

A situational analysis of agricultural production and marketing, and natural resource management systems in the central region of Uganda



RESEARCH
PROGRAM ON

Integrated Systems
for the Humid
Tropics

ILRI PROJECT REPORT



A situational analysis of agricultural production and marketing, and natural resource management systems in the central region of Uganda

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Acronyms

| | |
|-------------|---|
| AVRDC | World Vegetable Center |
| CGIAR | Consultative Group on International Agricultural Research |
| CFR | Central forest reserve |
| CIAT | International Center for Tropical Agriculture |
| CIP | International Potato Center |
| CBO | Community-based organization |
| DDP | District development plan |
| DFS | District Forest Service |
| DRC | Democratic Republic of Congo |
| DWD | Directorate of Water Development |
| EADD | East Africa Dairy Development Project |
| ECA | Humidtropics East and Central Africa Action Area |
| EPRC | Economic Policy Research Centre |
| EU | European Union |
| FANTA | Food and Nutrition Technical Assistance Project |
| FAO | Food and Agriculture Organization of the United Nations |
| FARA | Forum for Agricultural Research in Africa |
| FGD | Focus group discussion |
| FIEFC | Farm income enhancement and forest conservation |
| FSSD | Forest Sector Support Department |
| GAM | Global acute malnutrition |
| <i>icip</i> | International Centre of Insect Physiology and Ecology |

| | |
|---------|---|
| ICRAF | World Agroforestry Centre |
| ICT | Information and communication technology |
| IDO | Intermediate Development Objective |
| IITA | International Institute of Tropical Agriculture |
| ILRI | International Livestock Research Institute |
| ISFM | Integrated Soil Fertility Management |
| IWMI | International Water Management Institute |
| HLGSA | Higher local government statistical abstract |
| KII | Key informant interview |
| LVB | Lake Victoria Basin |
| LVEMP | Lake Victoria Environment Management Project |
| MAAIF | Ministry of Agriculture Animal Industry and Fisheries |
| MADDO | Masaka Diocesan Development Organization |
| MADIFA | Masaka District Farmers Association |
| MDG | Millennium Development Goal |
| MWE | Ministry of Water and Environment |
| NAADS | National Agricultural Advisory Service |
| NaCRRRI | National Crop Resources Research Institute, Namulonge |
| NARS | National agricultural research system |
| NARO | National agricultural research organization |
| NEMA | National Environmental Management Authority |
| NFA | National Forestry Authority |
| NGO | Non-governmental organization |
| NRM | Natural Resources Management |
| NWSC | National Water Sewerage Corporation |
| PA | Protected area |
| R4D | Research for development |
| SA | Humidtropics Situational Analysis |

| | |
|---------|---|
| SACCO | Savings and credit cooperative |
| SCI-SLM | Stimulating Community Initiatives for Sustainable Land Management |
| SME | Small- and medium-enterprise |
| SPGS | Sawlog Production Grants Scheme |
| SRT | Humidtropics Strategic Research Theme |
| UBOS | Uganda Bureau of Statistics |
| UCDA | Uganda Coffee Development Authority |
| UCSD | Uganda Coalition for Sustainable Development |
| UDHS | Uganda Domestic Household Survey |
| UGX | Uganda shillings |
| UNHS | Uganda National Household Survey |
| VEDCO | Volunteer Efforts for Development Concern |
| WFP | World Food Programme |
| WHO | United Nations World Health Organization |
| WUR | Wageningen University |

Introduction

The Humidtropics program

The [CGIAR Research Programs](#) (CRPs) aim to align the research of the 15 CGIAR [Research Centres](#) and their partners into efficient, coherent, multidisciplinary programs. These exploit the full potential of collaborative research for tackling complex development issues. Seven of the CRPs aim to improve yields and profits of crops, fish, and livestock; they are largely commodity-focused. Three CRPs tackle the challenges of improving sustainability and environmental integrity, adapting to and mitigating climate change. Two overarching CRPs contribute to improving policies and markets and to improving nutrition and diets. One very specific CRP manages and sustains crop seed collections. Finally, three CRPs are unique in that they take a holistic system perspective, without respect to commodities. Focusing on dryland systems, aquatic systems and on integrated systems for the humid tropics, these three 'systems CRPs' strive to improve the productivity, profitability, sustainability and resilience of entire farming and landscape systems. The three systems CRPs are intended to be the platforms where the research learning and outputs harvested from the other crop-focused, environmental- or policy-related CRPs are trailed in an integrated manner and their impacts measured on all of the production, marketing and natural resource management in drylands, humid tropics and aquatic systems.

Among the three systems CRPs, the [Humidtropics](#) CRP led by International Institute of Tropical Agriculture ([IITA](#)), seeks to transform the lives of the rural poor in tropical Americas, Asia and Africa. It uses integrated system research and unique partnership platforms for better impact on poverty and ecosystem integrity. Research organizations that are involved in core partnership with Humidtropics are World Vegetable Center (AVRDC), Bioversity, International Center for Tropical Agriculture (CIAT), International Potato Center (CIP), Forum for Agricultural Research in Africa (FARA) International Centre of Insect Physiology and Ecology (*icipe*), World Agroforestry Centre (ICRAF), IITA, International Livestock Research Institute (ILRI), International Water Management Institute (IWMI), and Wageningen University (WUR). As a research program for agricultural development, Humidtropics has four major objectives: reducing rural poverty, increasing food security, improving nutrition and health, and sustainable management of natural resources. Indeed, agricultural growth, through improved productivity, market development and income generation, has been shown to be a particularly effective contributor to reducing poverty, especially in the initial stages of economic development. Furthermore, access to affordable food is a problem for millions of poor in urban and rural communities and requires increasing global supply of key staples and reducing potential price increases and price volatility. In spite of increases in the production of key staples, poor populations spend most of their income on food and suffer from diets that are insufficient in proteins, vitamins and minerals, thereby affecting health and development, particularly among women and children. Finally, agriculture has a substantial impact on natural resources and must therefore be well managed to ensure sustainable ecosystem services, particularly in light of climate change.

To track the progress of the program towards reaching its objectives, the outcomes of Humidtropics are measured along six Intermediate Development Outcomes (IDOs). IDO 1 aims at 'Increased and more equitable income from agriculture for rural poor farm families, with special focus on rural women'. This IDO directly targets poverty reduction through increased incomes for the rural poor. IDO 2 is a complex target linked to nutrition: 'Increased consumption of diverse and quality foods from sustainable food systems by the poor, especially among nutritionally

vulnerable women and children'. IDO 3 measures how 'Sustainably intensified pro-poor food systems in the humid and sub-humid tropics deliver improved farm-level productivity to all farming families in equitable ways'. It directly addresses productivity enhancement at the farm level. IDO 4 targets natural resources management (NRM), which effectively protects or regenerates natural resource integrity at the farm and community levels: 'Improved management of natural resources is essential for sustaining increases in farm-level productivity and the provision of other ecosystem services'. The impact of Humidtropics on the empowerment of women and other marginalized groups is tracked through IDO 5: 'Empowered women and youth with better control over and benefit from integrated production systems'. Finally, IDO 6 is a complex social aspiration that the networks of people involved in Humidtropics and the policies and informal rules that form their working environment manage to foster innovations: 'Increased capacity for integrated systems to innovate and bring social and technical solutions to scale'. All of the IDOs are interrelated, just as the production, marketing and NRM systems they are supposed to track are interrelated.

Organized around four geographical 'Action Area Flagships', Humidtropics implements research for development (R4D) by testing innovations that respond to the challenges faced by stakeholders in the target field sites. To identify the current production, marketing and natural resource management systems the CRP has to work in, the CRP's Strategic Research Theme I (SRTI) on Systems Analysis and Global Synthesis proposes a series of research tools to gather robust evidence on the magnitude of the problems to be addressed.

The starting point for that evidence gathering and diagnostic activities required for the Systems Analysis and Global Synthesis is the Situational Analysis (SA), which paints a comprehensive and broad picture of the current systems that are key to tackling the problems faced in the target field sites.

The SA is followed by detailed characterization studies of production systems in the form of baseline household surveys, leading to household typologies and the description of the production and nutritional challenges faced by the different types of households in the target field sites. Identification of preliminary best-bet entry points for the CRP calculates trade-offs between possible interventions that could help tackle field site challenges. Through value chain assessments and business model identification exercises, SRTI tools also identify agricultural commodities that make the most business sense to develop and the potential means to accomplish that. Finally, the global synthesis tracks the development of the production, marketing and NRM systems in line with the CRP's IDOs. These outputs from SRTI activities, when discussed within the platforms of likely beneficiaries and research partners, help refine further field research activities for the CRP: pilot testing of technologies and strategies among producers; in-depth analysis of markets and value chains for target commodities and of institutional and policy environments; impact assessments of current and possible policies, of business and NRM models.

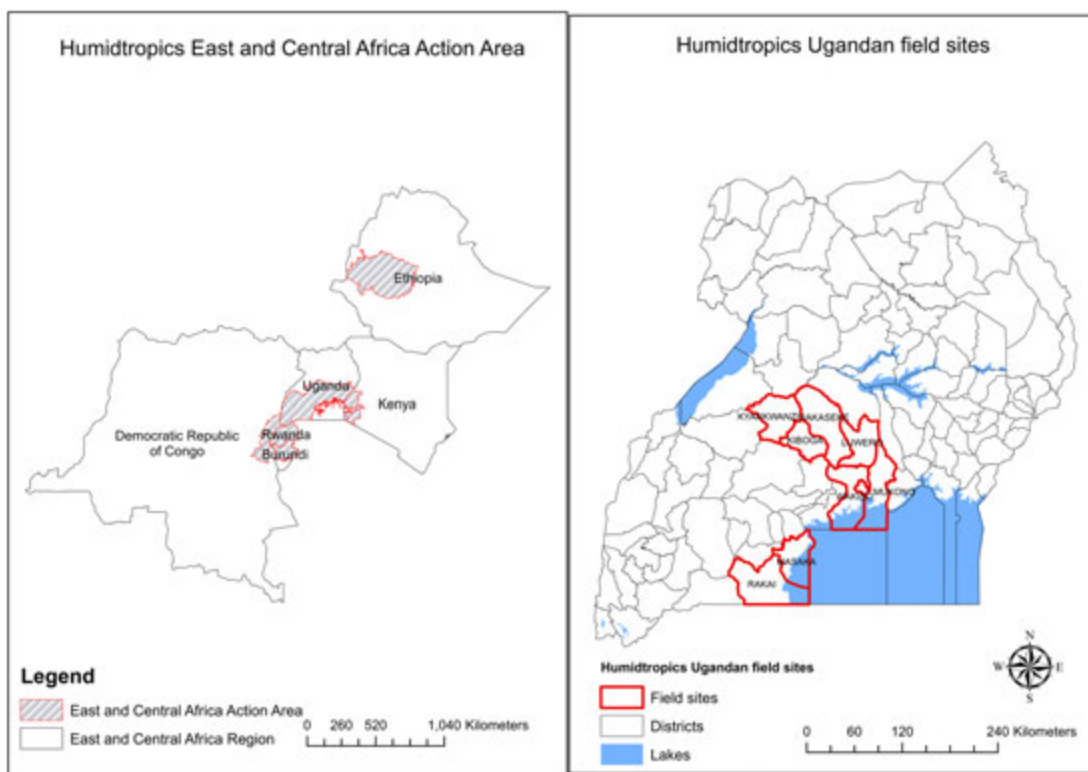
The SA aims to provide a broad set of information that will provide evidence to inform and tailor the subsequent exercises, and thus is not intended to look into the details of the target systems. Also, because Humidtropics by definition works in a consultative manner *through partners* in all aspects of the CRP, the SA also aims to create a joint and common understanding among all partners of the issues at hand, as well as to support the process of establishing strong and sustained linkages with stakeholders at multiple levels.

Given this context, the SA has three primary objectives. The first is to characterize broadly all important system aspects that are relevant to the CRP within the target action sites and, through that, generate information to inform all other Humidtropics activities to better attain the IDOs, as well as to inform ongoing field site selection. The second objective is to harness the various partner skills and experiences to develop a common and shared understanding of the issues that need to be addressed and potential solutions, particularly between international and national partners, allowing local and global expertise to play complementary roles. The third objective is to initiate and facilitate engagement with stakeholders and partners as part of the R4D platform development that is needed for the long-term success and scalability of Humidtropics.

The Uganda action site

The East and Central Africa (ECA) Action Area of the Humidtropics includes the humid and sub-humid tropics of West Kenya, southern Uganda, the Ethiopian highlands, eastern Democratic Republic of Congo (DRC), Burundi and Rwanda (Figure 1). The area is home to about 78 million people, mainly smallholder farmers, living on 29 million hectares of land resulting in an average population density of 263 persons per km². The area is uniquely endowed with great potential in terms of water, soils and human resources, with a significant young population. Unfortunately, the area faces debilitating poverty levels with about 36% of the people earning less than USD 1.25 per day and a substantial proportion of them experiencing a few to several months of food insecurity. Associated with food insecurity are high levels of child malnutrition. Ironically, in the face of food insecurity, a variety of staple crops, including maize, beans, banana, cassava, sweet potato, peanut as well as minor leafy greens and other vegetables are cultivated by farmers. The major cash crops grown in the area include coffee, maize, sugarcane, banana, soybean, Irish potato, cotton and tobacco. Livestock is a major asset for most smallholder farmers in the area though current livestock densities have been seriously affected by civil strife. The agricultural production systems and productivity in the area are in a sorry state of affairs due to a number of constraints that inhibit rural transformation.

Figure 1: The East and Central Africa flagship showing the six action sites (left) and the Uganda action site with its subdivisions: districts (right).



The left side of Figure 1 shows the overall East and Central Africa Action Area that encompasses areas in Ethiopia, Kenya, Uganda, Rwanda, Burundi and the Democratic Republic of Congo. Within the Ugandan Action Site, the eight second-level divisions, namely districts, taken as field sites for Humidtropics activities are shown on the right side of Figure 1.

Through a multi-stakeholder workshop held in Bukavu from 20–22 May 2013 (IITA 2013), Humidtropics has identified the following areas for integrated research and development actions in East and Central Africa:

- Crop-livestock intensification and interactions
- Productivity improvement, processing and market development for priority cash crops

- Integrating legumes trees into agricultural and livestock production systems (Agroforestry)
- Sustainable intensification of crop productivity based on integrated soil fertility management (ISFM) principles
- Sustainable intensification of banana-and-coffee-based systems
- Integrated approach to nutritional diversity, sustainable resource use and climate adaptation.

These research initiatives to be implemented through R4D platforms will integrate gender and youth dimensions of smallholder agriculture.

A Uganda action site launch meeting held in Mukono on 1 and 2 August 2013 decided to focus these entry points to four dominant production systems that were relevant to the Uganda action site (national agricultural research organization (NARO), Humidtropics and Makerere University 2013). The dominant production systems chosen in turn led to identify the field sites in which research for development would bring meaningful results for local communities (Figure 1):

- Banana-coffee dominant production system in Nakaseke
- Cereals dominant system in Rakai
- Cattle dominant system in Rakai
- Peri-urban system in Mukono and Wakiso.

The second section of this report details the methodology used in this analysis. The third section provides an overview of the development situation in Uganda. The following sections characterize, one after the other, the agricultural production systems, markets and institutions, and natural resource management systems. The final section identifies the overarching problems and issues brought out by the SA. It also provides suggestions for further Humidtropics research interventions to address them and thus attain the strategic development objectives of livelihood improvement, sustainable intensification, gender and youth empowerment and system innovation.

Methodology

Implementing team

Following a stakeholders mapping and analysis exercise done through a collective action involving Bioversity, IITA and ILRI, key stakeholders within Central Uganda were identified and formed a scientific steering committee to oversee the situational analysis. The committee included representatives from the national agricultural research system (NARS), academic institutions, non-governmental organizations (NGO), community-based organizations (CBOs), government institutions and CGIAR centres.

The scientific steering committee then recruited two consultants to carry out the actual implementation of the SA with monthly follow up, monitoring and reporting between consultants and the scientific steering committee.

The sources of data used in this exercise and report included secondary data, key informant interviews (KIIs), focus group discussions (FGDs) and stakeholder consultations in the eight Humidtropics districts in Uganda: Mukono, Wakiso, Kiboga, Kyankwanzi, Masaka, Rakai, Luwero and Nakaseke. The collection of data from different sources allowed for their triangulation and validation. An online repository for secondary data collected as well as primary data sets generated will be made available on <http://data.ilri.org/> (key words Humidtropics Uganda).

Secondary data

The SA followed the outline for Humidtropics situational analysis (Cadilhon et al. 2014) to identify which data were to be collected. Available data were sought from official secondary sources at national, regional district and sub-county levels. To complement government data, other secondary sources were utilized, including data sets and reports from national research institutes, NGOs, among others. For both government and non-government data sources and reports, the reference period for which data were requested was 2003–13. Most of the available data were for the period 2008–13; however, data gaps existed.

The information gaps identified were further analysed by the scientific steering committee and gaps that would be filled through KIIs and FGDs identified and the activity planned for.

Key informant interviews

Key informant interviews were conducted at the district and sub-county level. Interviewees were selected on the basis of their knowledge, expertise, and professional affiliation. Semi-structured interviews relating to policies, programs, and government directions were administered among district leaders and sub-county representatives in the eight districts. The key informants interviewed included district and sub-county leaders representing different government sections (development, production, education, health, etc.), administrative leaders, farmer group representatives, businessmen, NGOs, and professional agencies.

