among the livestock meat, there are no specified strategies and activities for pig sector development except for control of ASF that has an earmarked budget of UGX15 billion. New pig projects in the country will help farmers, traders and actors in the value chain to utilize the potential of pig farming in the country.

# Research and development partnership landscape

## Partnership landscape in livestock research and development

In Uganda, a range of institutions are involved in planning, funding and implementing livestock research and development (R&D) interventions. These institutes include are both government and nongovernment actors, and can be categorized into six types: i) government entities, ii) universities and colleges, iii) international agricultural research centres, iv) international development partners, v) civil society organizations (CSOs), and vi) the private sector. The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) is the main government body responsible for research and development in the livestock subsector. It is the ministry's mandate to formulate, review and implement national policies, plans, strategies, regulations and standards and enforce laws, regulations and standards in the livestock value chain<sup>19</sup>. Under the ministry, there are several departments and agencies, but those directly involved in livestock include: Directorate of Animal Resources, Directorate of Agricultural Extension Services, Department of Agricultural Policy and Planning, Department of Agricultural infrastructure, Mechanization and Water for Agricultural Production, National Agricultural Advisory Services (NAADS), the National Animal Genetic Resources Centre and Data Bank (NAGRC & DB) and the National Agricultural Research Organization (NARO).

Universities and colleges play an important role in providing training of human resource for livestock R&D as well as generating knowledge through research in the sector. There are several universities in the country, however, Makerere University is the most prominent among them in this regard. Foreign universities are involved in livestock R&D in Uganda as well including the Swedish Agricultural University and Swedish Veterinary Services, the Iowa State University and the University of Florida among others.

The international agricultural research centres involved in livestock R&D include ILRI, the International Potato Center (CIP) and the International Center for Tropical Agriculture (CIAT) among others. These organizations play an important role in generating and sharing research, information and building capacity for livestock R&D.

The international development partners involved in livestock R&D provide both financial and technical assistance to the government, including supporting development of enabling policies in the sector. Areas of support include documentation and analysis of good practices, facilitating public-private policy dialogue and advising government on policies conducive for the development and growth of the livestock subsector. These organizations include FAO, World Bank, the United States Agency for International Development (USAID), the International Fund for Agricultural Development (IFAD), the European Union (EU), and the African Development Bank (AfDB), etc.

Under the category of CSOs, we have NGOs, farmer organizations, associations and cooperatives. This group facilitates the linkage between farmers and the private and public institutions that provide services for the development of the livestock subsector. Farmer associations affiliated to the livestock subsector include the Uganda meat producers association (UMPCA), Renaissance Livestock Farmers' Network (RELIN Uganda), Uganda National Apiculture Development Organization (TUNADO), Uganda Dairy Farmers Association, Uganda Poultry Association, Uganda Pig Producers Association, Cattle Traders Association and the Uganda Silk Producers Association. NGOs involved in livestock R&D include SNV Netherlands Development Organisation, Volunteer Efforts for Development Concerns (VEDCO), Care International, Heifer International and Veterinarians Without Borders among others.

<sup>19</sup>. MAAIF (26 September 2016). 'Ministry of Agriculture, Animal Industry and Fisheries: About Us'. Entebbe: Ministry of Agriculture, Animal Industry and Fisheries (MAAIF).

## Research institutes

The National Agricultural Research ACT, 2005 provided for the development of National Agricultural Research System (NARS).

The NARS institutional framework encompasses public as well as private sector institutions in implementing agricultural research and promoting vertical and horizontal linkages with other national, regional and international institutions. Under MAAIF, NARO is mandated to guide and coordinate all agricultural research activities in the national agricultural research system in Uganda. NARO is comprised of the council as its governing body, a secretariat for its day-to-day operations, and 15 semi-autonomous public agricultural research institutes. The relevant research institutes of livestock operating under NARO guidance include the National Livestock Resources Research Institute (NaLIRRI) and the Zonal Agricultural Research and Development Institute (ZARDI), which are nine in total.

### National Livestock Resources Research Institute (NaLIRRI)

NaLIRRI was established by the National Agricultural Research Act 2005 to provide livestock research services under the policy guidance of NARO. NaLIRRI generates and transfers livestock-based technologies, knowledge and innovations in areas of livestock health, breeding, nutrition, apiculture and any emerging issues such as avian influenza, acaricide resistance in ticks and climate change challenges. The commodities under its mandate include dairy and beef cattle, goats, pigs, poultry, pastures and honeybees. The institute's headquarters and main facilities are located in eastern Uganda (Tororo district), and it has satellite stations at Nakyesasa (Wakiso district), Lugala (Namayingo district) and Serere (Serere district). The institute collaborates with a number of other institutions including the National Disease Diagnostic and Epidemiology Centre (NADDEC), the International Centre for Insect Physiology and Ecology (*icipe*), ILRI and the Uganda Veterinary Association (UVA).

### Zonal Agricultural Research and Development Institute (ZARDI)

The nine ZARDIs were established through the National Agricultural Research Act 2005, and are spread out across the country. They are the Abi Zonal Agricultural Research and Development Institute, the Bunginyanya Zonal Agricultural Research and Development Institute, the Bulindi Zonal Agricultural Research and Development Institute, the Kachwekano Zonal Agricultural Research and Development Institute, the Mbarara Zonal Agricultural Research and Development Institute, the Mukono Zonal Agricultural Research and Development Institute, the Nabuin Zonal Agricultural Research and Development Institute, the Ngetta Zonal Agricultural Research and Development Institute, and the Rwebitaba Zonal Agricultural Research and Development Institute. The institutes are responsible for carrying out and managing applied and adaptive research, and facilitating the development and dissemination of appropriate agricultural technologies that address the specific needs of their respective agricultural zones.

## Line agencies responsible for livestock development

### Directorate of Animal Resources

The Directorate of Animal Resources is responsible for spearheading the development of the livestock sector in the country. Its overall objective is to support sustainable animal disease and vector control, market-oriented animal production, and food quality and safety for improved food security and household income. The directorate has three departments, each headed by a commissioner and mandated to carry out different tasks towards livestock production and marketing. These are the Department of Animal Health, Department of Animal Production and the Department of Entomology. The Department of Animal Health is mandated to prevent, control and eradicate animal diseases and parasites, promote animal health and welfare and protect humans from diseases transmissible from animals to humans. The Animal Production Department supports sustainable market-oriented animal production and value addition for improved food security and household income.

Semi-autonomous agencies affiliated to the Directorate Animal Resources include the Coordinating Office for the Control of Tsetse and Trypanosomiasis in Uganda, NAGRC&DB and the Dairy Development Authority (DDA).