Table 1: below gives a summary of the experts interviewed as key informants.

| Location | Date | Person interviewed | Position |
|---------------------|---------------|----------------------|--|
| Mukono district | 7–8 July 2014 | Fred Mukulu | Production officer |
| | | David Kiryabwire | Veterinary officer |
| | | Noah Kiwanuka | Veterinary officer |
| | | Irene Musiime | Secretary for cooperatives and markets |
| | | Charles Njoola | District planner |
| Wakiso district | 9 July 2014 | Patrick Oine | Production officer |
| | | Rebecca Sabaganzi | Environment officer |
| | | Emma Mukisa | Health officer |
| | | Kirembwe | Veterinary officer |
| | | Beatrice Nakaiza | Health statistics |
| Kiboga district | 11 July 2014 | Jackson Katusiime | Commercial officer |
| | | Paddy Nsubuga | District planner |
| | | Katende Tebuseke | Farmers association |
| | | Richard Bakadde | Farmers association |
| | | Atikoro John Richard | Production officer |
| Kyankwanzi district | 12 July 2014 | Wandera James | NGO forum |
| | | Annet Birungi | World Vision |
| | | Hadijja Nabanoba | Civil society organization |
| | | Godfrey Ssebulime | Agriculture officer |
| | | Gwaliwa Christine | Education department |
| Masaka district | 14 July 2014 | Prossy Mutumba | Production officer |
| | | Kaboine Nyahika | Commercial officer |
| | | Musisi | Health officer |
| | | Lawrence Mayega | Veterinary officer |
| Rakai district | 15 July 2014 | Meddie Kanyike | National Agricultural Advisory Service (NAADS) coordinator |
| | | Mukisa | Environment officer |
| | | Chairman Kasaali DFA | Farmers association |
| Luwero district | 17 July 2014 | Sarah Namubiru | Production officer |
| | | Moses Kayimbye | Commercial officer |
| | | Josephat Mukasa | Veterinary officer |
| Nakaseke district | 18 July 2014 | Sekandi Moses | Veterinary officer |
| | | Lumbuye | Veterinary officer |

Source: Field KIIs 2014.

Data from the KIIs were subjectively analysed to identify key trends across the responses.

Focus group discussions

A semi-structured interview was designed to fill information gaps identified after reviewing the secondary data and the results of the KIIs. This was administered through FGDs. It was planned that the FGDs involving 10–15 people each would be conducted in each sub-county. And they were conducted by local partners while the consultants and other selected stakeholders took the notes.

District leaders identified the communes and villages that were to be visited based on criteria supplied by the research team:

1. Presence of all categories: forest, agriculture, or business-oriented people

2. Typical production systems that are representative of the province
3. Recommendations by NGO partners

Table 2: below gives a summary of the sub-county where the FGDs were carried out the dates and the number of participants.

Table 2: Location and gender composition of focus group discussions

| District (Sub county) of FGD | Date | No. of men | No. of women |
|-------------------------------|--------------|------------|--------------|
| Mukono (Nama) | 7 July 2014 | 4 | 13 |
| Wakiso (Nangabo and Busukuma) | 9 July 2014 | 6 | 12 |
| Kiboga (Kibiga) | 11 July 2014 | 8 | 12 |
| Kyankwanzi (Ntwetwe) | 12 July 2014 | 10 | 6 |
| Masaka (Kyamuliibwa) | 14 July 2014 | 6 | 5 |
| Rakai (Kakuuto) | 15 July 2014 | 10 | 9 |
| Luwero (Bamunanika) | 17 July 2014 | 8 | 11 |
| Nakaseke (Ngoma) | 18 July 2014 | 7 | 9 |

Source: Field FGDs 2014.

The research team of consultants and selected partners attempted to reduce bias in the district leader's selection of villages for FGDs by emphasizing that this was a research exercise and that no direct development assistance would result from it. The findings from these FGDs were directly used to provide qualitative information to the report.

Stakeholder consultation

Draft results were presented to the scientific supervisory committee that comprised of national government, the research and development NGOs, and stakeholders during a one-day workshop. Participants were asked to review and confirm or comment on the preliminary results of the SA that were presented. In addition, stakeholders were asked to provide inputs with respect to underlying system problems in the eight districts and to offer possible solutions. This information was used to complement and validate the issues raised from the preliminary assessment.

Development overview

This section highlights the current status of the project site in terms of development indicators: population, employment, health and nutrition, education, literacy and wealth. It also discusses their implications to Humidtropics in terms of reaching IDO 1 'Increased and more equitable income from agriculture for rural poor farm families, with special focus on rural women' and IDO 5 'Empowered women and youth with better control over and benefit from integrated production systems'. Other aspects such as access to safe water, status of infrastructure (roads, electricity) and ethnicity are also analysed.

Population

Uganda's population has risen from 24.2 million persons in 2002 to about 34.9 million persons in 2014 registering an average growth rate of 3% per annum. The population of the eight Humidtropics sites account for approximately 12.7% of the total population (Annex I). Within the eight districts Wakiso is the most populated (45% of total population) while Kiboga is the least populated (3.3%). Regarding population density, the two peri-urban districts fall above the national average of 177 persons/km² with Wakiso district having a population density of about 6.8 times more at 1206 persons/km² (Annex II). It was also observed that the proportion of men and women within the population was not significantly different. The implication of this to Humidtropics is that Mukono and Wakiso should be targeted with intensive crop-livestock production systems while Nakaseke, Kyankwanzi and Masaka could be targeted for expansion of land under agriculture due to the low population density.

In all the peri-urban and urban districts of interest, the majority of the population (61.5%) is below 18 years of age. Rakai, Luwero and Masaka districts give a near reflection of the national status in this regard though Mukono district depicts a relatively much lower percentage for the population below 18 years of age (Table 3). In addition, the working age population (18–65 years) is highest in the peri-urban districts of Wakiso (43.5%) and Mukono (50.9%), exceeding the national average of 37.1%. The other districts which are mainly rural maintain a working age group not significantly different from the national average. The trend is for youths to move from rural to urban settings in pursuit of employment opportunities. This can be reversed through reinforcement of policies that promote rural infrastructure: industrialization and agro-processing, electrification, water supply, information and communication technologies (ICT), and increase access to credit facilities like savings and credit cooperatives (SACCOs) which have the potential to retain young people and those of working age within rural setting.

Table 3: Population age structure in the respective Humidtropics sites

| District | Population proportion aged <18 years | Population proportion aged 18–65 years | Population proportion aged >65 years | Child-headed household (%) | Working children (6–17 years)(%) | Female-headed households (%) |
|-------------|--------------------------------------|--|--------------------------------------|----------------------------|----------------------------------|------------------------------|
| Wakiso | 53% | 43.5% | 3.5% | na | na | na |
| Mukono | 45.1% | 50.9% | 4.9% | na | na | na |
| Luwero | 59.3% | 37.3% | 3.4% | na | na | na |
| Nakaseke* | na | na | na | na | na | na |
| Kiboga | 58.5% | 38.5% | 3% | 0.2% | 15.1% | na |
| Kyankwanzi* | na | na | na | 0.25% | 18.9% | na |
| Rakai | 61% | 35.9% | 3.1% | 0.5% | 34.2% | na |
| Masaka | 58% | 36% | 6% | 0.36% | 13.5% | 28.5% |
| National | 61.5% | 37.1% | 1.4% | na | na | na |

Source: Uganda Bureau of Statistics (UBOS) 2013. na= data not available, * Nakaseke has been part of Luwero, while Kyankwanzi was part of Kiboga until 2010.

Another population aspect with implications for Humidtropics was the age at first child bearing. Approximately 21% of girls aged 15–19 in the Central-1 region (Masaka, Rakai, Wakiso) would have started child bearing, whereas the situation is worse in Central-2 region where 30% of girls aged 15–19 are already bearing children (UBOS 2013). A study carried out by Food and Nutrition Technical Assistance Project (FANTA-2) in 2010 confirms these findings in that the observed median age at marriage for women in the 20–24 age bracket was 19 years in Central-1 region, the same age for women at first birth. In Central-2 region (the other five Humidtropics districts), the median age at marriage for the same age bracket was 18, whereas the age at first birth is 19 years. The implications of this to Humidtropics are that early child-bearing and marriages deprive women the chance to further their education and career, and thus reduce ability for empowerment, constrain their decision-making capacity at household and community levels, which further compromises gender relations. It is therefore important to focus on interventions that recognize the young and unempowered women as vulnerable. There are also opportunities for working closely with agencies that would reinforce policies that support young women to go back to school (even after child birth) and those that reinforce laws against exploitation of young girls and early marriages.

Ethnicity

Ethnicity is considered vital for Humidtropics since it indicates which livelihood activities are likely to prevail in the different sites based on the traditions of those dwelling there. For instance, in Uganda, the presence of Banyankole or Banyarwanda peoples in an area is associated with rangeland grazing of cattle; the Baganda are linked to crop production (more specifically, banana, legumes and root crops).

The findings obtained from the focus group discussions show heavy presence of multi-ethnicities in the study sites as people migrate to these areas in search of better economic opportunities. The Baganda were found to be the most populous ethnic group in all the Humidtropics sites except Kyankwanzi which had more of the Basoga people (Table 4). Although the reasons are not documented personal communications indicate that the Basoga are attracted by the fertility of the land for maize production.

Table 4: Ethnicity presence in the respective Humidtropics sites

| Location | Ethnicity presence |
|------------|---|
| Wakiso | -Heavy multi-ethnicity presence with Baganda followed by Banyankole then Bakiga, Basoga, Banyarwanda, Barundi and Banyoro, Itesots and Sudanese. |
| Mukono | -Heavy multi-ethnicity presence with Baganda being the majority followed by Basoga, Bagisu, Banyankole, Bakiga, Rwandese, Burundi, Samia, Bafumbira, Batooro and Karamojongs. |
| Luwero | -Heavy multi-ethnicity presence with Baganda being the most followed by Banyarwanda then Banyankole. Other tribes present include Bakiga, Basoga, Badama and Bagisu |
| Nakaseke | -Heavy multi-ethnicity presence with Baganda being the most followed by Banyarwanda then Barundi and Bakiga. Other tribes present include Bagwere, Banyankole, Bakiga, Basoga, Bafumbira, Alur and Bagisu |
| Kiboga | -Heavy multi-ethnicity presence with Baganda constituting the majority followed by Banyarwanda, Basoga and Badaama. |
| Kyankwanzi | -Heavy multi-ethnicity presence with Basoga being the most populous followed by Bafumbira, Banyarwanda, Banyoro and then Baganda. |
| | -Baganda and Banyarwanda mostly into cattle rearing and milk trade |
| Rakai | -Heavy multi-ethnicity presence with Baganda being the most populous followed by Banyarwanda, Banyankole, and refugees (e.g. Baziba from Tanzania and Burundi) |
| Masaka | -Heavy multi-ethnicity presence with Baganda being the most followed by Banyankole, Banyarwanda, Bakiga, Basoga, Baruli, Badama and Alur. |

Source: Field FGDs and KII 2014.

Another observation in Table 4 is that the peri-urban districts (Wakiso, Mukono) have more ethnic diversity than the six rural districts. This could be attributed to rural-urban migration in pursuit of better livelihoods.

Employment opportunities

As urbanization rates in Wakiso and Mukono tend to be higher than in other Humidtropics districts, it is evident that the proportion of population employed in agriculture is much lower especially in Wakiso (27%). Employment in agriculture in the other districts is as follows: Mukono (59%), Luwero (75.7%), Nakaseke (88%), Kiboga (85%), Kyankwanzi (88%), Rakai (85%), and Masaka (72.8%). It is also important to note that in the peri-urban districts (Mukono, Wakiso), the percentage population in agricultural employment is lower than the national average of 66% while the other rural districts have higher rates (Annex III). Humidtropics should therefore be looking at non-farming employment options to create livelihood options and opportunities for the population which lives in these two districts.

Regarding employment opportunities in the Humidtropics sites, there seem to be more off-farm employment activities in the peri-urban sites as compared to the rural sites (Table 5).

The gender differentiated roles are such that men are more involved in both traditional and non-traditional cash crop enterprises, while women are largely engaged in food crops targeting household food and nutrition security. The majority of male youth is largely employed in the motorcycle business and brick making (Table 5). The main involvement of the young women did not come out clearly; therefore given their level of vulnerability further studies are needed to explore young women's livelihood sources.

Table 5: Occupation in the project sites by gender

| Location | Status of employment |
|------------|---|
| Wakiso | <p>More off-farm employment opportunities due to growth in manufacturing, construction and service industries</p> <p>Women mainly into roots and tuber production, merchandizing and brew sales</p> <p>Men mostly into livestock and vegetable production and hired labour</p> |
| Mukono | <p>Youth mainly engaged in motorcycle transport, brick making and vegetable production.</p> <p>More off-farm employment opportunities due to growth in manufacturing, construction and service industries (e.g. Namanve industrial park)</p> <p>Women mainly into piggery, cereals, pulses, roots and tuber production and produce selling</p> <p>Men mostly into hired labour, construction.</p> |
| Luwero | <p>Youth mainly engaged in motorcycle transport, stone mining, construction, metal scrap collection</p> <p>Women mostly into producing banana and pulses</p> <p>Men mostly into coffee and livestock</p> |
| Nakaseke | <p>Youth mostly into vegetable growing, poultry, agro-produce trade and brick making</p> <p>Women (Baganda) mostly into banana, roots and tubers</p> <p>Men mostly into coffee, maize and rice production as well as agro-produce trade</p> |
| Kiboga | <p>Youth do grow some maize and vegetables and do trade in agro-produce and motorcycle transport.</p> <p>Livestock is the main enterprise and matoke is the main staple while the district produces marketable surplus of maize, coffee, cassava, banana and beans</p> <p>Men mostly into maize and coffee</p> <p>Women mainly involved in maize and beans production especially for home consumption and ghee production</p> <p>Youths involved in livestock grazing and produce marketing and in vegetable production</p> |
| Kyankwanzi | <p>Livestock (cattle, sheep), beans and banana directly exported to South Sudan</p> <p>Men mostly into maize production and livestock rearing</p> <p>Women are heavily involved in production of beans, poultry and piggery</p> <p>Youths are involved in poultry production and value addition</p> <p>Crop production dominates followed by livestock, then produce trade</p> |
| Rakai | <p>Maize is the most dominant crop followed by beans (yellow and Nambale short),</p> <p>Main occupation is crop farming, livestock rearing, produce trade, fishing, construction and quarry mining.</p> <p>Men mainly into coffee production and cattle rearing while women mostly tend the banana gardens</p> |
| Masaka | <p>Youth are mainly into production of vegetables, coffee, maize and beans</p> <p>Main enterprises are coffee, banana, piggery, poultry, fruits, vegetables</p> <p>Women mostly into growing roots, tubers, pulses</p> <p>Men mostly into coffee (Baganda) and livestock (Banyankole)</p> <p>Youth mostly into producing vegetables, fruit and coffee</p> <p>Youth also into brick and charcoal making</p> |

Source: Field FGDs and KIs 2014.

Table 5 also shows more involvement in off-farm or non-farm employment activities in the two peri-urban districts (which is expected) as compared with the rural settings. This therefore raises the need to focus not only on agricultural interventions but also on off- and non-farm interventions. There is also need to further investigate the interactions between farming systems and off- and non-farm systems, and explore pathways through which these systems could interact for better livelihoods.

Health, nutrition and food security

This section covers the following indicators: mortality rates (women, infants, <5 years), malnutrition rates (stunting, wasting and underweight), dietary diversity (diversity of product consumption in target areas and potential impact on nutrition), dietary practices and traditional food systems description the range of nutritious products available and consumed within local markets. In terms of food security, information on the net household food balance (number of months that own production can feed the household) as well as the share of consumption of total production on key commodities is also captured.

Nationally, infant mortality has improved from 68 deaths per 1000 live births in 2009 to 54 deaths per 1000 live births in 2011/12. Similarly, the under-five mortality has improved from 103 deaths per 1000 live births in 2006 to 90 deaths per 1000 live births in 2011/12. The total fertility rate has declined from 6.7 in 2006 to about 6.2 in 2011 though fertility levels are higher in the rural areas (6.8) compared with the urban areas (3.8). Despite Uganda being recognized as the food basket of East Africa, malnutrition remains a problem of public health. Findings showed that stunting is the most prevalent form of malnutrition with all the sites indicating levels of more than 30%, while wasting was the least prevalent (Table 6).

Table 6: Regional distribution in the prevalence of severe (-3 z-score) and moderate (-2 z-score) malnutrition

| District | % Stunting in children under 5 years | | % Underweight children under 5 years | | Wasting in children under 5 years | |
|-----------|--------------------------------------|---------------------|--------------------------------------|---------------------|-----------------------------------|---------------------|
| | Severe | Severe and moderate | Severe | Severe and moderate | Severe | Severe and moderate |
| Central-2 | 15 | 39 | 4 | 13 | 3 | 5 |
| Central-1 | 8 | 30 | 2 | 8 | 1 | 3 |
| National | 15 | 39 | 4 | 16 | 2 | 6 |

Source: UDHS 2006; Central-1 Region=Wakiso, Rakai and Masaka; Central-2 Region=Kyankwanzi, Mukono, Luwero, Nakaseke, Kiboga.

Note: stunting=height for age, wasting=height for weight, underweight=weight for age.