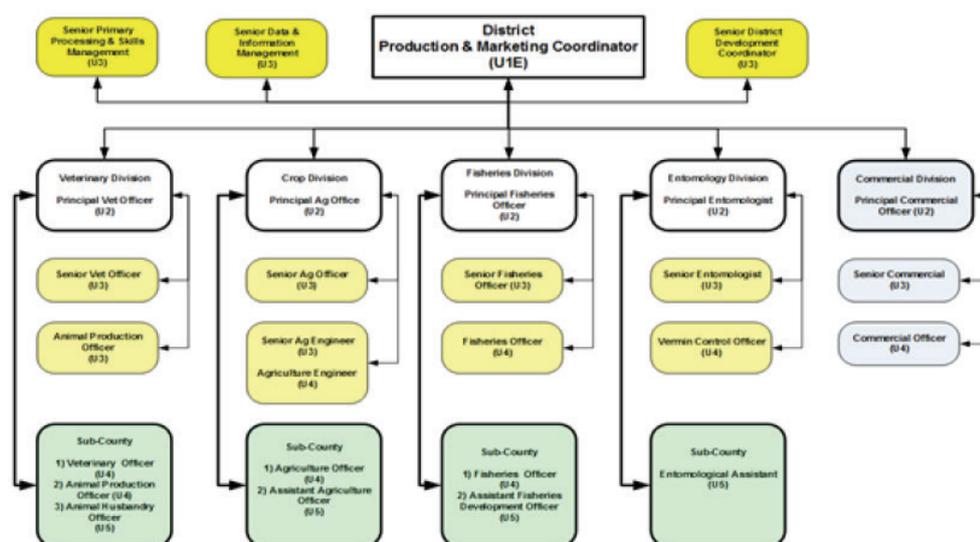
## National Animal Genetic Resource Centre and Data Bank (NAGRC&DB)

NAGRC&DB is one of the statutory semi-autonomous bodies of MAAIF that was established under the Animal Breeding Act of 2001. NAGRC&DB was formed to support genetic improvement, multiplication and conservation as part of the fulfilment of the National Animal Breeding Policy (1997). NAGRC&DB's mandate is twofold: i) to play a leading role in the commercialization of animal breeding activities in Uganda and ii) to carry out development activities that enhance animal genetic improvement and productivity.

## Directorate of Agricultural Extension Services (DAES)

The mandate of DAES is to promote adoption of appropriate information, knowledge and technological innovations for commercialization of agriculture. The directorate has two departments: the Department of Extension and Skills Management and the Department of Agricultural Investment and Enterprise Development. The latter is responsible for supporting sustainable agribusiness development and management, public and private sector investments and emerging commercially viable agricultural enterprises for improved food security and enhanced household income. The DAES is responsible for facilitating and coordinating all actors (public and private) in extension service delivery. There are approved structures for extension service delivery at national, district and subcounty levels. The DAES structure at district local government and subcounty levels is shown in Figure 28.

Figure 28. Extension service delivery structure at local government and subcounty levels



Source: National Agricultural Extension Strategy, 2016

## National Agricultural Advisory Services (NAADS)

The NAADS was established in 2001 by an Act of Parliament (NAADS Act 2001) to specifically facilitate efficient and effective delivery of agricultural advisory services for enhanced production and productivity. However, since 2014, NAADS' role was changed to 'Providing support for the management of agricultural input distribution chains, promotion of strategic commodity interventions, agricultural chain development and farmer access to agricultural financing<sup>20</sup>.' NAADS focus areas now include i) increasing access to critical and quality agricultural inputs for smallholder farmers including women, youth, older persons and people with disability (PWDs); ii) supporting the development of agriculture commodity value chains through provision of agribusiness value addition, and marketing linkage services; iii) facilitating farmer groups/cooperatives to access appropriate agricultural financial services; and iv) strengthening institutional and collaboration frameworks to enhance operational effectiveness and efficiency.

20. Source: Report by the Inter-ministerial Technical Committee (ITC) submitted to the Minister of the Presidency in November 2013. Rebuilding and revitalizing the national agricultural extension system in Uganda.

NAADS works closely with OWC through the Office of the President in linking farmers, in setting district priorities, selection of enterprises and verification of beneficiaries. OWC also does the distribution of the procured agricultural inputs to benefiting households. Similarly, NAADS operations are designed to function through the local government structures, but with the involvement of OWC officers. NAADS is also supposed to work closely with NARO to promote sharing of technical information on available technologies generated and providing feedback to inform research agenda.

## Universities and colleges

### Makerere University

Established in 1922, Makerere University is Uganda's largest and oldest institution of higher learning, and among the top five universities in Africa. The university works in partnership with government, the livestock industry and several other universities in research and resource training for the agricultural sector and development of the country as a whole. The university has 10 colleges offering program to about 36,000 undergraduate and 4,000 postgraduate students. Two of the colleges that are directly involved in livestock research and development are the College of Agricultural and Environmental Sciences and the College of Veterinary Medicine, Animal Resources and Biosecurity (CoVAB). CAES has two institutes that handle research, namely the Makerere University Agricultural Research Institute Kabanyolo and the Makerere University Biology Field Station (MUBFS). The college also has 14 centers serving as a base for knowledge transfer and partnerships. CoVAB focuses mainly on training, research and outreach services, and it is the only institution that offers Veterinary degrees in the country.

## Nongovernmental, private sector and other institutions

### International Livestock Research Institute (ILRI)

ILRI is a CGIAR research centre, working with partners worldwide to enhance the roles that livestock play in food security and poverty alleviation, principally in Africa and Asia. In Uganda, ILRI's focus has been on the smallholder pig value chain as a high-potential area that can improve livelihoods, incomes and assets of smallholder pig producers – particularly women and other value chain actors. Since 2012, ILRI working in collaboration with partners has carried out action research and capacity development interventions to address identified constraints in the pig value chain. ILRI's focus areas in the country are animal health, feeds and forages, systems analysis for sustainable interventions and value chain transformation and scaling.

### Food and Agricultural Organization of the United Nations (FAO)

FAO is a specialized agency of the United Nations that leads international efforts to eradicate hunger. According to its webpage, FAO cooperation with Uganda focuses on three priority areas that are aligned with national and regional development priorities: production and productivity of agriculture, forestry and fisheries commodities; agricultural knowledge and information; and resilience to livelihood threats, with an emphasis on climate change. FAO's work on livestock focuses on both animal production and animal health. More specifically, the focus is on sustainable development of dairy, beef, pig and poultry as well as small ruminants' production and draught animals; inclusive of animal health and welfare-related diseases, responsible use of animal genetic resources, sustainable animal nutrition and feeding.

### World Bank

The World Bank provides both financial and technical assistance to Uganda. Financial support provided by the bank is in form of low interest loans, interest free credits and grants to cover a wide array of investments. Priority investment areas that have been supported by the World Bank in Uganda include strengthening governance, accountability

and service delivery; raising incomes in rural areas through increased agricultural commercialization and enhanced resilience of the poor and vulnerable; and boosting inclusive growth in urban areas. The World Bank also shares innovative knowledge through policy advice, research and analysis and technical assistance. In addition, the bank supports capacity development in Uganda.