Looking at the malnutrition rates over time, the national prevalence of stunting has declined from 45% in 2001 to 39% in 2006, at a rate of 1.2 percentage points per annum. Central-1 Region seems to be doing better than the rest of the districts in the Humidtropics sites. Regarding the underweight indicator, a decline from 19% in 2001 to 16% has been observed nationally which implies a rate of 0.6 percentage points per annum. Nonetheless, Central-2 Region is yet to meet the millennium development goal target of 12.5%.

However, the prevalence of wasting in Uganda has been rising, from 5% in 2001 to nearly 6% in 2006. Higher percentages are observed in Central-2 Region and under the World Health Organization (WHO) classification, this falls under the category of 'poor'. Since wasting is rare in children who are 36 months or older, this rise can be attributed to the steep rise in wasting rates among infants from as young as four months, suggesting that infection rates are likely to be high and poor feeding practices such as early introduction of liquids other than breast milk could be the cause. One crucial point would be maternal malnutrition, which results into intra-uterine growth retardation putting the unborn child at disadvantage even before birth. Ensuring that we have educated and informed mothers should be the first step, these mothers will be able to practice appropriate feeding practices (for themselves and their children), they are more likely to have a say in household decisions and may be able to participate in productive activities that could bring income or other resources useful to the household.

Commonly consumed food items

Food most frequently consumed are depicted in Table 7. The FANTA-2 (2010) report indicates that cassava, banana (matoke), beans, sweet potato and maize (in that order) are the most frequently consumed foods in Central-1 Region. Similarly, cassava, potatoes, banana (matoke), beans and maize (in that order) are the most frequently consumed foods in Central-2 Region.

Table 7: Foods commonly consumed in the Humidtropics sites

| District | Foods commonly consumed |
|------------|---|
| Mukono | Banana, maize, rice, beans, cassava, fruits, vegetables |
| Luwero | Banana, cassava, sweet potatoes, maize, beans, peanuts, tomatoes, pineapples, cabbages, green vegetables, upland rice, pineapples, water melon, passion fruit, milk |
| Nakaseke | Cassava, sweet potatoes, maize, banana, beans, peanuts, tomatoes, pineapples, cabbages, green vegetables, upland rice, pineapples, water melon, passion fruit, milk |
| Kiboga | Bananas, cassava, maize, beans, horticultural crops, milk |
| Kyankwanzi | Bananas, cassava, maize, beans, milk |
| Rakai | Banana, maize, beans, cassava, horticultural crops, Irish potato, passion fruit, pineapple, sweet potato |
| Masaka | Bananas, maize, sweet potato, beans, cassava, peanut, horticultural crops |
| Wakiso | Banana, maize, rice, beans, cassava, fruits, vegetables |

Source: Field FGDs 2014, (MasakaDDP 2011), (Rakai-HLGSA 2009), (Luwero-HLGSA 2009), (Mukono-LG 2009), (Wakiso-HLGSA 2009).

Note: Diet diversity information is obtained from (FANTA-2 2010) and the order is from the most to the least consumed.

Though the carbohydrate rich staples dominate the list, it is quite comforting to note that beans (plant protein) and fruit and vegetables are also commonly consumed in the sites.

Dietary practices

Just as observed in Table 7, the most frequently consumed food items are the staples (roots, tubers and bananas) recording consumption on a daily basis by the majority of the population. The least consumed food items are the animal-source foods such as meat and milk (Table 8). This therefore calls for mixed-farming systems and enterprises that will enhance household access to a diversity of nutritious food item either from the farm or through local markets.

Table 8: Dietary diversity in the Humidtropics sites

| Region | Average number of days per week this type of food is consumed | | | | | | | |
|------------------|---|------|-------|-----------|-------|-----|--------|---------|
| | Milk | Meat | Fruit | Vegetable | Sugar | Oil | Pulses | Staples |
| Central-2 Region | 1 | 1 | 3 | 2 | 4 | 3.5 | 4.5 | 7 |
| Central-1 Region | 1 | 1 | 4 | 3.5 | 3 | 2 | 3.5 | 7 |
| National | <1 | <1 | 2.5 | 3 | 2 | 2 | 3 | 7 |

Source: (FANTA-2 2010). Staples refer to roots, tubers and matoke.

Central-1 Region=Wakiso, Rakai and Masaka; Central-2 Region=Kyankwanzi, Mukono, Luwero, Nakaseke, Kiboga.

Although the 2005/06 UBOS- Uganda National Household Survey (UNHS) report indicates that a majority of the households (>60%) in the Humidtropics sites consume highly diversified diets with a mean score of 14 calculated as per weighing food items based on nutritional density (see footnote of Table 9), it is important for more studies to be carried out to confirm whether the trend is the same today. In addition, a gap could be in the food combination and preparation procedure. It is therefore important that studies are carried out to establish whether food preparation and combinations being applied are those that will enhance nutrition retention and availability.

Table 9: Dietary diversity score 2005/06 by household

| Region | Mean score | % households in mean score category indicated | | |
|-----------|------------|---|----------------|--------------|
| | | Low (2–7) | Medium (8–14) | High (15–19) |
| Central-1 | 14.1 | 2.6% | 30.3% | 67.1% |
| Central-2 | 14.1 | 2.0% | 34.5% | 63.5% |
| National | 13.5 | 3.4% | 42.1% | 54.5% |

Source: Economic Policy Research Centre (EPRC) using UBOS-UNHS 2005/6 data.

Note: The food categories are weighted based on nutritional density as follows; matooke=2, cereals=2, roots and tubers=2, legumes and pulses =3, meat and related products=4, oils and fats=1, fruits=1, vegetables=1, condiments=1, restaurant foods=1 and unclassified or other foods=1.

Education and literacy

In general, primary school enrolment has increased from 7.9 million in 2008 to 8.3 million in 2010 with girls' enrolment surpassing that of boys in 2010. Similar observations were made in Mukono, Luwero and Rakai in 2008. This could be a reflection of the efforts by several gender-concerned agencies to see that girls go to school. Another argument put forward is that boys get attracted to engaging in economic activities fairly early and hence get distracted from continuing with formal education (UBOS 2012a).

For secondary school enrolment, there has been a steady increment from just over 1 million in 2008 to 1.2 million in 2010. However, fewer girls than boys are able to complete secondary school education. Humidtropics should work with partners focusing on supporting girls to stay longer in secondary school in order to increase their chances of obtaining tertiary education for higher skills acquisition (Annexes IV and V).

However, the important point of concern is that only 324,487 children are enrolled in Secondary I compared with Primary 7 students numbering 544,531. Hence, a drop-out rate of about 37%. Humidtropics ought to consider interventions with partners working on education to reduce this drop-out rate if sustainable livelihoods are to be obtained.

Wealth and incomes

Although most of the Humidtropics districts lack official data on household asset ownership, considering the percentage of households living below the poverty line, more than half of the households in Kiboga are poor (60.4%). Kyankwanzi district is the next poorest district with 38% of households living below the poverty line. The reported poverty levels (Annexes VI and VII) necessitate reinforcements of efforts through partnership in industrialization and agro-processing in rural areas for employment creation. It is also important that in addition to boosting production, the links to markets are reinforced in order to reverse this situation.

Access to electricity and water

Since transformation from subsistence agriculture to agri-food commercialization through value addition is a process which requires some infrastructure in place, access to electricity is a vital indication of the potential of an area to invest in agro-processing businesses, which have an implication on the value captured by actors in a given location. Likewise, water is not only a resource for the health of the population but is also a production input for livestock as well as a utility in many processing industries. The availability of water and electricity is therefore a key indicator to the livelihood options of an area.

Of the eight Humidtropics districts, the peri-urban districts have better access to water and electricity. They account for 32% (26.6 million m³) of the total national water consumption 81.6 million m³). The other rural districts constituted less than 1% with Kiboga having the lowest level at 21,492 m³ water consumed (Annex VIII).

Roads

With regards to roads, Masaka and Rakai have access to a national highway which runs through to the Uganda-Tanzania border at Mutukula. This creates opportunities for them to transport what they produce towards Kampala or across the border to Bukoba region in Tanzania. A one-stop border post has been set up at Mutukula to ease clearance of goods crossing from one country to the other.

Kiboga and Kyankwanzi are also linked to Kampala by a very good tarmac road, which continues up to Hoima. Goods produced in these districts can be easily transported to Kampala in less than four hours.

Mukono is hardly 15km away from Kampala and it is crossed by a major highway linking Uganda to Kenya. Goods produced in this district can easily be transported to Kampala and beyond or even East into Kenya. Likewise for Luwero, it is also located on the national highway to northern Uganda, which is tarmac and well maintained, hence transportation of goods is less challenging. However, for Nakaseke, the road linking it to Luwero is not tarmac and is vulnerable to extreme weather, thus causing some seasonal challenges in the transportation of goods to markets beyond the district.

Presence of extension support and development agencies

Findings as shown in Table 10 indicate a very high presence of R4D partners in the Humidtropics sites. This creates a great opportunity for collaboration and coordination of key partners in a formal structure such as an innovation platform to ensure the best-bet practices emerging from research activities are scaled up and out and sustainability enhanced.

Table 10: Presence of NGOs and other development organizations in the Humidtropics sites

| District | Organizations or interventions |
|----------|---|
| Wakiso | NAADS distributing planting material |
| | Sawlog Production Grants Scheme (SPGS) alone, 231 ha have been planted (155.9 in central forest reserves (CFRs) and 75.1 on private land) |
| | NRM supporting agencies i.e. National Forestry Authority (NFA), SPGS, district natural resources office, Environmental Alert, Nature Uganda, Lake Victoria Environment Management Project (LVEMP) and Volunteer Efforts for Development Concern (VEDCO) |
| Mukono | IITA, WakisoDPO, NARO, Bioversity, ILRI, ICRAF, VEDCO, Forest Sector Support Department (FSSD), District Forest Service (DFS). |
| | NAADS distributing planting material |
| Luwero | MUZARDI-NARO, Makerere, Uganda Christian University, FSSD, DFS, Community Agricultural Infrastructure Improvement (CAIIP) of the government of Uganda/Ministry of Local Government |
| | Under the SPGS, 247.4 ha have been planted (205.3 in CFRs and 42.1 on private land) |
| | Presence of several agencies to support farmers namely: NAADS, VEDCO, Maganjo Farmers Association, FarmAfrica, Uphold, Uganda Coffee Development Authority (UCDA) promoting coffee growing |
| | SPGS has supported the planting of 1351.6 ha of trees (385.4 in CFRs and 966.2 on private land) |
| | Presence of agencies that support NRM. These include NFA, district natural resources office, VEDCO, Global Climate Change Alliance (GCCA) |

| District | Organizations or interventions |
|------------|--|
| Nakaseke | The SPGS has supported establishment of 2243.8 ha of forest plantation (1536.9 in CFRs and 706.9 on private land) Presence of agencies that support NRM. These include NFA, SPGS, district natural resources office, The Conservation Agriculture Regional Program (CARP), VEDCO, Sustainable Land Management (SCI-SLM) project, Nakaseke Rural Youth Sustainable Livelihoods Initiative, United Nations Development Programme, CARITAS, and Gesellschaft für Internationale Zusammenarbeit (GIZ) Presence of agencies to support farmers: East Africa Dairy Development Project (EADD), Sameer, Dairy Development Authority, National Animal Genetic Resources Centre, NARO-MUZARDI, NAADS, Seatini, Caritas, The AIDS Support Organization, Sasakawa Global2000, VEDCO |
| Kiboga | Presence of some agencies namely WorldVision, IITA, USAID-LEAD, Heifer Intl, EADD, Hunger project. Under the SPGS alone, 6294.9 ha have been planted (6255.3 in CFRs and 39.6 on private land) |
| Kyankwanzi | Agencies such as NAADS, Worldvision, Child Fund, Infectious Disease Institute, IITA, CAIP, Malaria consortium, Luwero-Rwenzori Agency, Under the SPGS, 157.7 ha have been planted in CFRs NAADS |
| Rakai | Presence of agencies that support NRM. These include NFA, SPGS, district natural resources office, Nature Uganda, Kitovu Mobile, World Vision, LVEMP, SCC-VI Agroforestry Program Presence of NGOs and agencies such as CARITAS, NAADS, CIDI, Kasaali Coffee Farmers Association and Worldvision aimed at helping farmers improve their productivity. |
| Masaka | Nkobazambogo Youth Group, NAADS/ UCDA mainly promoting coffee growing, Rakai District Tourism Board Presence of NGOs e.g. CARITAS, WorldVision, St Jude, MADIFA, VI, JOE, LVEMP for lake basin conservation, SPGS for tree planting, VI for agro-forestry ILRI working on piggery value chain, NAADS |

Source: Field FGDs and KIs 2014.

Land tenure

The Land Act of Uganda 1998 recognizes four major systems of land tenure and these are: Mailo tenure, b) Customary tenure, c) Freehold tenure, and d) Leasehold tenure. Definitions and details on what each tenure kind implies are provided in Annex IX.

Following field visits of the districts of interest to Humidtropics, Table I I describes the tenure systems prevalent in each of the sites. Apart from Rakai and Masaka district, which are mainly public land (leasehold or freehold), all the other six districts, whether peri-urban or rural, seem to be mainly under the *Mailo* tenure system. The implications of this are that since this is a more permanent form of ownership it creates greater opportunity in venturing into long term investments on-farm, off-farm and non-farm.

Table I I: Land tenure systems prevalent in the Humidtropics sites

| District | Land tenure systems |
|------------|--|
| Wakiso | Private <i>Mailo</i> tenure system with Bibanja holders (legal squatters) |
| Mukono | <i>Mailo</i> tenure system (80%)> Public > Kabaka's land |
| Luwero | <i>Mailo</i> tenure system (~75%)> Kabaka's > public land |
| Nakaseke | <i>Mailo</i> tenure system (70-80%)> Kabaka's > government owned (Freehold) |
| Kiboga | <i>Mailo</i> tenure system (~60%)> public land under Leasehold tenure system |
| Kyankwanzi | <i>Mailo</i> tenure system (~60%)> public land under Leasehold tenure system |
| Rakai | Most land is Public> <i>Mailo</i> >freehold>Kabaka's. |
| Masaka | Most land is Public> <i>Mailo</i> >freehold> Kabaka's. |

Source: Field FGDs and KIs 2014. Lists are ordered from the most coverage to the least.

Section summary

The key issues emerging from this section include:

- High population growth and density in the Humidtropics peri-urban districts is accompanied by greater involvement in off- or non-farm activities and better access to water and electricity compared with the rural districts. The underlying cause of these differences is rural-urban migration in search of better economic opportunities. This leaves the rural districts with a higher proportion of dependent population groups (<18 years and >65 years), poor infrastructures and low access to social amenities. It is, therefore, important that as more effort is put towards diversifying enterprises in peri-urban areas to fully make use of available infrastructure, R4D interventions focus on promoting rural infrastructure (industrialization, agro-processing, electrification, water supply, ICT) and increasing access to credit facilities.
- Young age at marriage and at first birth among women (18–19 years) implies low literacy levels and puts them at a disadvantage. They are deprived the chance to further their education and career. This reduces their ability for empowerment, constrains their decision-making capacity at household and community level, which further compromise gender relations. In addition, since women tend to be responsible for food preparation and childcare within the family, their lack of knowledge and access to resources impacts negatively on the food and nutrition security of their children, themselves and the household in general.
- There is more reliance on starchy staples (roots tubers and bananas) for food with limited or negligible consumption of animal-source food (milk and meat).
- The most prevalent form of malnutrition is stunting indicating prolonged food inadequacy among the vulnerable population groups.
- Gender plays a crucial role in the type of employment people are engaged in and certain patterns have been observed in each district.
- Access to piped water and electricity is steadily improving with greater coverage in Mukono and Wakiso, which implies opportunities for value addition to agro-commodities, as well as establishment of manufacturing industries.
- Most of the Humidtropics sites are linked to major highways leading to regions and borders of neighbouring countries, which are considered potential markets for agricultural commodities.
- In regards to land tenure systems, the permanent *Mailo* system tends to dominate most of the Humidtropics sites. One of its advantages is permanency of tenure, which is supportive of serious investments on land (i.e. tree planting, perennial crop production, soil conservation measures).

Production systems

This section highlights production aspects concerning the different commodities or enterprises focused on by Humidtropics in Uganda: cassava, maize, banana, rice, coffee, tea, vegetables, fruits, soybean, beans, dairy cattle, pigs, poultry and fish (farmed and wild). This section outlines the existing production systems, current production status of each commodity, the production opportunities as well as the strengths (Table 12). It also reflects on the challenges which may hinder realization of these opportunities and what kind of interventions the Humidtropics program may have to implement to meet IDO 3 ‘Sustainably intensified pro-poor food systems in the humid and sub-humid tropics deliver improved farm-level productivity to all farming families in equitable ways’ and IDO 5 ‘Empowered women and youth with better control over and benefit from integrated production systems’.

Key elements of the production systems

Within the peri-urban areas, the main crops are largely annual and they include fruit and vegetables, sweet potatoes, maize, beans, peanuts, bananas, cassava, coffee, sweet potato and soybean while livestock include poultry, pigs, intensive dairy cattle, goat, sheep and aquaculture fish.

The rural areas are dominated by both perennial and annual crops like banana, coffee, maize, beans, cassava, fruit and vegetables, potatoes, soybean, upland rice and peanuts, among others. Livestock rearing is also predominantly practiced: cattle (both beef and dairy), pigs, poultry, goats, sheep, and bees.

Table 12: Current status of priority commodities in Humidtropics sites

| Commodity | Current status | Opportunities or strengths | Challenges and implications for Humidtropics |
|-----------|---|---|---|
| Cassava | <p>Production: 4.2–4.9 million tonnes (Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)/FAO 2010)</p> <p>Yield 10–12 t/ha</p> <p>Seed or cuttings mainly obtained from NaCRRRI via NAADS, NGOs and private multiplication gardens</p> | Existence of centre of excellence for cassava | <p><i>Challenges</i></p> <p>How to deal with cassava brown streak disease (CBSD) which lowers productivity in most parts?</p> <p>How to strengthen the seed distribution systems?</p> <p><i>Implications</i></p> <p>Support the strengthening of seed delivery systems since this role has not been done well</p> |

Table 12: Current status of priority commodities in Humidtropics sites

| Commodity | Current status | Opportunities or strengths | Challenges and implications for Humidtropics |
|-----------|--|--|---|
| Maize | <p>Current production estimated at 1.4 million tonnes annually</p> <p>Yield 2–2.5 t/ha</p> <p>Mostly grown by small-scale farmers accounting for 95% of total production</p> <p>Extension service done mostly by NGOs</p> | <p>Increasing demand from institutions such as schools, police, army, tertiary colleges, universities, hospitals and prisons</p> <p>It is easy to store for relatively longer periods</p> | <p><i>Challenges</i></p> <p>How to increase maize productivity?</p> <p>How to increase input usage?</p> <p>How to deal with the inconsistent quality of seed and chemicals?</p> <p>How to encourage the compliance with standards?</p> <p><i>Implications</i></p> <p>Promote mechanism or models that have been developed to help farmers source good quality inputs.</p> |
| Banana | <p>Current production 9.8 million tonnes (FAO 2014)</p> <p>Yields estimated at about 5.4–5.6 t/ha</p> <p>Planting material mostly exchanges amongst farmers</p> <p>Disease-free planting material is produced by two private companies (AGT and Biocrops) as well as by NaCRRRI and all are located in Wakiso</p> | <p>Demand for dessert and roasting banana in Kenya</p> <p>Strong banana research program</p> | <p><i>Challenges</i></p> <p>How to deal with the uncontrollable spreading of banana bacterial wilt (BBW)?</p> <p><i>Implications</i></p> <p>Provide extension services towards BBW control.</p> |
| Rice | <p>Current production 233,000 tonnes</p> <p>Yield is estimated to be between 2.5 and 3 t/ha against a potential of 4–5 t/ha.</p> <p>Approximately 82% of rice is produced by smallholders (KILIMO TRUST 2012c).</p> <p>Very few large scale producers (Tilda, Pearl Rice, Doho)</p> <p>Most farmers use seed saved from previous harvests and only 8% of the rice seed used is procured from certified seed suppliers (KILIMO TRUST 2012c)</p> | <p>Over the past 20 years, rice consumption has increased by 360% owing to the change of eating habits associated with urbanization (KILIMO TRUST 2012c).</p> <p>Unexploited land and water resources with potential to produce rice</p> <p>Government's willingness to support irrigation schemes (e.g. Doho)</p> | <p><i>Challenges</i></p> <p>How to establish strong rice value chain institutions?</p> <p>How to deal with the weak value chain institutions?</p> <p>How to improve existing extension services?</p> <p><i>Implications</i></p> <p>Promote lowland rice in areas with ample water resources</p> <p>Promote upland rice in Wakiso, Mukono, Masaka and Rakai.</p> |
| Coffee | <p>Annual production 210,000 tonnes</p> <p>The coffee value chain supports 3.5 million households in Uganda, or around 65% of the population (UCDA 2013)</p> | <p>UCDA renders ample support in input supply, market information and promotion of coffee abroad as well regulation of actors</p> <p>Coffee can be profitably intercropped, with banana hence increasing productivity per unit area</p> | <p><i>Challenges</i></p> <p>How to deal with coffee pests and diseases?</p> <p>How to deal with unpredictable weather conditions?</p> <p><i>Implications</i></p> <p>Support coffee growers in managing the changing weather patterns</p> <p>Encourage small-scale producers in the zoned areas to grow coffee.</p> <p>Explore coffee-banana integrated system</p> |

Table 12: Current status of priority commodities in Humidtropics sites

| Commodity | Current status | Opportunities or strengths | Challenges and implications for Humidtropics |
|--------------|---|--|---|
| Horticulture | <p>Current production estimated at 11–12 million tonnes annually (FAOSTAT 2014)</p> <p>Production is mostly by smallholder farmers.</p> | Conducive climate which warrants horticultural production in most parts of the country | <p><i>Challenges</i></p> <p>How to access quality planting material?</p> <p>How to deal with rampant horticulture pests and diseases?</p> <p><i>Implications</i></p> <p>Link smallholder producers to big processors (e.g. Britania)</p> <p>Support the development and supply of quality planting material</p> |
| Soybean | Current production estimated at 166,000 tonnes annually | Strong research support by Makerere and NARO, which has led to release of a few new varieties in recent years (e.g. Namsoy4M and Maksoy1N) | <p><i>Challenges</i></p> <p>How to increase soybean productivity and margins to farmers?</p> <p><i>Implications</i></p> <p>Support the dissemination of better yielding improved varieties</p> <p>Build the capacity of farmers in the agronomic practices</p> <p>Support farmers to add value to the soybean</p> |
| Tea | <p>Current production is about 63,000 tonnes up from 33,789 tonnes a decade ago.</p> <p>Only 10% of tea produced is consumed domestically as the rest is exported.</p> | Tea has relatively high profitability at production level, especially in the first season (Kraybill and Kidoido 2009) | <p><i>Challenges</i></p> <p>How to deal with land markets and tenure systems that cannot enable large tea estate owners to acquire more land to expand production?</p> <p><i>Implications</i></p> <p>Support creation of a regulatory body to superintend the actors and promote tea production</p> |
| Beans | <p>Average production is 450,000 tonnes per year over the past 10 years.</p> <p>Farmers prefer high-yielding and early-maturing varieties while consumers prefer varieties which have a short cooking time, make a thick soup, have swelling characteristics.</p> <p>Good taste and long shelf life after cooking</p> | Strong research backing from NARO with release of several varieties | <p><i>Challenges</i></p> <p>How to control the diseases affecting bean yield?</p> <p>How to counteract declining soil fertility?</p> <p><i>Implication</i></p> <p>Organize smallholder farmers to capture opportunities of supplying exporters and humanitarian agencies</p> |

Table 12: Current status of priority commodities in Humidtropics sites

| Commodity | Current status | Opportunities or strengths | Challenges and implications for Humidtropics |
|-----------|--|--|---|
| Pigs | <p>Current production is 3.2 million heads as of 2008 (MAAIF-UBOS 2009).</p> <p>Female-headed households owning pigs have increased from 15% to 32% over the past decade (UBOS 2009).</p> <p>Pig production considered an enterprise for income generation amongst poor households</p> | <p>Pigs feed on a variety of foods, which makes them easy to manage.</p> | <p><i>Challenges</i></p> <p>African swine fever disease, which causes farmers to sell off animals immediately once outbreaks are detected leading to a glut in the pig market.</p> <p>How to prioritize pig production in Uganda's national agenda?</p> <p><i>Implications</i></p> <p>Pigs can be a potential source of income for farmers in rural, urban and peri-urban areas.</p> |
| Fish | <p>Annual production of farmed fish estimated at 12,000 tonnes</p> <p>Capture fish activity is mostly in the lake zone with annual catch estimated at about 100,000 tonnes</p> | <p>Government willing to support young people in establishing fish farmers</p> <p>Presence of fish feed manufacturer</p> <p>Strong aquaculture research presence (NARO-National Fisheries Resources Research Institute) with support from China and other development agencies</p> <p>Dwindling fish stocks in natural water bodies, hence justifying the focus on fish farming</p> <p>Cage farming gives better yields.</p> <p>Government is planning to set up an aqua-park in central Uganda.</p> | <p><i>Challenges</i></p> <p>How to add value to farmed fish?</p> <p>How to improve extension and advisory services delivery to fish farmers?</p> <p>How to promote sound fishing methods?</p> <p><i>Implications</i></p> <p>Integrate aquaculture into existing cropping-livestock systems for mutual benefits (water for irrigation, manure to feed fish, pond silt to fertilize plants)</p> <p>Promote value addition to farmed fish</p> <p>Identify value addition options for farmed fish</p> |
| Poultry | <p>More than 80% of households in Uganda keep poultry.</p> <p>A few poultry breeding companies have been established.</p> | <p>Changing social behaviour and diets are creating increased demand for chicken, mostly in urban areas.</p> | <p><i>Challenges</i></p> <p>How to deal with high cost of feed?</p> <p>How to promote proper mixing of feed by farmers?</p> <p>How to satisfy the high demand for chicks?</p> <p>How to increase the capacity of chick breeders? Implications</p> <p>Make use of the poultry manure for soil improvement</p> <p>Use soybean produced in communities to bring the cost of poultry feeds lower</p> |

Table 12: Current status of priority commodities in Humidtropics sites

| Commodity | Current status | Opportunities or strengths | Challenges and implications for Humidtropics |
|--------------|--|---|--|
| Dairy cattle | <p>More than 80% of milk is produced by smallholders.</p> <p>Dairy sector is regulated by the Dairy Development Authority.</p> | <p>Milk, being a whole food, can be promoted in the school feeding programs.</p> <p>Some agencies (Send a Cow, Heifer International, EADD) are promoting livestock production among smallholders.</p> | <p><i>Challenges</i></p> <p>How to deal with high incidences of milk adulteration?</p> <p>How to increase the number of milk collection centres?</p> <p>How to lower the cost of veterinary care?</p> <p><i>Implications</i></p> <p>Link smallholder groups to big processors (e.g. Jesa Dairy Ltd in Wakiso)</p> <p>Work with Heifer-established dairy hubs within the region</p> |

Sources: See within table, field FGDs and KIs 2014.

Key production systems

For the peri-urban area (Wakiso and Mukono), there is a comparatively high level of systems integration due to resource limitations especially land for production. The systems can be generally classified as intensive farming involving crop and livestock combinations. These systems are largely operating through using livestock waste as manure and crop residues as animal feed. Some of the crop-livestock integrations include:

Roots and tubers combined with piggery, banana-cattle, maize-legume and to a small extent coffee-banana system. The system is also integrated with trees, like Calliandra that is fed to animals and Albizia for soil improvement. The Ficus trees species is also predominant especially in the coffee-banana systems where it operates as a source of shade.

For the rural areas, both perennial and annual systems do exist but the perennial systems are much more established in the rural areas, especially due to availability of more land for production. The banana-coffee system is particularly common. It is usually mixed with agroforestry trees especially the indigenous mutuba tree (ficus) and Mugavu (*Albizia coriaria*). Other trees do exist like fruit trees for example jack fruit (*Artocarpus heterophyllus*), pawpaw (*Carica papaya*). The other dominant system is maize-piggery-or-poultry system. The maize bran is used to feed livestock while the manure goes back to the fields as fertilizer. In some areas like Kiboga and Kyankwanzi, this system is further improved by the introduction of soybean. This is working well as a source of protein for both human and livestock. Agroforestry trees like calliandra and griveria are also very common.

Challenges and opportunities for production systems

Opportunities and challenges do exist for both the rural and urban/peri-urban operation areas of Humidtropics in Uganda. These challenges and opportunities, however, do vary between peri-urban and rural areas.

Challenges

For both rural and urban/peri-urban areas, the challenges range from production to post-harvest handling. Because of over-cultivation, there are challenges of low soil fertility. This is further made worse by the fact that there is a low input use within the zone. Farmers are also facing challenges of how to deal with crop and livestock diseases e.g.,

BBW, Coffee wilt, cassava mosaic disease and CBSD, East Coast fever, African swine fever and Newcastle disease, among many others. Along the different value chains, storage facilities are still poorly developed and this inevitably presents a challenge to farmers, who have to deal with high post-harvest losses.

Opportunities

Opportunities include the availability of improved varieties and breeds within the zone. Proximity to the research organization NARO together with other partners in Namulonge and Kawanda is another glaring opportunity. These can act as knowledge incubation centres for farmers. This knowledge can further be conveyed by the different civil society support partners like EADD, Sameer, Dairy Development Authority, National Animal Genetic Resources Centre, NAADS, Seatini, Caritas, The AIDS Support Organization, Sasakawa Global2000 and VEDCO, among many others. Due to availability of electricity and water there is a strong agro-processing potential that can be tapped. Other value addition opportunities do exist, which require no electricity: for example, ghee production fetches an attractive market price. In both rural and urban/peri-urban areas, farmers integrate crop and livestock. This presents an opportunity of using animal manure for soil improvement.

Women and youth involvement in production systems

Within the peri-urban areas, women are involved in piggery, cattle and poultry rearing. For cattle, they are mainly engaged in zero grazing especially in the areas of feeding, watering and cleaning of livestock sheds. The youth are strongly involved in vegetable production due to its short growing cycle and thus able to give them a quick source of income.

Within the rural areas of the zone, women are mainly involved in annual crops contributing to both cash and food security like maize, beans, roots and tubers. In other areas, women are also involved in banana production. The youths are engaged in vegetables, especially tomatoes, as well as annual crops like maize and legumes. A good number are also doing poultry and piggery rearing, livestock grazing and market gardening.

Challenges and opportunities affecting innovations for sustainable intensification

Population growth

The major challenge in Wakiso district is how to deal with the high population density. Wakiso district has the highest population density, attributed to the rural-urban migration that has occurred in recent years where people have moved towards Kampala in search of better social and economic opportunities. However, the accommodation costs in Kampala are quite high, people prefer to live in the peri-urban areas such as Wakiso and Mukono districts. This implies that Humidtropics should target Mukono and Wakiso districts with intensive crop-livestock production systems because pressure on the land is relatively high. On the contrary, the population densities in Nakaseke, Kyankwanzi and Masaka are relatively low, hence opportunities for expansion of land under agriculture could be pursued.

Soil degradation

Ugandan soils have been considered fertile for a long time but existing evidences indicate that there is a decline in soil fertility as a result of soil nutrient depletion. This is attributed to over-cultivation and soil mining. Soil erosion is also an observed problem in Humidtropics areas. The challenge is how to deal with soil degradation associated with the present agronomic practices. Key agronomic practices, such as crop rotation, mulching and furrowing, are not widely practiced.

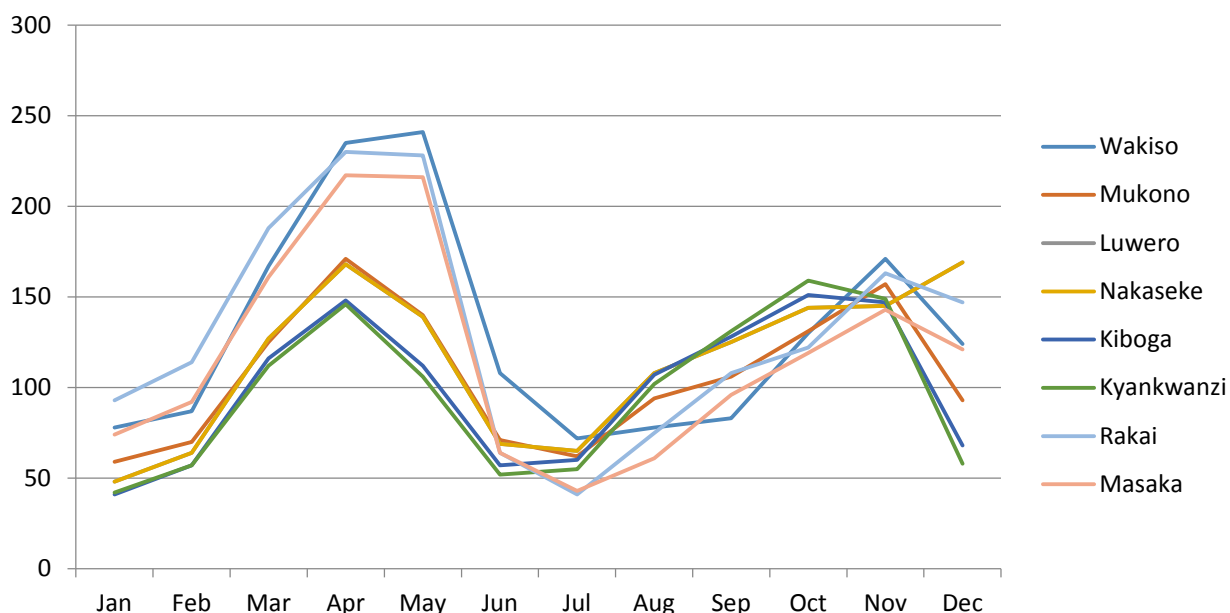
Uncoordinated actors

Several value chain actors do exist within both urban and rural Humidtropics field sites who can help address production-related constraints. However, they tend to operate in an uncoordinated manner and sometimes give conflicting information, thus making their impact on the ground less effective. This also leads to low levels of adoption of the different technologies being transferred. The big challenge is how to bring the different actors along the value chains to work together and share work programs and activities.

Rainfall

Rainfall determines the types of crops grown as well as the type of livestock kept. In places that are predominantly dry like Nakaseke, Kyankwanzi and some parts of Kiboga, farmers engage more in livestock keeping. On the other hand, in Wakiso, Masaka and Mukono that receive higher rainfall, farmers are more into crops.