### Vetline Services Limited

Vetline Services Limited is a private company that provides pig artificial insemination services in Uganda. The company started in 2010 and is headquartered in Mukono, about 15 km from Kampala. The company has an established boar stud and a laboratory for semen processing, storage and quality control with capacity to process and store 100 doses daily. It keeps a database of farmers who utilize their services, including monitoring the conception rates of the pigs inseminated and piglets delivered. Since 2014, the company has inseminated over 7,000 pigs in 35 districts of Uganda, delivered over 45,000 piglets attaining an average litter size of 9.1 and an average success rate of 75%. It has recruited over 1,700 farmers for pig insemination and trained over 100 pig artificial insemination technicians.

### Pig Production and Marketing Uganda Limited (PPM)

Pig Production and Marketing Uganda Limited is a private livestock company specialized in trade of pigs and their products including breeding stock. The company was established in 2010 and offers consultancy services in pig production and marketing through training of clients/farmers and provision of production manuals. Its other services include linkages to input suppliers and providing a market for pigs. The main objective of PPM is to modernize, promote and develop pig production in Uganda through providing secure and sustainable markets, advisory services and necessary inputs to make the sector a reliable source of income for both smallholder and medium-scale pig farmers in Uganda. The company's premises are located in Wakiso district.

### Devenish Nutrition Ltd

Devenish Nutrition (established in 2014) is an Irish company that has set up a model pig farm and feed mill in Hoima district in western Uganda to improve availability of quality pig breeds and feeds for pigs. The project is a hybrid commercial and development project that seeks to select and raise the best pigs of improved genetics, and sell them at their different stages of growth to progressive farmers including members of the Hoima Model Livestock Farmers Cooperative Society Ltd. The feed mill produces pig and poultry feeds, which are now sold throughout the country. The aim of the company is to transform the pig and feeds industry in Uganda by availing high-quality feeds and improved breeding stock to farmers, purposively to support farmers' transition from subsistence to sustainable commercial level farming.

### Nakifuma Farming Company Ltd

Nakifuma Farming Company is a Greenfield investment (founded by AgDevCo and Centurion Agricultural partners) specialized in high-tech pig farming and production of quality pork. The farm's operations (started in 2019) are in Nakifuma, in the outskirts of Kampala. The company has an established sow pig breeding and finishing unit with an abattoir that is currently in the final stages of construction (expected to be operational by October 2020). The company intends to use improved genetics and animal husbandry practices to meet both the local and regional growing demand for meat. The farm has capacity to produce 10,000 growers per year and intends to supply 200 pigs (of 100kgs) per week to the market. The regional markets targeted include the DRC and Kenya. The company has also established an AI laboratory and trained staff in semen collection. Future plans include working with commercialized out-growers who can follow full biosecurity measures and access quality feeds.

### Breeds, Feeds and Meat Ltd

Breeds, Feeds and Meat Ltd is specialized in producing pig breeds, feeds and meat. The company, which was established in 2016, has a pig breeding and finishing unit located in Kasanje, about 30 km from Kampala. It can produce 25 tonnes of high-quality feed per day for all feeding stages of the pig life cycle. At the moment all the feed is utilized on farm, but the company plans to increase production to supply the market. Currently the company has an abattoir

under construction and has intentions of exporting pork. The company uses AI services and can provide semen as an external service. Future plans of the company include setting up a training program for farmers who buy their products. They are ready to sell good-quality pig breeds at gilt stage and is willing to work with outgrowers who can meticulously follow biosecurity measures and procedures in producing high-quality meat. In addition, the company is beginning to make concrete slats (for raising pigs) to supply to the market at reasonable prices.

### Sanyu Pig Breeding Farm

Sanyu Pig Breeding Farm located in Luwero is specialized in pig breeding with the aim of supplying quality pig breeds to the market. The company was established in 2018 and has an abattoir under construction in Matugga, Wakiso district. It intends to go into meat processing and export of quality pork to neighbouring countries.

## Summary

Although pigs as an enterprise are not among the 12 chosen strategic priority commodities of the MAAIF's Agriculture Sector Strategic Plan (2015/16–2019/20), the enabling environment (legal framework) for research and development of the piggery enterprise is not limiting. Both government and nongovernment actors are involved in the R&D on pigs. Government research efforts, though limited, are mainly targeting improving production with focus on animal health and breeding. On the other hand, nongovernment actors are focused on improving the whole pig value chain, especially for the benefit of smallholders. Countrywide extension service delivery structures to transfer generated technologies and knowledge to farmers and other value chain actors exists through the local governments and CSOs involved in livestock R&D. Ongoing R&D interventions in the subsector by the various players, especially ILRI, have started to attract new private sector entrants such as Devenish Nutrition into the pig value chain.

## Policy environment and implications

Uganda does not have a clear national livestock subsector policy that provides a specific rationale for livestock development and the context in which livestock development is expected to contribute to the wider national development goals of improving consumer demand, food security and poverty reduction (Kasirye and Denormandie 2012). Livestock policies are scattered in various policy documents, strategies and master plans, which creates duplication in implementation. The policies largely aim at increasing household welfare (i.e. level of income and consumption) by improving the level of breeding, farm management, access to animal health services and drugs, animal feeding, production, productivity, value addition, and marketing of livestock and livestock products. However, these policies generalize the required interventions across livestock enterprises. They do not highlight specific concerns of pig farmers and development of piggery in the country.

The government has in place a road map that guides government, the private sector, farmers' organizations, civil society and development partners in making public interventions in the agricultural sector that can boost agricultural growth, food security and poverty reduction. Following the expiration of the Poverty Eradication Action Plan (PEAP) and the strategic Plan for Modernization of Agriculture (PMA) that are well articulated in MAAIF and MFPED (2000); MFPED (2000); and Bahigwa et al. (2005), the government adopted a more Comprehensive National Development Planning Framework (CNDPF) comprising five related elements: the Uganda Vision 2040, from which three 10-year National Development Plans (NDPs), six five-year National NDPs, five-year Sector Development Plans (SDPs), and annual plans and budgets are derived. So far two NDPs have been produced: NDPI for the period 2010/11 to 2014/15 and NDPII, which is from 2015/16 to 2019/20. NDPI was largely focused on strengthening the foundation of the economy for future economic growth and social transformation, while the thrust of NDPII is to propel the country to middle income status by 2020 through strengthening Uganda's competitiveness for sustainable wealth creation, employment and inclusive growth. Like the NDPI, NDPII is committed to a "quasi-market" private sector-led approach<sup>21</sup> to development through a mix of government investments in strategic areas and private sector market-driven actions.