Figure 2: Annual rainfall pattern in Ugandan Humidtropics districts.



Source: www.samsamwater.com/climate.

Implications for Humidtropics

- As a result of population migration from rural to urban areas, adoption of intensive crop and livestock production systems is growing rapidly as well as pressure on land, especially in Wakiso and Mukono, is becoming very high.
- In districts with lower population densities (i.e. Nakaseke, Luwero), large-scale commercial farming is beginning to take root with some reasonable investments in maize production. Much of the land previously under communal grazing is being converted to large-scale crop farms.
- Despite the presence of agricultural research organizations in Mukono and Wakiso, crop diseases are still responsible for the poor yields in Humidtropics field sites. Likewise, some livestock diseases still have extreme effects on the herd in these places (i.e. African swine fever). There is generally low 'trickle down' of research to the intended end-user with respect to crop and animal diseases.
- Gender plays a significant role in the type of enterprise to be undertaken to attain Humidtropics' intermediate development objectives; such considerations are critical.

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- Some crop-crop and crop-livestock systems as well as crop-tree systems have been observed. For instance, the banana-coffee-shade tree system is prominent in most of the Lake Victoria Crescent zone. Furthermore, those engaged in crop-livestock systems are beginning to appreciate the benefits of manure in boosting yields and crop residues as feed.
 - However, in other urban areas where production systems are more intense, agroforestry still draws a lot of scepticism.

Markets and institutions

This section outlines the current status of each commodity with regards to market opportunities as well as the strengths. The challenges which may hinder realization of these opportunities are also mentioned. The conclusions lists interventions for Humidtropics to meet its IDO-2 'Increased consumption of diverse and quality foods from sustainable food systems by the poor, especially among nutritionally vulnerable women and children' and IDO-6 'Increased capacity for integrated systems to innovate and bring social and technical solutions to scale'.

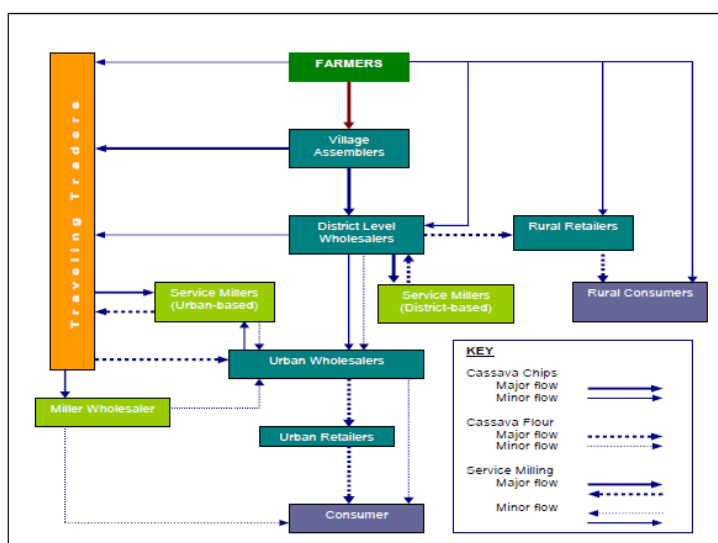
The focus is on commodities that were selected and determined to have potential impact on Humidtropics action sites. These include crops, livestock and aquaculture-oriented enterprises. The main crops identified include cassava, maize, banana, rice, coffee, horticultural crops, soybeans, tea and beans. The main livestock species that hold potential for improving livelihoods for these areas include pigs, dairy cattle and poultry in addition to fish farming.

Description of the selected value chains

Crops

Cassava is rated as the second most important staple and a crop of high industrial potential (MAAIF's DSIP 2010). Sixty percent of produced cassava is for own consumption, while 40% is traded (USAID 2010). It is commonly traded as flour (50%), dried chips (45%) and fresh root tubers (5%). In the Humidtropics sites, cassava is mostly grown in the rural districts of Rakai, Kiboga, Kyankwanzi, Luwero and Nakaseke. Farmers realize peak prices from the sale of their produce mostly in April. Besides local sales, cassava from Uganda is also exported notably to South Sudan and eastern parts of DRC (USAID 2010).

Figure 3: Value chain for dried cassava.

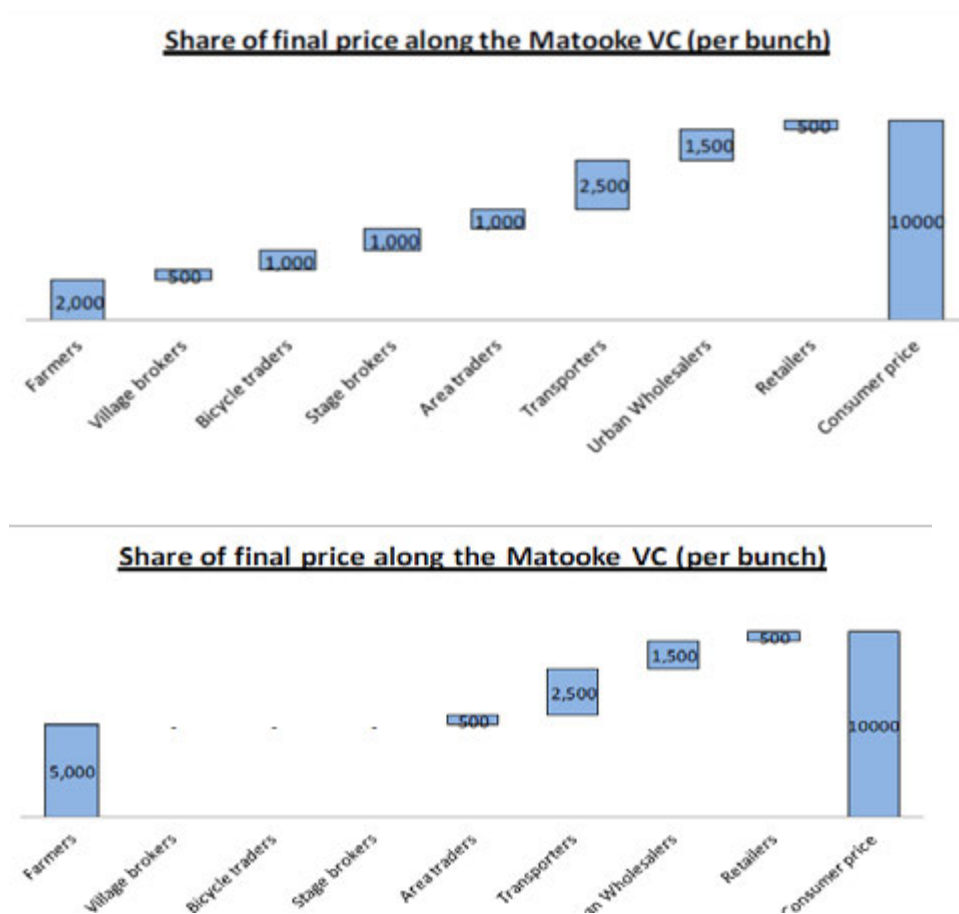


Source: Kilimo Trust (2012).

Maize is the main staple in East Africa. However, in Uganda it is rated third in production volume after banana and cassava (SMJR 2012). It is mainly grown in the rural districts of Iganga, Jinja, Mayuge, Bugiri, Kapchorwa districts of the eastern region, Kamwenge and Kasese districts of the western region, and Masindi, Kiryandongo and Lira districts of the northern region. A good proportion of farmers in Kiboga, Masaka and Rakai districts also grow maize. Maize is largely grown as a cash crop and is usually sold to urban poor populations and institutions such as schools and colleges. Substantial amounts are also exported to other countries in the region. About 75% of total maize produced in Uganda is usually sold for cash; only 25% of these sales go to the local market. Current export of maize from Uganda to countries, such as South Sudan and Kenya, stands at about 850,000 tonnes/ year (FSN WG 2014). The World Food Programme (WFP) is also a major destination for Ugandan maize, accounting for 40–50% of all export maize from the country (SMJR 2012).

Banana is considered the most important staple crop in Uganda. It is commonly grown in the urban districts of Wakiso and Mukono, and rural districts of Masaka, Rakai, Kiboga, Luwero and Nakaseke. Yields are estimated at about 5.4–5.6 t/ha. Banana is categorized into four types based on what they are used for, namely: cooking, dessert, roasting and brewing varieties. Value addition into dried chips, flour, wine and juices is in place, but at a very small scale. Nationally, there are two marketing options available to farmers, which are also exhibited in the case of the districts that fall under Humidtropics. These include: (a) Traditional marketing—involving several actors in the chain as depicted below and (b) Improved marketing approach—where farmers are well organized, possibly into groups, which enables them to by-pass several actors within the traditional value chain. The more improved market approach enables farmers to undertake activities normally implemented by other value chain actors; farmers’ groups can thus appropriate 50% of the value added as compared to only 20% of the value added accruing to farmers under the traditional marketing.

Figure 4: Distribution of margins along the banana value chains.



Adapted from SMJR 2012.

Rice is the most traded food commodity across borders in East and Central Africa. In Uganda, rice is mainly produced in the eastern and western parts of the country. However, there are pockets of rice production in the Humidtropics areas concentrated in Wakiso, Mukono, Masaka and Rakai (MAAIF 2009). The yields are estimated at 2.5–3 t/ha against a potential of 4–5 t/ha. Approximately 25% of the rice is traded un-milled, while the rest is milled and then traded up to the final consumer. Demand for rice outstrips supply in Uganda and there are massive opportunities for farmers to provide import substitution worth USD 150 million if production is doubled and quality improved (SMJR 2012). Over the past 20 years, rice consumption in Uganda has increased by 360% owing to the change of eating habits associated with urbanization (Kilimo Trust 2012c). Policy-wise, an external common tariff of 75% is levied on rice imports into the East African Community and this is aimed at providing an opportunity for local rice production to grow.

Coffee plays an important role in the Ugandan economy. Annual production is estimated at 210,000 tonnes. It contributed 18% of the export earnings between 2000 and 2011 (Ahmed 2012); current figures put this contribution at 20–30% of Uganda's export earnings. Its export value is estimated at USD 481 million, of which 80% is Robusta coffee. It is estimated that 8 to 10 million people are involved in direct coffee production and depend in one way or the other on coffee production. Indeed, the coffee value chain supports 3.5 million households in Uganda (approximately 65% of the total population) as per the UCDA (2013) report. A majority of these households are poor and would therefore benefit a great deal from an improvement in this sub-sector. Per capita consumption of coffee is at 0.25 kg/year and hence the local consumption of 8,400 tonnes only amounts to 4% of what is produced. In the Humidtropics sites, coffee is grown in the rural districts of Masaka and Rakai, while in urban district it is produced in Wakiso and Mukono. Producer prices often mimic export price trends especially between 2005 and 2011 with producers receiving 64% of the export prices in 2005 and as high as 88% of the export price for Fair Average Quality (FAQ) coffee in 2011.

In terms of government support, UCDA renders ample support in input supply, market information and promotion of coffee abroad. This offers an opportunity to several multinational companies willing to invest upstream (i.e. supply of quality inputs using a check-off system,). Attractive prices and profit margins also exist in this value chain: i.e. a farmer may obtain up to 37% profit while traders who bulk and hull can get 39% and exporters obtain 16%. This is specifically the case of specialty coffees (coffee grown in the highlands, forest, organically grown coffee), which have niches in the European markets.

Tea remains the third largest export in terms of value for Uganda after coffee and fish. Current production is estimated at 63,000 tonnes up from 33,789 tonnes a decade ago. Exports have increased from 30,477 tonnes in 2001 to 53,178 tonnes in 2010 (Kiwanuka 2012). Similarly to other countries in the region, the tea value chain in Uganda is characterized by many producers and a few downstream players: 70% of tea exported is sold at the Mombasa auction while 20% is sold through direct sales. Only 10% of tea produced is consumed locally. Currently, Uganda's share of tea export in the global market is 2.8% and the target is to increase it to 5%. Among the Humidtropics project areas, tea is mainly produced in the rural districts of Kiboga, Luwero, and Nakaseke.

Table 13: Trends in tea production, export and domestic consumption in Uganda 2000–10

| Year | Production (ton) | Export (ton) | Domestic consumption (ton) | Consumption as percent of production |
|---------|------------------|--------------|----------------------------|--------------------------------------|
| 2000 | 29,282 | 26,338 | 2944 | 10.1 |
| 2001 | 33,255 | 30,477 | 2778 | 8.4 |
| 2002 | 33,789 | 31,109 | 2680 | 7.9 |
| 2003 | 36,475 | 34,069 | 2406 | 6.6 |
| 2004 | 37,018 | 35,000 | 2018 | 5.5 |
| 2005 | 37,734 | 33,071 | 4663 | 12.4 |
| 2006 | 36,726 | 32,699 | 4027 | 11.0 |
| 2007 | 44,913 | 43,638 | 1275 | 2.8 |
| 2008 | 45,978 | 45,158 | 820 | 1.8 |
| 2009 | 50,982 | 47,920 | 3062 | 6.0 |
| 2010 | 59,449 | 53,178 | 6271 | 10.5 |
| Average | 40,509 | 37,514 | 2995 | 7.5 |

Source: Kiwanuka and Ahmed (2012).

Beans production in Uganda has been estimated to be 450,000 t/year on average in the past decade. Beans are mainly produced in the rural districts of Kiboga and South Luwero. A large proportion of the production is consumed locally with only around 20% of the production exported. Local demand is indeed likely to grow as school enrolment increases (with government considering making lunch compulsory at school). The main destinations of these exports are Kenya, South Sudan, DRC, Tanzania and Burundi. The regional exports for beans are likely to grow from 200,000 to 350,000 tonnes annually in the short run (FSNWG 2014). Regional political instability also contributes to high demand for beans by relief agencies, which use it to address food shortages in refugee camps. It is estimated that relief agencies need close to 50,000 tonnes of beans annually to address the humanitarian crisis in the region. World Food Programme (WFP) is the largest bean exporter from Uganda and obtains its exports through two procurement options. First, WFP buys beans from farmer groups or CBOs that are able to supply at least 40 tonnes. This ensures that farmer groups are paid a fair price. Besides, producer groups are also assisted with market information on commodity prices throughout the country. This is mainly done in eastern, central and western Uganda, where farmers have surpluses every year. Alternatively, WFP purchases from traders who can stock or bulk at least 200 tonnes of beans.

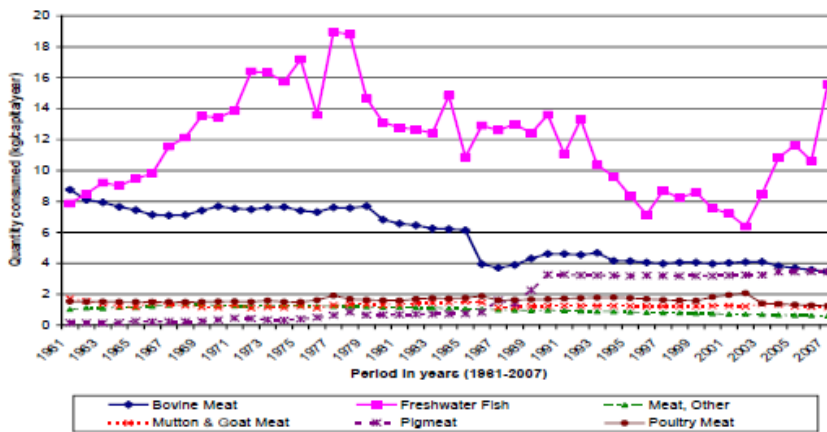
Besides the usual beans, there is also production of soybean that is estimated at 166,000 tonnes annually. Soybean is mostly purchased for export or for industrial processing into vegetable oil and animal feeds locally. Soybean is mainly produced in Kiboga. The main traders of soybean are Mukwano and Mount Meru export companies. These companies buy soybean from farmers and export them abroad or trade it with processing industries locally. Export to Kenya and Tanzania is currently estimated at 40% of total soybean production and this is likely to grow since animal feed is in high demand in these two countries. According to KILs held in 2014, Ugachick and Biyinzika also manufacture animal feeds from soybeans locally. Other manufacturers also process soybean into baby foods. The processors include Maganjo, Sesako, Kayebe, and East Africa Basic foods. Processing capacity currently in Uganda is at 600 t/day.

Horticultural crops are mainly produced in the urban districts of Mukono and Wakiso and the rural districts of Masaka and Rakai. Current production trends are estimated at 11–12 million tonnes annually (FAOSTAT 2014). Most horticultural products are traded and consumed in raw form. Processing companies that produce juices, dried chips, tomato sauces and puree include Britannia Ltd. in Kampala, which handles mangoes, pineapples and passion fruit, Reco Industries in Kasese processing tomatoes into ketchup and puree, and Jakana Foods in Kampala, which processes pineapple and banana. Some horticultural crops also find their way into the Kenyan markets where the demand is very high.