The NDPII prioritizes five key growth areas with the greatest multiplier effect as identified in the Uganda Vision 2040, namely agriculture, tourism, minerals, oil and gas, infrastructure, and human capital development. The first and second NDPs together with the National Agricultural Policy (NAP) informed the current Agriculture Sector Strategic Plan (ASSP 2015/16–2019/20). The ASSP that superseded the DSIP 2010/11–2014/15 is the current flagship plan for investment and development of the agriculture sector in line with the NDP. Development of the agriculture sector is expected to contribute to national wealth creation and increased employment along the agricultural value chains, which in turn will enhance poverty reduction and lead to social-economic transformation of the country to a middle-income status. According to the ASSP, investments in the sector will be channelled to specified priority and strategic commodities across their entire value chains focusing on research; extension; pest, vector and disease control; provision of inputs; promoting sustainable land use and soil management; post-harvest handling; improving markets access and value addition. The priority commodities include bananas, beans, maize, rice, cassava, tea, coffee, fruits and vegetables, dairy, fish, livestock (meat); and strategic commodities are cocoa, cotton, oil seeds, and oil palm. The strategic plan targets to achieve four objectives namely, (i) increasing agricultural production and productivity; (ii) increasing access to critical farm inputs; (iii) improving agricultural markets and value addition and (iv) improving service delivery through strengthening the institutional capacity of MAAIF and its agencies.

The following section looks at other related policies/policy gaps influencing development of the pig sector from farm to fork.

21. As noted in the NDPII, a quasi-market approach will be pursued in order to increase the efficiency of the public sector and the competitiveness of the private sector. With this approach, government will invest in key strategic infrastructure in order to remove the barriers of entry and increase private sector participation in the key growth areas. Government will create strategic partnerships with the private sector through PPPs [public private partnerships] for investment in infrastructure, human capital, minerals, oil and gas, tourism and agriculture.

## Pork consumption

There are several policy issues related to pork consumption. These range from production, management of feeds, disease control, marketing, pig meat inspection and price effect. The UPTOP (2006) study showed a number of policy gaps in terms of government efforts to enhance consumption and exchange of livestock products. For example, the strategic linkages with relevant government ministries and other key public institutions, exporters, and export associations were either limited or missing. These and other actors in the value chain may be important when it comes to providing expert information and guidance that can enhance pork consumption.

There have been calls to put in place a comprehensive policy guideline that can encourage production and trade of livestock and livestock products. Marketing of these (livestock and livestock) products remains a challenge due to several factors including lack of information and high transaction costs. It is imperative that livestock farmers be helped with affordable access to information that can help them improve the safety, quality and quantity of livestock products for increased market access. Within the value chains, livestock farmers need support with access to credit and veterinary services so that they can increase their productivity and supply to market and get involved in value addition along the value chain. The marketing infrastructure and its efficiency also need to be improved.

In both urban and rural areas, food safety issues and poor-quality standards at major abattoirs and slaughterhouses has become an issue of debate. Food safety concerns also cover the roadside butchers/markets and ready-to-eat pork products. There is need to ensure effective inspection of livestock transportation, slaughterhouses, pork, roadside butcheries and ready-to-eat pork markets.

Noteworthy is that the private sector can serve some of the interests of the livestock sector to a large extent but these need support by public sector investments including in livestock research, investing in modern abattoirs, enforcing of slaughter standards and improving marketing infrastructure, to ensure quality meat products that are distributed at a lower cost.

## Pig production

The Uganda government through MAAIF has made a number of investment programs and policies that aim at developing a sustainable livestock industry and ensuring sufficient supply of good-quality meat for national, regional and international markets. The policies include the National Delivery of Veterinary Services, National Veterinary Drug Policy, National Hides, Skins and Leather Policy, Animal Breeding Policy, Animal Feeds Policy, National Agricultural Extension Policy and the NAP, among others. Livestock development programs implemented based on these policies have aimed at increasing animal production and productivity, ensuring animal health, appropriate market channels for all producers, and better provision for veterinary services to livestock farmers in the country.

In the current ASSP 2015/16–2019/20, livestock (meat) is among the 12 priority commodities that are being addressed to increase production and productivity. The set production targets for livestock (in the ASSP) for 2020 comprise beef production, 360,000 metric tonnes (valued at USD1.636 billion); pork, 139,185 metric tonnes (valued at USD421 million); mutton and goat meat, 39,775 metric tonnes (valued at USD421 million); poultry, 63,647 metric tonnes. Planned interventions to achieve the set targets include control of vectors and diseases through vaccinations, disease surveillance and construction of infrastructure for disease control, pasture development, provision of adequate water for livestock production through the construction of valley dams, provision of quality genetic materials, promotion of labour-saving technologies and creating a buffer stock/animal handling grounds to support beef processing. Noteworthy is that past agriculture sector development plans, including the last agricultural sector Development Strategy and Investment Plan (DSIP), pig meat was not among the prioritized strategic commodities. In the current plan (ASSP) though pig meat is recognized as important for the food and nutrition security of Ugandans, most planned interventions are still mainly targeting beef.

To further enhance support to the livestock subsector, there are calls to improve management systems at the district (local government) level. Currently, the Local Government Act of 1992 and the decentralization policy of 1993 allow local governments (districts, urban authorities and subcounties) to perform some core functions of animal husbandry and extension services. These functions include the enforcement of government regulations, creation of by-laws, and recruitment of extension service providers and veterinary officers. However, few districts have been able to put in place livestock by-laws.

Overall, the liberalization policy has resulted in less government participation in the livestock subsector. The private sector is expected to play a leading role in enabling easier access to livestock inputs and services for farmers and thereby improving productivity. But the policy has limited the government's regulatory roles on inputs sourcing and use, leading to poor-quality inputs for farmers, thereby reducing their production capabilities. A favourable business climate and policies for micro, small and medium-enterprise development for livestock production are essential (Kang'ethe et al. 2017).

## Export and import of live pigs and pork products

Policies on the export and import of live pigs and pig products are largely missing. This is because pigs are not yet considered among the priority enterprises for investment in the country. Therefore, there is need to put in place policy interventions that encourage greater pig productivity, high-quality pig meat products and export of live pigs and pig meat to the neighbouring countries.

## Use of veterinary services

The National Policy for the Delivery of Veterinary Services (2003) aims at improving the delivery of veterinary services with the overall goal of increasing production and productivity of livestock. The policy emphasizes four main areas: (i) promotion of effective provision of veterinary services nationwide, including more remote areas where the bulk of the animals are kept; (ii) promotion and development of an effective and efficient system of veterinary service delivery; (iii) making the role of public services in veterinary service provision clearer, more efficient and more sustainable, and (iv) enhancing the effectiveness of all cadres of veterinary service provided. At the same time, the National Veterinary Drug Policy (2002) aims at (i) controlling the supply of veterinary drugs, (ii) improving the legislation and inspection of veterinary drugs, and (iii) supervising the licensing of veterinary drug outlets. Other prevailing national policies of liberalization, privatization and decentralization imply the increasing role played by the private sector in bringing services closer to the rural communities. However, the slow growth of the private veterinary sector continues to limit access to clinical veterinary services and veterinary drugs (Kasirye and Denormandie 2012).

Furthermore, the delivery of veterinary services has been somewhat affected by the decentralization policy. For example, whereas veterinary officers at the district operate under the local government, their recruitment is done by the central government. As a result, conflicts and power struggles emerge between officials in the local and central governments about who is responsible for supervising and monitoring, which hinders efficient delivery of veterinary services. To improve the implementation of veterinary services policies, the Cabinet approved the Principles for the Veterinary Practitioners Bill in 2019. The bill seeks to harmonize the new Act with the 1995 Constitution of Uganda and the regional veterinary regulatory frameworks, and to promote professionalism and strengthen the regulatory framework for improved delivery of veterinary services.

The National Drug Authority (NDA) is mandated with the work of inspecting and regulating all drugs that come in the country according to the National Drug Policy and Authority Act of 1993 (GoU 1993), the Food and Drugs Act (GoU 1959), and the Animal Diseases Act (GoU 1918). However, the national drug policy, like other related policies, is silent on specific issues of pig drugs and their handling. Nevertheless, it establishes that NDA has to ensure availability, at all times, of essential efficacious and cost-effective drugs to the entire population of Uganda, as a means of providing satisfactory healthcare and safeguarding the appropriate use of drugs. Though MAAIF should equally play a critical role in enforcing the drug regulation and distribution, it is yet to put in place a mechanism to work with the Ministry of Health.

## Breed choice and use of artificial insemination

The Animal Breeding Policy (1997) and Act (2001) provides guidelines to farmers, investors, researchers, extension workers (advisory service providers) and civic leaders on suitable breeds for the various agro-ecological zones and production systems. The policy seeks to improve alternative breeding programs, trade in genetic materials, breeding and management systems for conservation and suitable use of indigenous genetic resources and use of modern breeding technologies in the country (Kasirye and Denormandie 2012). However, lack of funding and institutional weaknesses in the administrative structure has not produced good service to livestock farmers in general, and especially for those in the pig sector. There has not been a practical breeding program in the country until the recent entry of private sector players. Some individuals import exotic boars and sows and breed piglets for commercial purposes, but this is also not well regulated. The National Breeding Policy is in particular silent on pigs, yet there is need to identify good pig breeds for the different production systems and feeding practices prevalent in the country.

## Production and use of feeds

Animal feeds should be mixed and processed in a way that does not affect the health of animals; hence, good quality-feed ingredients and suitable technology should be used in feed production. Several policies and laws are in place to govern the processing and sale of compounded animal feeds including the National Animal Feeds Policy (2005) that aims at developing the animal feeds industry to further improve animal production and productivity. The policy emphasizes the importance of the private sector in spearheading the supply of quality animal feeds. Nevertheless, there has been challenges related to the implementation of this policy due to lack of a legal framework for implementation. The lack of feed quality regulation on importation, manufacture, distribution and use of compounded livestock feeds, feed ingredients as well as supplements; and the failure by authorities to crack down all those selling and supplying ineffective and adulterated animal feeds has let down pig farmers in Uganda. Furthermore, high taxation laws (i.e. the 18% VAT) imposed on imported animal feed premixes is cited as a key constraint, compromising feed quality, due to actors opting to forego use of the feed premixes, as a means of cutting down on the cost (Lukuyu et al. 2013).

The liberalized nature of government policies on agricultural input and output markets that allows every individual to participate in the domestic exchange and importation of animal feeds, even without first seeking clearance from the authority, is also contributing to the supply of poor-quality feeds and low pig productivity. To curb the problem of the weak regulation, the Principles for the Animal Feeds Bill (2018) approved by Cabinet in 2019 seeks to promote a well-regulated Animal Feeds Industry integrating the various aspirations for its stakeholders, farmers, clients and the related value chain actors; and to promote the development of the animal feeds industry for increased production of quality feeds at affordable costs.

Other related policies include the Food and Drugs Act that has been in operation since 1959 and requires that all premises of feed production be registered to allow for easy supervision by the authorities. The Public Health Act aims at minimizing poor hygiene in relation to premises used to process feeds and in all related activities. The involved personnel and feed handling procedures should uphold a high level of hygiene. The National Agricultural Advisory Services (NAADS) Policy establishes the need to train farmers on how to select good agricultural inputs. The National Trade Policy emphasize the importance of fair trade. Elsewhere, the Uganda National Bureau of Standards Act mandates the Uganda National Bureau of Standards to formulate national standard specifications for various commodities and codes of conduct and also to enforce those standards. The standards protect the public from issues such as harmful ingredients and dangerous components. The Act also establishes fair trade in terms of standard measurements (net weight) that protect buyers from being cheated by unscrupulous pig producers and traders. The amount of weight declared on the label should be the net weight of feeds in the package. However, almost all these policies are lacking when it comes to enforcement of the specified standards. Farmers will continue to suffer from poor-quality feeds until feed manufacturing standards are enforced in the country.

## Access to knowledge

In the new policy framework for agricultural extension services, the National Agricultural Extension Policy (NAEP), published in 2016, provides a clear direction and roadmap for public agricultural extension services<sup>22</sup>. To operationalize the NAEP, the National Agricultural Extension Strategy (NAES) was also put in place in the same year. The NAEP is intended to support and complement the implementation of other related policies that have been formulated over the years. These include the National Agricultural Policy (2013); the National Policy on Delivery of Veterinary Services (2003), the National Agricultural Research Policy (2005), the National Animal Breeding Policy (1998), the National Fisheries Policy (2004), the Animal Feeds Policy (2003), the Food and Nutrition Policy (2003), the National Fertilizer Policy, the National Land Use Policy (2013), the National Environment Management Policy (1994), the National Gender Policy (2007) and the National Youth Policy (2001).

Under the NAEP, the provision of agricultural extension is designed to continue through the decentralized function in line with the government's decentralization policy. The pluralistic nature of Uganda's extension system is preserved with both public and nongovernment actors working to address the diverse needs of farmers, but through better coordination. The policy encourages farmer organization for effective participation and maximization of benefits from agricultural extension services. The fundamental shift (which is a plus) is in use of the value chain approach to address the extension needs as opposed to the previous focus on mainly primary production. The policy also establishes gender responsiveness in the provision of extension services as one of the guiding principles. It states: 'in the provision of extension services, gender-based constraints, needs and opportunities will be identified and addressed in order to effectively realize the full potential of both women and men. . . beneficiary targeting will be guided by the principles of gender equity and equality' (NAEP, 2016).

The NAES has four strategic objectives for provision of agricultural extension services: (i) to establish a well-coordinated, harmonized pluralistic agricultural extension delivery system for increased efficiency and effectiveness; (ii) to empower farmers and other value chain actors (youth, women and other vulnerable groups) to effectively participate and benefit equitably from agricultural extension processes and demand for services; (iii) to develop a sustainable mechanism for packaging and disseminating appropriate technologies to all categories of farmers and other beneficiaries in the agricultural sector and (iv) to build institutional capacity for effective delivery of agricultural extension services. The NAES also elaborates the mandates, roles and responsibilities of MAAIF, the Directorate of Agricultural Extension Services, technical directorates and agencies, production and marketing departments of local governments, and other relevant ministries, departments and agencies.