Livestock

Pig production in Uganda was estimated at 3.2 million head as of 2008 (MAAIF-UBOS 2009). It is considered an enterprise for income generation amongst poor households. Pigs are sold as piglets to those who want to start this enterprise or as fatteners (8 months old) for slaughter. Fatteners are mainly sold through four channels namely: i) direct sales to consumers, ii) sales to neighbourhood butcheries, iii) sales to butcheries in nearby towns and iv) sales to traders. Selling to neighbourhood butcheries is the most dominant supply channel. Nationally and among other livestock meat products, the average per capita consumption of pig meat ranks third after consumption of fresh water fish and bovine meat (Tatwangire 2014). Indeed, the percentage contribution of pig meat to per capita protein supply increased from 3.1% in 1999 to 3.6% in 2009, overtaking other meat-based diets such as mutton and poultry. Moreover, pig meat is only second to milk in terms of supply of energy and also second to freshwater fish in terms of protein supply among all animal-based food sources in Uganda (FAOSTAT 2012).

Figure 5. Trends of average per capita consumption of all livestock products in Uganda.



Adapted from Tatwangire 2014.

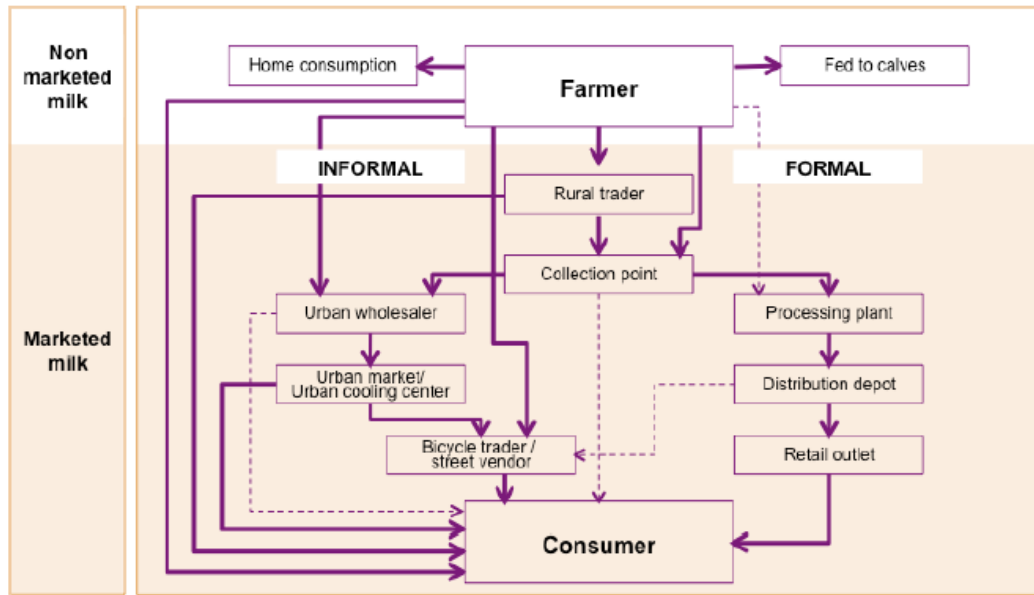
About 98% of pigs are sold live and slaughtered for pork with little if any value addition taking place (Mutetikka et al. 2009). Prices of live pigs have increased over the years courtesy of increasing demand due to growing population, and increasing urbanization and consumer purchasing power. Currently prices range from UGX 6500–7000/kg live weight in the districts near Kampala; prices can be as low as UGX 4500/kg of live weight in deeper rural areas. Increasing prices have improved margins for several players along the value chain except for poor farmers.

A dominant player in the processing and packaging of pork is the Quality/Fresh Cuts company, which offers a full range of meat products (beef, pork and poultry) including frozen and fresh prime cuts, plastic-packed retail cuts, sausages, ham and minced meat (Tatwangire 2014). The company covers 85% of Kampala's processed meat market with a daily output of 11 tonnes of fresh meat (6 tonnes of beef, 3 tonnes of pork and 2 tonnes of chicken). There are also ten other smaller players, two main ones being Sausage King and Your Choice, which have a daily production of 300–500 kg minced beef, beef sausages and pork sausages, marketed through supermarkets in Kampala. The big retail outlets (Shoprite, Nakumatt, Tusksys) also purchase large amounts of carcasses, from which special cuts are made for the high-end markets.

In terms of dairy production, the central region where the Humidtropics districts lie has the second highest population of exotic or cross-breed dairy cattle in the country (World Bank 2011; Balikowa 2011). Similarly, the region has the second highest milk production, accounting for 34% of total milk produced in Uganda. Milk in Uganda is sold to consumers as raw warm milk, raw chilled milk, artisan-pasteurized milk and commercially pasteurized milk. Only about 34.7% of milk produce is sold; milk is mostly traded unprocessed. Again the central region has the second highest share of milk produced that is sold. Other by-products such as cheese and ghee represent a very small part of the dairy sector. Moreover, not much milk produced in Uganda is exported as the demand in the domestic market is very high.

The dairy value chain in Uganda like elsewhere in East Africa is characterized by a prevalence of the informal sector, lack of critical mass and high variability in prices (EADD 2008). While the formal sector offers more accountability and higher revenue certainty, the informal sector attracts more liquid milk mainly due to its ability to pay higher prices. Additionally the informal market also pays cash for milk delivery as opposed to the formal sector that often delays payment. However, the informal sector is known for little, if any, quality control.

Figure 6: Ugandan dairy supply chain.



Source: Field KIs and FGDs 2014.

The formal sector often acts as a bulking mechanism for large processors. Most processors are located in Kampala, closer to the main market for commercially pasteurized milk (Balikowa 2011). On the other hand most dairy cooperatives are located in the southwestern region followed by the central region where the Humidtropics sites are found.

Milk prices are generally subject to volatility and are sensitive to both seasonality and geographical spread; for the formal sector, profitability at the primary collection centre is quite low given the cost of bulking the milk (EADD 2008). This explains why there are few bulking centres across the entire dairy regions of the country.

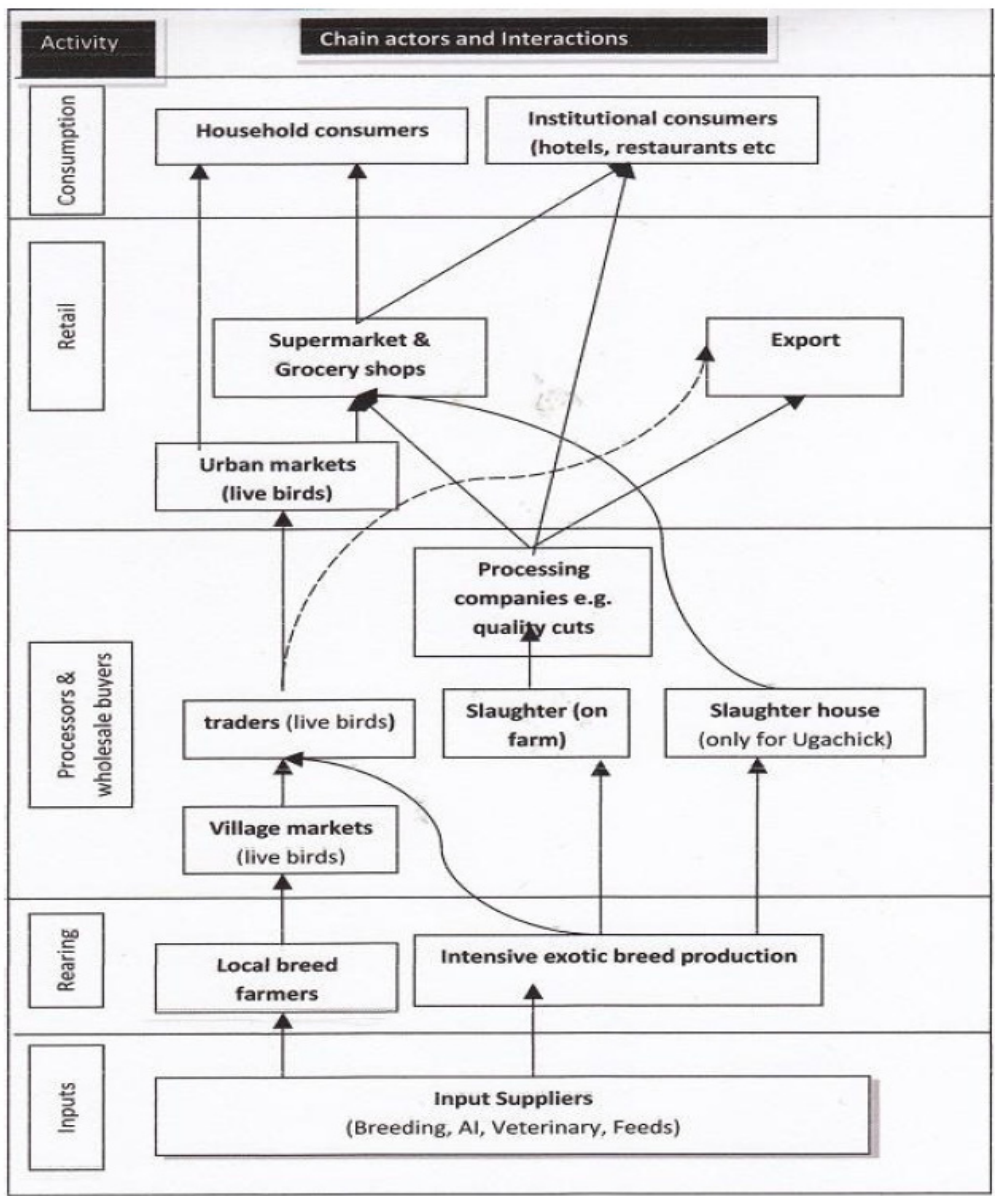
Figure 7: Map of Uganda showing the different milk sheds.



Adapted from Balikowa 2011.

The poultry sector in Uganda consists of different types of birds including chicken, turkey, duck, geese and pigeons. However, chicken have greater economic significance and play an important role in household livelihood. We therefore focus our analyses on chicken. At household level, chicken provide a livelihood to about 50% of Ugandan households; the majority of households (97%) keep indigenous chicken mainly for subsistence purposes. Exotic chicken mainly kept for sale account for only 12% of the chicken population: 70% broilers, 20% layers and 10% breeder broiler and breeder layers. Chicken, mostly indigenous breeds and some exotic broilers, are mainly traded live. There is however, an increasing trend of pre-sale slaughtering and packaging of chicken largely driven by increasing urbanization, changing consumer tastes and preference and growth of supermarkets in Uganda. The eggs and slaughtered broilers find their way into supermarkets and hotels in urban centres, while local chicken are traded locally; some find their way into urban centres. With increasing urbanization and rising incomes, this niche market is likely to grow. The exotic chicken rearing is concentrated around towns and urban centres, especially in Kampala and neighbouring districts of Wakiso and Mukono where commercial broiler and layer enterprises are also concentrated.

Figure 8: Broiler chicken value chain map.



Source: Deloitte-NAADS (2014).

Available statistics show that demand for chicken is growing at the rate of 3% per annum with current per capita consumption standing at 1.7 kg/person per year (FAOSTAT 2011). In terms of pricing, chicken meat is 25% and 47% more expensive than fish and bovine beef respectively. Moreover, demand for chicken is less price elastic, at least relative to fish and beef; increasing income will lead to lower growth in demand and consumption of chicken. Chicken prices have, however, been stable over the years and a medium-sized broiler currently goes for an average of UGX 9000.

Aquaculture

Fish farming is an enterprise that has gained ground in Uganda especially with the dwindling fish harvesting from Lake Victoria. Annual production of farmed fish is estimated at 12,000 tonnes. Approximately 98% of farmed fish is exported: mainly to Rwanda and also to DRC. About 90% of captured fish from the Uganda lakes is exported, mainly to the European Union (EU) by air. Small-scale fish farmers may make profit margins of 7–21%, while large scale farmers may make up to 30%. Fish farming is mainly practiced in urban districts of Mukono and Wakiso, and rural districts of Masaka and Rakai.

Opportunities for improved market access

Significant market opportunities

Proximity to urban areas and population growth. Humidtropics sites, the urban and peri-urban districts of Mukono and Wakiso in particular, are located within close proximity of Kampala city, which is characterized by a growing population and an increasing purchasing power. This provides a ready market for agricultural produces from the two districts. Additionally, as shown in Table 3, the two districts have the highest population densities of all the Humidtropics districts and a large proportion of this population is not employed in agriculture. A majority of residents in these two districts therefore rely on purchases rather than own-production to meet their food needs. This presents additional market opportunities for food products from within the districts and beyond. In particular, the growing urban population in Kampala and its environs presents growing opportunities for livestock products (pigs, poultry and milk) as well as horticultural commodities and high-value staples such as rice. The large urban market also presents possibilities for realizing higher farm gate prices especially for urban and peri-urban districts of Wakiso and Mukono.

Poultry (chicken). Increasing urbanization and rising incomes also imply increasing demand for chicken and eggs, which boils down to increased commercialization of chicken production and a growing demand for day-old chicks. This presents an opportunity to integrate backwards into rearing of breeder broilers and layers, as well as establishment of hatchery businesses.

Location along main highways to neighbouring countries. Some of the neighbouring countries are characterized by unfavourable climatic conditions and present a ready market for surplus grain and other key foodstuff produced in Uganda. Most Humidtropics sites are located along major highways connecting to key border towns. This enhances the ability of producers in such locations to link to regional markets.

Seed markets. For maize producers, the unexploited regional seed market presents significant opportunity to supply one of the most reliable niche markets. Again the strategic location of some Humidtropics sites along a highway would make them attractive for seed companies looking for farmers to contract for maize seed production. Besides maize, demand for rice seeds also present a market opportunity for rice producers. Unlike maize, rice production relies heavily on the formal seed distribution system. Demand for certified rice seeds is likely to peak especially as more acreage is dedicated to upland rice. Significant seed market opportunities also lie in export destinations. For instance, in 2008 Uganda supplied NERICA seeds to Mali (Uganda Rice Revolution 2009).

Export markets. Several products produced in the Humidtropics sites such as tea, coffee, maize, beans and soybeans are destined for export markets (global and regional), which tend to be more lucrative than local markets. There are also opportunities for cassava producers to export cassava dried chips mostly to DRC. Farmers can obtain a profit margin of 56% if they sell dried chips and 33% if they sell fresh root tubers (Deloitte-NAADS 2014). For maize and beans, there is even a more lucrative opportunity to tap into the stable export market presented by the WFP procurement procedures.

Infrastructure and market access

Courtesy of their proximity to major urban areas, the two urban districts of Wakiso and Mukono have better access to electricity and reliable water supply. For instance, 82% of the population in Mukono has access to safe water for drinking (DWD-MWE 2010). Moreover, some rural districts are relatively well served with electricity e.g., Nakaseke and Rakai. Households and some processing plants especially in Rakai are connected to the national grid courtesy of the rural electrification program. This has enhanced opportunities for value addition.

Additionally, a couple more districts such as Kyakwanzi, Kiboga and Masaka lie on major highways linking Kampala to neighbouring Rwanda, Burundi and Tanzania. The road infrastructure provides opportunities for delivering commodities from these regions into Kampala markets and across the borders into neighbouring countries.

Post-production handling, agro-processing and value addition

Bananas. There exist vast opportunities to produce new products from bananas such as chips, flour, wine and juices. These products are demanded both locally and abroad. For instance, there is a growing demand for Uganda's dessert and roasting banana in Kenyan markets while dried banana chips is highly demanded in the EU markets. Local demand for dried chips is also growing and Danielle Foods, Amfri farms and Biofresh Ltd are among local companies already processing bananas into dried chips. Amfri farms Ltd and Biofresh Ltd are also the main exporters of fresh bananas to the EU markets. Besides improving shelf life of banana, reducing post-harvest losses and possibly stabilizing farm gate prices, the agro-processing opportunities would create employment opportunities through establishment of small and medium enterprises (SMEs).

Cassava. Local industrial demand for cassava (animal feeds, breweries, packaging, and bakery) is estimated at 200,000 tonnes annually and valued at USD 44 million. This provides a nascent opportunity for cassava producers to integrate into an industrial value chain that would substantially reduce post-harvest losses and improve earnings for producers.

Pork. With increasing urbanization and rising incomes, there exists vast opportunities to diversify pig meat into several niche products such as pork sausages and mince pork. This would increase product values with possible improved margins to farmers.

Poultry (chicken). With increasing demand for pre-sale slaughtered and packaged chicken, there are increasing opportunities for growing businesses around commercial slaughtering and processing of chicken. This would provide opportunities for growth of SMEs.

Milk. There have been significant improvements in collection centres and development of cold chain infrastructure through provision of chilling plants especially under the EADD project.

Coffee. There is an upcoming coffee plant in Kyankwanzi which will provide opportunities for post-harvest processing and value addition. Another coffee processing plant is also coming up in Rakai.

Soybean. Increasing demand for animal feed both locally and in the region present an opportunity for producers to gain access to agro-processing. Further opportunity for improved access to agro-processing is presented by manufacturing of baby food from soybeans.

Maize. There is also a growing demand for maize bran for manufacturing animal feeds (Compete 2010).

Financial services

There is widespread and concentrated spread of SACCOs and micro-financing institutions. Their heavy presence is an opportunity to alleviate credit constraints experienced by rural actors along several value chains. The presence of these financial institutions provides opportunities for engaging the financial sector to develop suitable products for various actors along the different value chains.

Information access

Across all value chains there exists substantial opportunities to use modern technologies such as mobile text messages and traditional approaches such as notice boards in trading centres. Appropriate and well-packaged radio programs can also be used to disseminate market information.