22. The NAEP defines agricultural extension services as interventions/activities by government and non-state actors that facilitate access of organizations, and other value chain actors to knowledge, information, and technologies; mediate their interaction with other relevant organizations; and assist them to develop their technical and management capacity in agriculture and family life (NAEP 2016).

## Access to credit by production system

Uganda does not have a specific policy on access and use of credit for different production systems. Nevertheless, Uganda liberalized controls over bank interest rates in the early 1990s following the disastrous interest controls that were imposed in the 1980s. These reduced nominal interest rates in relation to the rate of inflation, thus shrinking the banking system. Reforms that led to the liberalization of the financial sector were part of the structural adjustment programs that started in 1987. The policy of liberalizing bank interest rates in Uganda allows banks to extend credit to customers who would not otherwise have access to bank loans (GoU, 2012), thus increasing lending.

The Bank of Uganda Act and Financial Institutions Statute of 1993 have also contributed to the strengthening of the financial sector and in domestic resource mobilization. The government has been committed to strengthening key rural services including rural financial and marketing services. Since 2006, it has been implementing the Rural Financial Services Strategy and promoting an extensive rural finance system in the country. SACCOs were adopted to drive increased access to financial services in rural communities. The SACCOs are being used as instruments to achieve the fourth pillar of the Prosperity for All Program (PFA) in Uganda. The ultimate objective is to ensure that financial services reach people in every subcounty. In this context, poor farm households are encouraged to mobilize savings and to use those savings deposits as a source of investment capital for rural enterprises.

There is need to accelerate and expand measures that reduce lending rates over the longer term by addressing the fundamental factors that underpin commercial bank lending rates such as reducing banks' operating costs through the provision of relevant infrastructure, reducing the risks to banks of lending by rolling out the Credit Reference Bureau and the national identity card; and ensuring that the commercial courts are facilitated to increase the time available to handle business/commercial disputes in a quick and efficient manner that promotes economic growth.

It is also necessary to enhance the management and governance of MFIs that is vital in building trust and confidence in the sector. A performance monitoring tool should be created and used by all formal microfinance operators to improve the reporting, performance monitoring, information sharing and control systems.

## Public health practices

The MAAIF is mandated to enforce veterinary-related legislation including on meat hygiene and safety that is essential for the production of quality meat. Among others, MAAIF (i) formulates and reviews national policies, legislation, standards, plans and programs related to the livestock sector; (ii) regulates livestock marketing and fisheries activities; (iii) promotes the sustainable use of natural resources and (iv) coordinates and monitors private sector service providers in veterinary services, agricultural extension, national development programs, regulatory services, disease control and water use in agricultural production. According to the GoU (2007), some of the policy interventions that are being implemented include allowing the participation of private district veterinary officers (privatization policy), streamlining disease control and regulatory services that ensure food safety and general hygiene especially in slaughterhouses; control and reduction of tsetse fly infestation; and operationalization of water for agricultural production and genetic multiplication in plants, livestock and fish.

Government policies on livestock emphasize the importance of disease control and quick response to disease outbreaks. Here, the aim is to produce good-quality pork and meat products that meet international standards and boost exports of animal origin. There are strategies to improve the delivery of veterinary services at affordable costs in the whole country. The public veterinary extension services under MAAIF together with the NAADS program works with the private sector and NGOs to satisfy local demand of the various services rendered to farmers. However, all government policies on the livestock sector and food safety are generalized. They do not address specific concerns of different livestock enterprises, meat products and production/or marketing systems. For example,

the National Meat Policy has been in operation since 2003 and recognizes the importance of increased livestock population in supporting the meat industry and improving the level of income for the majority of rural and peri-urban households in Uganda. But the role of pigs and pork in this regard is not stated in the policy.

The National Meat Policy aims at providing an environment that is conducive to attract investment in the industry and to build capacity for the country to supply meat and meat products to the domestic and export markets (GoU 2003). The policy has provisions that promote (i) sustainable production of quality meat; (ii) improvement in meat processing, value addition and enforcement of standards in the meat industry; and (iii) marketing of meat and meat products in both internal and external markets (GoU 2003). In addition, the policy has provisions that are spearheading direct private sector (livestock producers, traders and meat processors) investment in livestock production, processing and marketing of meat and meat products. It includes different strategies that are vital for building capacity for increased supply of quality meat; developing infrastructure for improved delivery of services; defining conditions that are necessary for good animal welfare and quality assurance and providing support services in disease control. It also has clear plans for sensitizing stakeholders (producers, traders and processors), establishing meat processing facilities, setting up a marketing information system, encouraging formation of marketing association, setting standards of meat products and enforcing regulations.

Other policies and laws that govern the handling of animals for slaughter, processing and sale of meat products and all food intended for human consumption include the Animals Prevention of Cruelty Act; the Food and Drugs Act; the Public Health Act; the Uganda National Bureau of Standards (UNBS) Act and the Weight and Measures Act. These laws aim at ensuring that pork and other meat products are processed and sold in ways that ensure quality and safety for consumers.

## Value chain governance and openness to upgrading

The phenomenon of improving value addition and corresponding commodity value chains in Uganda is relatively new. There is no specific policy or strategy for harmonizing the way actors in smallholder pig value chains are governed. The lack of organization of farmers, traders, processors and other actors in the value chain creates inefficiencies that open the door for exploitation and poor-quality products. There is need for a pig value chain governance policy so that actors and particularly pig farmers can benefit further from pig production. A meaningful collaboration among policymakers, research organizations, universities, NGOs and the private sector can help in developing the capacity of key actors in the value chain right from the production and distribution of inputs to the distribution and consumption of pork and pig meat products.

# Current perspective on opportunities for pro-poor pig value chain development

In terms of research, Makerere University, NaLIRRI and MAAIF have been putting in relatively limited efforts in pig production research. Compared to other animals, the pig enterprise has received the least research input from major institutions in the country. Some of the research on pigs in Uganda has been on characterization of pig systems, nutrition and management and more on animal health (i.e. ASF and cysticercosis prevention and control). However, there is lack of clear linkages between the research and development institutional actors.

Pig production is a non-priority area for the government compared with other livestock enterprises such as dairy and beef cattle, goats, poultry, and apiculture. In terms of government policies, only the National Agricultural Advisory Services (NAADS)<sup>23</sup> has a focus on promoting pig production in the country. Most local governments or districts choose agricultural initiatives that put more emphasis on crop-related enterprises (and other types of livestock) than piggery. NGOs such as VEDCO are trying to fill existing gaps by conducting interventions in pig farming in central and eastern Uganda.

Pig production systems have the potential to ensure pro-poor development, since it is the poor and marginalized groups and women who engage in piggery. Besides, pork and other pork products have high demand in the market that makes pig production a potential lucrative business. There is still room for increasing efficiency in pig production systems even though the market of live pigs, pork and pork products is segmented. However, there is need for the market to reward quality of pork and efficient supply of pork.

Animal stocks in Uganda are still highest for cattle, followed by goats, pigs and are least for sheep. However, the largest increase in average production (in tonnes) has been mostly registered in pigs, followed by sheep, cattle, and is lowest for goat meat. The growth rate in pork and pork products provides the country with an opportunity to increase local consumption and exports of animal-sourced foods.

Despite a high potential for regional trade and exports of live pigs and pork products, especially in neighbouring countries, the number of pigs imported in Uganda and pigs exported to neighbouring countries such as Kenya, Tanzania, Rwanda, Southern Sudan and DRC is low. The pig sector in Uganda largely serves the domestic market and there is need to take advantage of its potential to supply the regional market.

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23. In the case of the promotion of pig production, NAADS identifies a pig farmer leader in a village based on institutional criteria, then they are given animals and training on the condition that they will train other farmers in the village, and allows their boar to serve gilts and sows of other farmers in the village for small fee. In some cases, there is some sort of "pass the gift" approach such as is used in the Heifer Project. The effectiveness of this scheme and the way recipients are selected has been criticized due to perceived bias.

# Strengths, weaknesses, opportunities and threats to pig value chain development

Table 30. Major strengths, weaknesses, constraints (SWOT) analysis of pork value chains

Strengths	Weakness/challenges
Existing domestic demand and market for pork across all regions of the country. Potential demand for pig meat in neighbouring countries such as South Sudan	Dominance of subsistence, smallholder pig production systems, with extensive management
Requires relatively low capital investment (low financial capital, small land holdings, cheap labour; mainly family labour)	Low productivity in prevalent systems due to limitations in genetic potential and feeding and animal health problems
Compatibility with other crop farming enterprises (mixed crop-livestock systems)	Lack of government and private breeding programs for improving the genetic potential of pigs. Almost all pigs in Uganda are a mixture of cross-breeds, with few pure breeds
For many smallholder farms the pig enterprise could become the main source of income	Massive inbreeding due to small pig numbers in each farm, poor access to genetic material and limited knowledge on genetic improvement among farmers and poor technologies
Commercial large-scale pig farms on the increase in urban and peri-urban areas	Dominance of poor farm management practices resulting in low productivity
Piglets of reasonable genetic potential (cross-breeds) available in the market	Low public awareness on pork safety and quality issues
Low management costs, particularly in smallholder pig farms using family labour	Lack of pig keeping specifications and diagnostic tools to guide commercial pig farming (e.g. diet, housing, animal health, breeding, marketing)
A wide range of professionals available to facilitate the value chain (public and private service providers including; breeders, animal nutritionists, veterinarians, traders, processors etc.)	Limited coverage of extension services
There are some upcoming export-quality processors in the country	Lack of recording system which has undermined decision-making based on economic performance
Protocols on the establishment of common markets (e.g. East African Community [EAC] and Common market for Eastern and Southern Africa[COMESA])	Fake drugs and adulterated commercial feeds in the local market
Relatively high reproductive turnover compared to other types of livestock due to the large litter size and high offtake under good management	Inadequate feeding and nutrition due to lack of knowledge on the quality of local feed resources for pigs, amidst low utilization of supplementary feeding
	Poor quality of pig pens or housing in many farms resulting in the exposure of animals to extreme heat and inadequate management of excreta
	Lack of organized farmer groups (e.g. cooperatives) to explore opportunities to upgrade and cost share in areas of extension services, purchase of inputs, marketing and collective guarantee to access loans
	Poor coverage of financial services, and absence of specific lines for promoting pig production
	National policies and public-private strategic investments are biased towards livestock enterprises of cattle, goats and chicken
	Limited coverage of public veterinary systems, and high costs limit access to private veterinary services
	Weak linkages between stakeholders (farmers vis-à-vis traders, public veterinarians vis-à-vis private vets; pig breeders vis-à-vis input dealers etc.)
	On-farm theft due to lack of appropriate infrastructure. Unhygienic slaughterhouses and poor quality of pork
	Lack of sufficient veterinary services and vaccines for major diseases such as African swine fever

Opportunities	Threats
Favourable climate conditions result in the availability of a wide range of green forages and feedstuffs for pigs throughout the year	Natural disasters (notably floods, drought and mudslides) Emerging, re-emerging and endemic pig diseases (e.g.ASF)
Local demand to increase the national pork per capita consumption	Limited access to microfinancing and credit markets High financial interest rates leads to reduced profit and failure to break-even.
Pork is a preferred meat for the majority of the population	Inadequate public investments in the livestock sector, especially pig production
High demand for pork in the region (Uganda, Rwanda, South Sudan, Kenya and DRC)	
Fast-growing regional (EAC) and local consumer market through growth of population, urbanization and per capita income	
Establishment of common markets (e.g. EAC and COMESA)	
Potential for increased carcass weight and productivity through modern production techniques (feeding, breeding and animal health management systems)	
Government commitment to increase investment in agro-processing and marketing of non-traditional export commodities	
Government commitment to increase investment capital for the rural communities through private sector led credit and savings schemes	
Improvements in animal health regulation, surveillance and research	
Favourable foreign investment and macroeconomic policy	