Market institutions and opportunities for organized marketing structures

Tea and coffee. Some of the produces from Humidtropics sites are marketed through an organized structure like the tea auction in Mombasa. Moreover, there are several marketing institutions in the more rural areas that link farmers to markets. For instance, there are various coffee buying centres in Masaka (National Union of Coffee Agribusinesses and Farm Enterprises, Kyagalanyi) and Luwero (Ibero, Kyagalanyi) districts. There are also opportunities to institute a more organized way of marketing coffee through auctions, which would enhance efficiency and price transparency. These commodities also represent significant opportunities for access to niche export markets. Production of specialty coffee (organic coffee), for instance, opens opportunity for accessing niche markets in the EU through some form of contract farming.

Soybeans. Soybeans is mostly purchased for export or industrial processing into vegetable oil and animal feed. These export and processing opportunities present an ideal setup for establishment of contract agriculture that would improve earnings for producers while also providing market assurance.

Horticulture. There are also several processing companies in Kampala that process juices, tomato sauce and other products that could contractually be linked to producers as a means of ensuring marketing outlets and improved returns to producers.

Pig production. Value addition of pork through processing into diverse niche products presents an opportunity for direct linkages between producers and processors. The quality and standards requirement often emphasized by such high-value chains provides incentives for direct sourcing from producers often involving contracts. Such institutional arrangements would improve returns to producers besides providing market assurance.

Poultry production. The growing demand for pre-sale slaughtered and packaged chicken presents an opportunity for a more organized value chain based on contract farming. With increasing urbanization and changes in tastes and preference, the chicken value chain will experience increased concentration with supermarkets playing an increasing role as a market outlet for chicken. This provides opportunities for producers to integrate into high-value chains (characterized by tighter coordination and contract farming) and to benefit from higher returns and market assurance.

Finally, there are various development agencies and initiatives working on market linkages for smallholder farmers. These include the EADD initiative, Sameer and VEDCO, among others.

Constraints to market access

Agro-processing and value addition

In spite of existing opportunities for some commodities, there is still inadequate capacity for value addition and agro-processing for most value chains. For instance, the pineapples produced in Luwero district often have to be sold at throw-away prices due to lack of processing facilities that could enhance returns to growers. Similarly, only 20% of coffee produced in Kiboga can be handled by the 10 coffee hullers present in the district. There are also no value addition opportunities for fruits and vegetables produced in Masaka, leading to huge post-harvest losses. Most of the commodities are also characterized by inadequate storage technologies and poor post-production handling, thus affecting quality of products marketed. While rice mostly undergoes some form of processing before sale, the poor quality of processing facilities often yields low quality grain that can hardly compete with imported rice. Owing to its high quality grain, the imported rice is generally preferred by the urban population (MAAIF 2009). Rice production is also subject to inadequate storage facilities or rural warehouses leading to substantial losses at farm level.

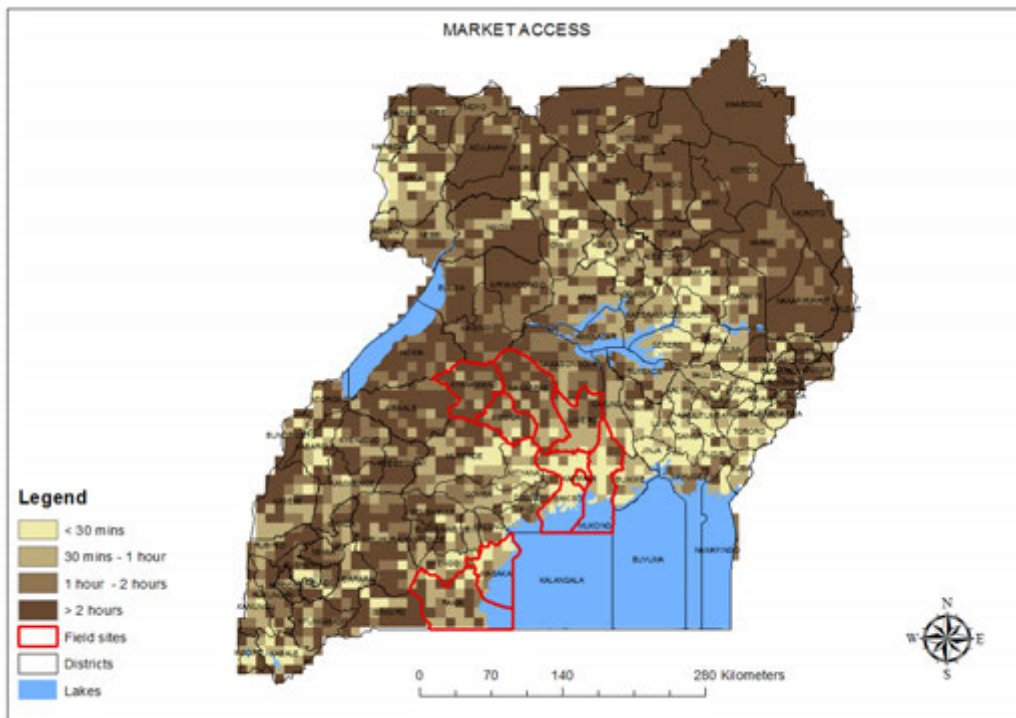
Maize production also suffers from a lack of appropriate storage and post-harvest handling facilities, which forces farmers to sell immediately after harvest. This leads to grain glut and lower prices for producers. Wide price fluctuations often experienced in the maize market is indeed a consequence of poor storage and post-harvest handling facilities. The industrial potential for cassava is also compromised by the limited investment in processing facilities. Similarly, the value addition opportunities for bananas that have been discussed above are limited by low investment in processing infrastructure.

With regards to livestock, dairy production is faced with inadequate infrastructure for post-production handling such as coolers and chilling plants. While some districts, such as Nakaseke, have relatively high numbers of milk coolers, there are only five such coolers in Luwero district. Kiboga district on the other hand only has 15 milk coolers, which can only accommodate 50% of total milk produced in the district. Similarly, limited infrastructure for processing and handling of pig meat also leads to poor quality and unsafe pig meat. Out of six abattoirs in Kampala and Wakiso, only one specializes in the slaughter of pigs. The rest are illegal slaughterhouses that can hardly meet quality standards for supply of safe pig meat.

Poor infrastructure

While most districts falling within the Humidtropics sites are traversed by at least one major highway, the poor road network, particularly in rural districts, is a big hindrance to market access. A district like Nakaseke only has one tarmac road with most feeder roads in the district becoming impassable during the rainy season, which further impedes market access. While road infrastructure is particularly critical for the highly perishable horticultural and dairy products, poor infrastructure also affects the value potential of major grain staples. For distributors of staples such as maize, cassava and rice, the poor road network increases trading cost, which is often then passed on to farmers. In extreme cases, production regions for many staples remain inaccessible, thus making it impossible for producers to bring any production surpluses to the market. For dairy, poor road infrastructure, especially feeder roads impedes timely delivery of milk to markets. Moreover, improper handling and erratic power supply lead to substantial losses due to spoilage.

Figure 9: Map of times to access markets.



Data source: Nelson (2008).

Institutional arrangements for market access

Most of the selected value chains lack economies of scale; their actors generally lack the capacity to produce sufficient volumes required by large output markets. Consequently, most commodities are traded in local markets in small quantities. These micro markets only attract very low prices. Additionally, weak or non-existent value chain institutions have led to poor or no market information about outlet channels for most commodities produced in the Humidtropics sites. For the **maize value chain**, producers often have low volumes of marketable surplus and are geographically dispersed making it difficult to undertake collective marketing. This also applies to the **beans value chain** where, due to limited information, marketing is done largely on an individual basis with limited collective action, leading to low bargaining power and consequently lower farm gate prices for producers. Similarly to maize, bean producers are also scattered and they produce low volumes with low marketable surpluses. This lowers their bargaining power while also making trading quite costly, a burden which is often passed on to producers in lower farm gate prices. For beans, the scattered nature of producers and the low volumes of marketable surplus, particularly limit possibilities to exploit export and niche market opportunities presented by WFP and soybean processing firms.

Similar experiences are prevalent in the **banana supply chain** where lack of collective marketing compromises producers' ability to realize substantial gains in earnings. In the coffee value chain, there is a large number of small traders supplying a few exporters (who also act as bulking agencies), which leads to oligopsonistic behaviour.

The **livestock value chains** are also victims of inadequate institutional arrangements for enhanced market access. For instance, there are fewer well-structured pig producer groups that can propagate collective marketing in order to enhance producers' bargaining power. The poor structure of the industry is manifested by the many traders at each level of the supply chain, which often results into higher transaction costs and exploitation of farmers by traders. The dairy sector is dominated by a few key organizations, which exposes the industry to systemic risk in case these key organizations fail. The dairy value chain is also characterized by a weak and small formal sector.

Finally there are also weak input markets and a general lack of appropriate mechanisms for linking producers to input suppliers, thus limiting use of improved seed varieties, fertilizers and other livestock inputs.

Market information

Nearly all the value chains under discussion are exposed to the challenge of low farm gate prices. The low prices are a consequence of limited agro-processing or value addition opportunities that often leave producers at the mercy of traders. Low farm gate prices are also caused by information asymmetry. For the banana value chain, limited or unreliable access to market information on market options and prices is quite prevalent. Market information is often disseminated through bicycle traders and other agents who have less incentive to provide reliable information to farmers. For beans producers, information is mostly obtained from district radio broadcasts, yet many poor farmers can hardly afford radios. Moreover, the information is not well packaged and is less detailed. Limited market information also limits access by pig producers to more high-end supply chains, such as supermarkets, where access to information is a critical factor to the sustainable supply of commodities. The dairy value chain is also characterized by information asymmetry between producers and marketers leading to overpriced inputs and underpriced outputs. Due to information asymmetries across various value chains, producers are left with less bargaining power and are increasingly exploited by traders. There is therefore need to strengthen linkages amongst value chain actors to improve access to market information.

Market prices

Since most of the value chains selected are characterized by produce that is sold raw or unprocessed, market prices are generally low. This is further compounded by limited value addition. An underdeveloped domestic market is another factor leading to low market prices of all the value chains selected. Prices also often fluctuate largely due to seasonality and general lack of storage facilities. Poor storage facilities also lead to low quality products that tend to command low market prices. In the dairy value chain, farmers are forced to accept low prices in exchange for market assurance provided by the cooperatives and chilling plants.

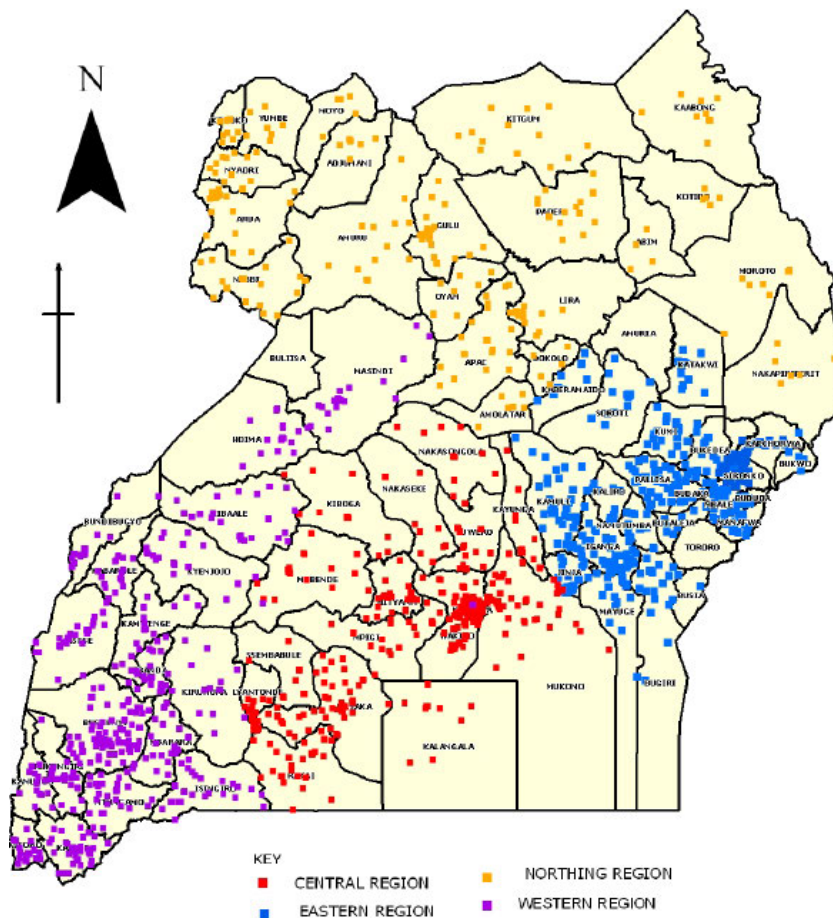
The unorganized market approaches adopted in most value chains also lessens the bargaining power of producers leading to low output prices. Traders are often more organized than farmers and some traders operate cartels, which collude in setting prices thereby hindering farmers from negotiating better prices.

Credit access

While most Humidtropics districts are well served with micro finance institutions, Kyankwanzi, Nakaseke and Kiboga districts have limited coverage of financial institutions.

Moreover, even where they exist, most of these financial institutions do not have sufficient appropriate financial options for smallholder farmers and other value chain actors at various levels of the value chain. In the banana value chain for instance, value chain actors complained of limited access to credit, especially small and microenterprise traders who are often neglected by existing financial options that focus mainly on farmers.

Figure 10: Map of micro-finance institutions' distribution in Uganda.



Adapted from UBOS 2010.

Summary of implications for Humidtropics

Market development in the Humidtropics field sites of Uganda is still wanting. To solve this, multi-stakeholder innovations approaches, which link farmers to markets and business development services, should be the driving force behind systems intensification within Humidtropics. The key issues emerging from this situational analysis are:

- Farmers generally complain of low prices offered and this may be attributed to the little or no value added to their produce as well as the urgency to sell immediately in order to obtain cash to meet immediate needs.
- A ready market exists for almost everything produced in Mukono and Wakiso as well as most urban and peri-urban areas.
- Inadequate storage both at household and community levels is responsible for the low farm gate prices obtained by farmers who are unable to store and wait for off peak periods when prices are a little better. Worse still, inadequate storage is responsible for the heavy losses in quality for most harvested produce.
- Electricity and water coverage is improving so value addition is likely to improve too as the private sector responds to this opportunity.
- Good roads linking most of the districts studied to key markets within the country and beyond the country's border are to be considered as opportunities which can be captured in the short run.

Natural resources management and the environment

This section highlights the status of natural resource management and the environment in the eight Ugandan districts where Humidtropics will operate. The section specifically covers forests, water, soil, rainfall and demography in target districts of Kiboga, Kyankwanzi, Luwero, Wakiso, Nakaseke Rakai, Mukono and Masaka. The analysis covers the status of the resources, the challenges and opportunities for sustainable intensification within Humidtropics, highlighting efforts of recent and ongoing projects and programs addressing NRM and the environment in the selected districts. The Intermediate Development Indicator that this section will help to address is IDO-4 'Improved management of natural resources is essential for sustaining increases in farm-level productivity and the provision of other ecosystem services'.

Forest cover and agroforestry

Forest degeneration

Countrywide, total annual deforestation rate inside and outside protected areas is estimated at 1.8% (0.7% inside protected areas and 2.27% outside) or an absolute loss of about 88,638 ha per year (NFA 2009). An earlier conservative estimate suggested the national cost of deforestation in the range of USD3.8–5.5 million/year (Falkenberg and Sepp 1999). However, deforestation rates and thus associated costs vary across the districts where Humidtropics will operate (Table 14).

Table 14: Deforestation rates in selected districts in Uganda 1990–05

| District | Forest area (ha) | | | % change |
|----------|------------------|---------|---------|----------|
| | 1990 | 2005 | Change | |
| Wakiso | 38,028 | 21,065 | -16,963 | -45 |
| Mukono | 107,981 | 96,142 | -11,839 | -11 |
| Kiboga | 168,681 | 81,551 | -87,131 | -52 |
| Luwero | 47,718 | 22,833 | -24,884 | -52 |
| Nakaseke | 189,734 | 137,947 | -51,787 | -27 |
| Rakai | 33,158 | 27,771 | -5387 | -16 |
| Masaka | 21,990 | 31,333 | 9342 | 42 |

Source: NFA (2009).

Forest degeneration in the peri-urban districts of Wakiso and Mukono is due to the spilling over of urbanization from the capital city Kampala resulting in high encroachment on forests for economic activities including construction works, furniture and small-scale manufacturing industries (bakeries, brick making). The two peri-urban districts have the highest acreage of built up area in Uganda after Kampala. In the rural districts, degeneration is largely due to both agricultural expansion as farmers open new crop fields to cover declining yields (due to declining soil fertility,

inadequate rainfall, and pests and diseases), and direct conversion of forests to grazing land especially in Kyankwanzi, Kiboga and Nakaseke. Furthermore, these rural districts have a relatively high population below the poverty line (up to 60% in some districts compared with a national average of 22%), which precipitates dependence on forest resources like trees for charcoal burning. Indeed, Kiboga and Nakaseke jointly supply about 25% of Kampala's charcoal demand (Kisakye 2004; Namirembe 2011).