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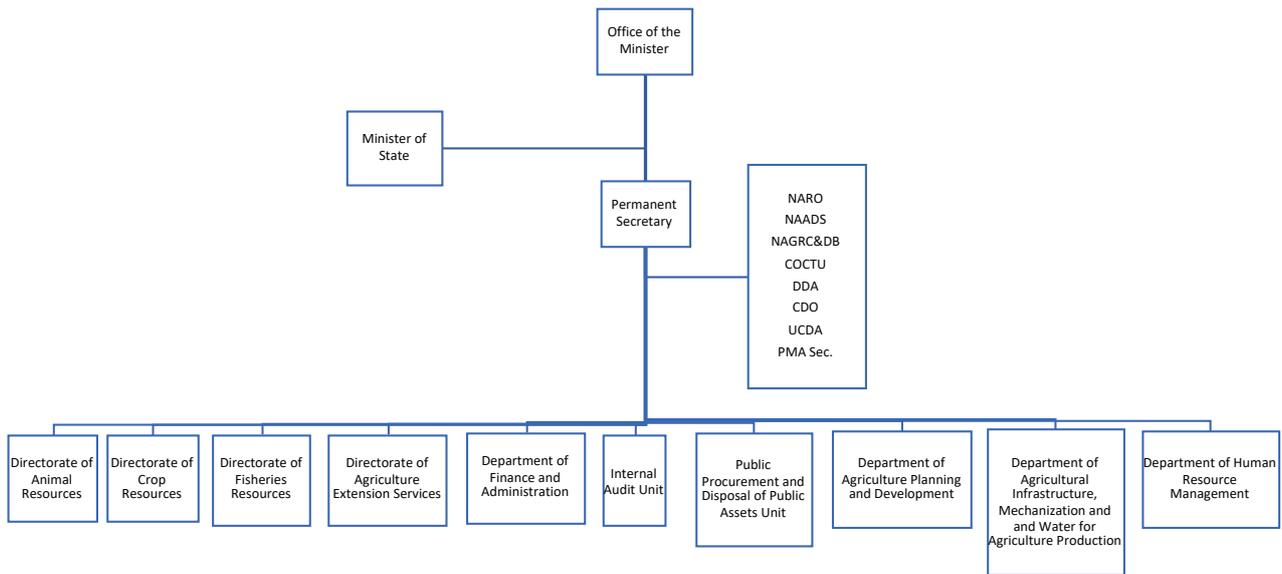
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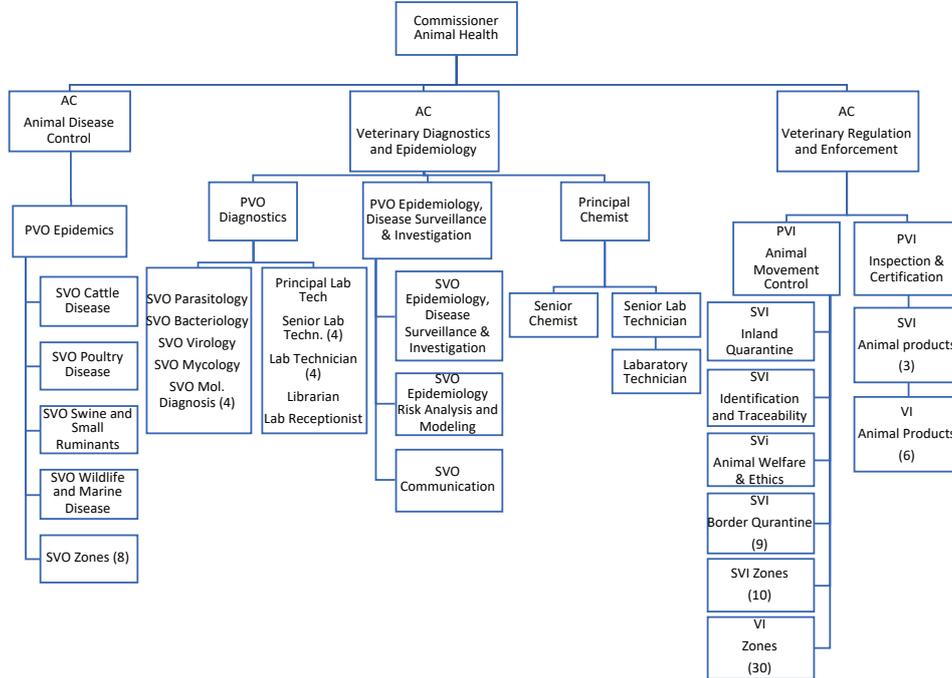


Figure A4. Spatial distribution of human population density in Uganda (CIESIN 2011)



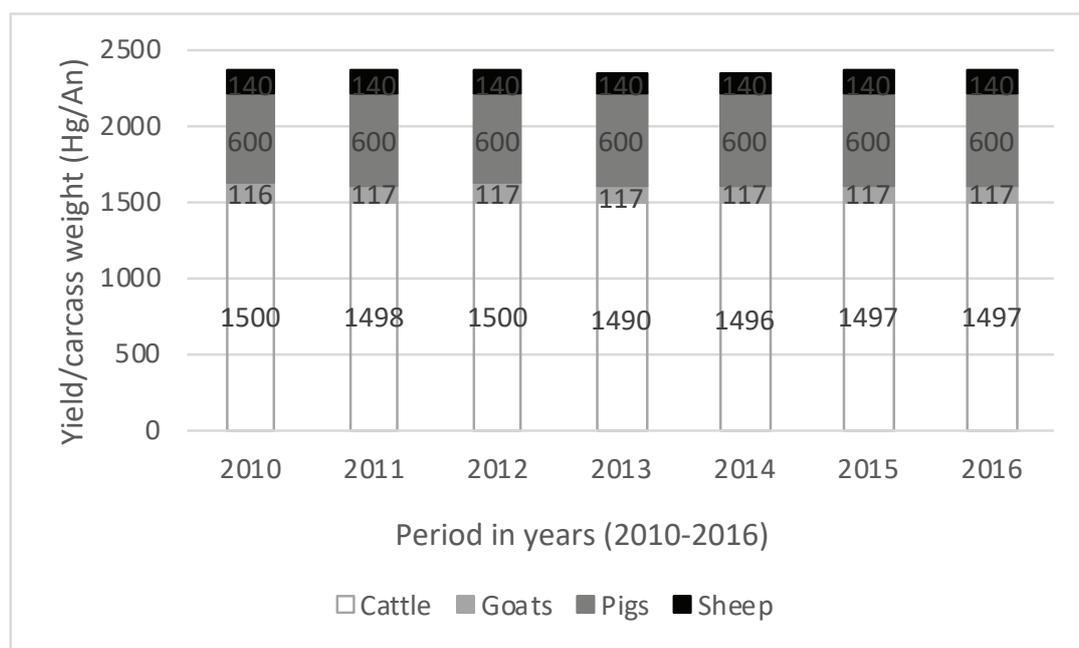
Note: The map presents a spatial distribution of human population in Uganda based on the estimates of human population of Global Rural–Urban Mapping Project (GRUMPv1) for the year 2000. Here, the population density grids measure population/km<sup>2</sup> (CIESIN 2011). Source: ILRI Report on site selection for smallholder pig value chains and targeting in Uganda.

Figure A5. The macro-structure of MAAIF reviewed and amended 2016



Source: MAAIF, 2016b

Figure A6. Organizational structure of Department of Animal Health



Source: MAAIF, 2016b

Table A1. Pig ownership by district in Uganda, 2008

Region	HHs owning pigs, % of all HHs	HHs owning pigs, number	Mean herd size, all HHs	Mean herd size, pig owning HHs	Median herd size, pig owning HHs
UGANDA	17.8 (0.22)	1,135,130 (14,370)	0.5 (0.01)	2.8 (0.03)	2
Central	23.4 (0.50)	436,400 (7,430)	0.7 (0.02)	3.0 (0.05)	2
Eastern	16.3 (0.32)	262,360 (4,670)	0.4 (0.01)	2.7 (0.06)	2
Northern	9.3 (0.33)	105,070 (3,900)	0.3 (0.02)	3.2 (0.18)	2
Western	20.6 (0.51)	321,740 (9,930)	0.5 (0.02)	2.4 (0.06)	1
Karamoja zone	4.7 (1.84)	9,570 (3,960)	0.3 (0.11)	6.1 (0.35)	3

Source: National Livestock Census report, 2008