Forest management is under four different institutional arrangements, but it is notable that most of the degeneration is outside protected areas (Table 15). Management of protected areas is relatively well planned by the Uganda Wildlife and National Forestry Authorities, but the areas under joint management tend to suffer, possibly due to inter-institutional conflict and unexecuted responsibilities, which commonly occur along boundaries where the interests and jurisdictions of multiple actors overlap (Mitchell 1990). Forest degeneration is much more pronounced outside protected areas mainly because of a lack of well-planned management (Nsita 2010). Management of private forests is in principle supported by the DFS that is mandated to provide advisory support to private forest owners and also manage the district forests, but many report limited capacity to do this due to both financial constraints and related low staffing levels. The low allocation of resources to the environment and natural resources sector (typically between 0.3 and 0.6% of total national budget) limits the ability of DFS to undertake its activities, including hiring of personnel. Consequently, local administrations in all the Humidtropics districts are too weak or quite disempowered to check the rampant degeneration of natural resources. For instance, as one natural resource officer in Mukono observed:

'The district has only two rangers to support forest activities in its 13 sub-counties. One of the sub-counties is an island and a ranger is stationed there, which then leaves only one ranger with responsibility for 12 sub counties ... and that is too small especially when compared with the deployment for agricultural activities.'

Table 15: Deforestation under different tenure or institutional frameworks in Uganda

| Responsible institution | Forest area 2005 (ha) | Forest area lost between 1990 and 2005 (ha) | % change |
|-------------------------------------|-----------------------|---|----------|
| Uganda Wildlife Authority | 643,149 | 36,344 | -5.3 |
| National Forestry Authority | 627,951 | 124,192 | -16.5 |
| Joint management (UWA and NFA) | 30,748 | 6,812 | -18.1 |
| District forest services | 1211 | 418 | -25.6 |
| Private owners | 2,301,117 | 1,161,876 | -33.6 |
| Total area of forest in the country | 3,604,176 | 1,329,570 | -26.9 |

Source: NFA (2009).

Re-forestation and re-forestation

The main driving force towards the establishment of forest plantations is SPGS, a government project implemented by the Ministry of Water and Environment (MWE). SPGS supports development of the forestry industry through providing subsidy grants to private tree farmers. Since 2004 SPGS has offered technical support and conditional grants for commercial-scale tree planting for timber, and poles to 389 tree farmers: 166 in central forest reserves and 223 on private land. The scheme seeks to reduce pressure on natural forests as well as to supply the country's predicted timber needs. Over 40,000 ha of mostly tropical pine timber plantations have been established countrywide. Focusing on Humidtropics' geographical scope, SPGS has supported the establishment of 11,127 ha of forest plantations (Table 16). About 80% of this has been in the previously degraded or deforested CFRs and the remaining 20% on private land. Districts with comparably larger coverage are Kiboga, Nakaseke and Luwero.

Table 16: Plantation forest establishment under SPGS in selected districts of Uganda 2005–13

| Location (District) | Area planted (ha) | | |
|---------------------|-------------------------|--------------|--------|
| | Central Forest Reserves | Private land | Total |
| Wakiso | 155.9 | 75.1 | 231.0 |
| Mukono | 205.3 | 42.1 | 247.4 |
| Kiboga | 6255.3 | 39.6 | 6294.9 |
| Nakaseke | 1536.9 | 706.9 | 2243.8 |
| Luwero | 385.4 | 966.2 | 1351.6 |
| Masaka | 150.8 | 201.4 | 352.2 |
| Rakai | 0 | 248.8 | 248.8 |
| Kyankwanzi | 157.7 | 0 | 157.7 |
| Total | 8690 | 22,80.1 | 11,127 |

Source: Sawlog Production Grants Scheme (SPGS 2013).

Among the challenges faced in reforestation efforts is that the establishment of forest plantations constitutes a change in land use on private land and also in the CFRs. Plantation establishment thus competes with crop production. Local populations have been evicted from CFRs in all Humidtropics districts in favour of plantation establishment.

It is important to note that forest plantations offer a maximum sustainable yield of 20–40 m³/ha per year as compared with 2 m³/ha per year from even the richest natural forests (Kazoora 2007). For some locations it is more feasible and cost-effective to use plantation biomass to produce electricity than depending on thermal energy (Tennigkeit 2006). Regenerative energy sources (bioenergy) have generated considerable interest in efforts to address both the oil and climate crises (McLaren 2005). Consequently SPGS is now in the early stages of implementing activities on the GCP/UGA/041 Project—'Global Climate Change Alliance' (GCCA) in Uganda. Its activities are meant to improve the resilience of the agricultural production system in the cattle corridor by promoting bio-energy plantations and improved charcoal production technologies. SPGS seeks to establish 600 ha of subsidized private-sector bio-energy plantations in the six cattle corridor districts of Nakaseke, Luwero, Nakasongola Kiboga, Mubende and Ssembabule. Three of these (Nakaseke, Luwero and Kiboga) fall within Humidtropics' area of interest. Establishment of plantations is mainly by large scale tree planters who are usually from outside the districts. Local participation is limited by access to land and financial resources. Local tree farmers are interested in carbon trade, but are limited by access to information. District forest officers are also ignorant of this.

The opportunities envisaged in reforestation are that plantation establishment reduces pressure on natural forests. Forest plantations provide firewood (e.g. from thinning and dry branches) which reduces dependence on manure and mulches for fuel. The latter two can then be used as inputs in agricultural production. Access to firewood reduces the burden on women and children who otherwise travel long distances collecting firewood. The time saved can be likewise invested in agriculture. Plantations employ local people in undertaking silvicultural operations. This way they are a source of income that the smallholders can also reinvest in agriculture.

The low forest plantation establishment in Mukono is attributable to a preference for natural forests to protect the shores of Lake Victoria and the Sezibwa river system. This presents an opportunity to support management of these natural areas and assisting natural regeneration.

There are no large fruit or cash tree crop (rubber, palm oil, coffee or tea) plantations in the Humidtropics districts. The only large-scale agricultural plantation involves sugar cane in Mukono district.

Agroforestry

Local farmers in Uganda traditionally maintain trees on their farm for increased production and environmental sustainability. In the peri-urban districts, tree crops such as ficus (*Ficus natalensis*), musambya (*Markhamia lutea*), jack fruit (*Artocarpus heterophyllus*), or pawpaw (*Carica papaya*) are frequently maintained for their other uses: raw material

to produce bark cloth and as live fence for demarcating land parcels. Ficus help improve soil properties. Jack fruit and pawpaws are a source of fruits. These trees also act as wind breakers in banana plantations and provide shade in coffee plantations. The trees also provide habitat for pollinators, which increase crop yields. Land use under trees is frequently Cocoyam, coffee (especially in Nakaseke), and banana (especially in Kiboga) cropping.

In the pastoral districts of Kyankwanzi and Nakaseke trees on farm in this zone tend to be those maintained from the naturally occurring vegetation, typically scattered tree and shrub formations. Common species are *Albizia* and *Acacia*. However, these pastoral rangelands are some of the overgrazed areas in Uganda which defoliates the trees, and destroys tree roots and seedlings. Furthermore, trampling by livestock compacts the soil and interferes with regeneration of trees (Obua et al. 2006).

Farmers are hesitant to plant trees with long gestation periods. Furthermore, some species like fruit trees and *Eucalyptus* cause disputes between neighbouring farmers when planted along farm boundaries. However, there are some existing opportunities for promotion of agroforestry practices:

- Existing efforts by farmers to maintain or retain trees on farm demonstrate willingness to practice agroforestry.
- There are existing initiatives (e.g. ICRAF) that support planting and maintenance of on-farm trees in the districts and Humidtropics can partner with these.
- High yielding varieties of fruit trees are available.
- There is a reasonable local market for fruit and other tree products that can be enhanced by value addition.

Identifying opportunities for sustainable multiple agroforestry crop production systems might help private forest owners get a more valuable return from their forested land, and thus help protect it.

Water management

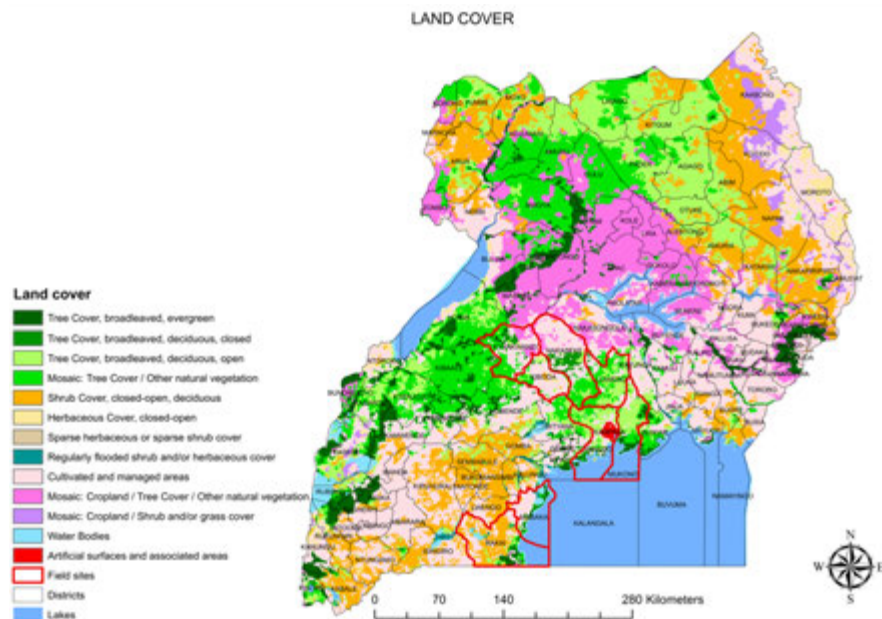
The topography of most of the Humidtropics sites in Uganda is characterized by hills and ridges that are highly dissected by streams and drainage ways (Kabanyoro et al. 2013). Lake Victoria is the main water body with extensions into Masaka, Rakai, Wakiso, and Mukono districts. Other water bodies include Lakes Nabugabo in Masaka and Kijanebarora in Rakai (Figure 11). These provide opportunities for irrigation to facilitate all year round agriculture. This is particularly beneficial to horticultural enterprises.

The water-nutrient interface is a particularly important component to consider given that these water bodies are surrounded by agricultural activities. However, temporal changes in the quality and quantity of water in these sources are not sufficiently documented and in many cases somewhat controversial. Some data is available for Lake Victoria, where rapid eutrophication is resulting from burning of biomass, sedimentation and run-off of nutrients from the catchment. Consequently, it is estimated that phosphorus levels have increased two to three times over the last 40–50 years (Hecky 1993), possibly due to increased atmospheric deposition from wind erosion and forest burning (Scheren 1995). It is estimated that 56% of the phosphorus input into the lake is due to runoff from agricultural land by the farmers living close by, 30% due to domestic waste, and 10–15% due to urban waste and atmospheric deposition (Bullock et al. 1995). However, it is important to note that these estimates are based on models and not measurements of actual nutrient inputs, which points to the need for investigations to measure these.

Besides natural water sources, the government of Uganda has provided water to the most water-stressed districts through the construction of water boreholes, wells and dams. However, many of these are drying up due to the degeneration of their catchment forests. For example, wide scale conversion of catchment forests in Kyankwanzi-Kiboga hills into croplands has resulted into the drying up of boreholes, wells and dams in Kiboga and Kyankwanzi districts.

Some individual farmers in Masaka, Rakai, Wakiso, and Mukono districts use simple technologies to harvest and store rainwater in ponds lined with polythene for irrigation use in the dry season.

Figure 11: Land cover map of Uganda with water bodies.



Data source: FAO (2003).

Demographic threats and opportunities to NRM

The increasing human demography and income levels in both rural and urban areas (see Annexes I, VI and VII) are leading to rising demands for animal products (Tatwangire 2014). The 2002 national census and the 2008 national livestock census offer the most comprehensive livestock datasets in Uganda. Overall, there was a general increase in the numbers and densities of all the livestock between 2002 and 2008. There is currently a wide variation in livestock density across the districts (See Annexes X and XI). For instance, focusing on cattle alone, the 2008 census revealed that Kiboga and Nakaseke were among the districts with the highest cattle population densities in the country with over 150 cattle per km². These districts have a 1:2 people to livestock ratio. Other cattle corridor districts recorded 50–150 cattle per km² while Wakiso, Masaka, and Mukono had less than 50 cattle per km².

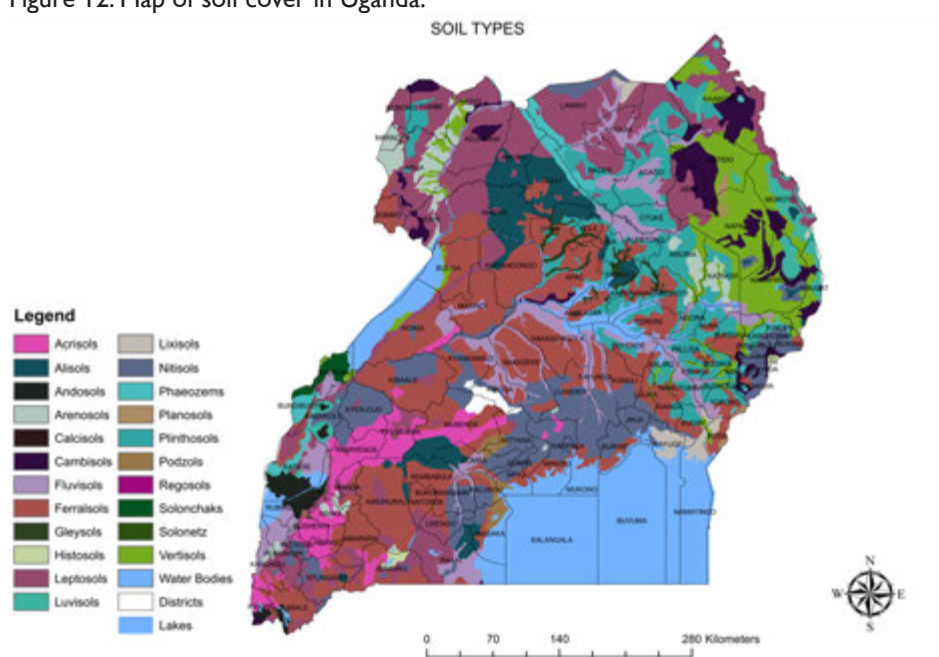
Conversion of forests to grazing land is a significant land-use change and a major driver of deforestation. This has particularly been the case in the districts of Kiboga and Nakaseke. Besides deforestation, consumption of plant cover by livestock, especially in instances of overgrazing contributes to rangeland degradation (Dregne et al. 1991). The biggest challenge to farmers in the western Savanna grasslands and pastoral rangelands is scarcity of drought reserves and watering points during the dry season. This is attributed to the 'ranch system' that hinders opportunistic grazing of livestock. High livestock densities may precipitate farmer-herder conflicts over the same finite land and water resources.

Wetlands are a key natural resource covering about 13% (or 30,000 km²) of Uganda's total area. They provide a variety of socio-economic and bio-physical goods and services. In the urban districts of Mukono and Wakiso, wetlands are the last free or cheap areas for infrastructure development (e.g. buildings and roads), but are dominated by brick baking and sand mining activities because of the proximity to urban centres with a high demand for construction material. Furthermore, they are used as reserve lands for farming of seasonal crops and vegetables that are also in high demand to feed the ever growing urban population. The main threat in the rural districts is small, but one can observe continuous nibbling of the edges of seasonal wetlands for agricultural production.

Description of NRM status by production system in Humidtropics sites

The soils in the Lake Victoria crescent are Ferralsols (FAO 2006) with a wide range in the content of K-feldspar and texture. Poorly drained areas (e.g. valley bottoms) have black and grey clays. Along the shores of Lake Victoria, soils are hydromorphic (See Figure 12). Soil quality varies across the zone but it ranges from moderate to good. There is extensive wind erosion during the dry season because soils remain exposed during prolonged dry months after the cultural practice of uncontrolled bush burning. Other factors for soil erosion include population pressure, poor methods of farming, overgrazing and vulnerable soils (NEMA 2000). In the western Savanna grasslands, soil quality ranges from moderate to good. There is extensive wind erosion during the dry season because soils remain exposed during prolonged dry months after the cultural practice of uncontrolled bush burning. In the pastoral districts, there is fair variation in the quality of the soils, but generally these range between moderate to poor.

Figure 12: Map of soil cover in Uganda.



Data source: FAO 2007.

Agricultural productivity has generally declined throughout the districts. For example, Masaka is no longer a hub for coffee and bananas, and food insecurity is prevalent. The region has some of the most severe soil nutrient depletion rates in the country (up to 80–100 kg of NPK per ha/year). Masaka and Mukono have the most depleted soils, with the lowest banana productivity in the zone. Some areas in the zone have lunnyu soils. These soils tend to support *Cymbopogon* spp., a weed that forms dense monotypic strands that out-compete native plant communities, thereby lowering local species diversity and consequently altering ecosystem properties. Caritas MADDO is already working in the area on soil and land management.

Rainfall in Humidtropics sites

Considering that agriculture in Uganda is mainly rainfed, information about rainfall is considered very important in understanding the agricultural potential of respective areas in the program sites. Rainfall determines the types of crops grown, as well as the type of livestock kept. For all the districts in the project site, bimodal rainfall is received and average annual precipitations do not differ much across Humidtropics areas in Uganda (Figure 3 in production systems section).

This implies the potential to harvest twice a year especially with annual crops. Furthermore, the amount of precipitation is meant to guide decision-makers on which crops to promote for which area. However, the occurrence of extreme meteorological events like droughts and flooding are more relevant indicators to address the vulnerabilities and risks faced by smallholder farmers.

Many organizations are already intervening on NRM

Currently, several agencies are undertaking a number of activities to conserve and attain a sustainable use of natural resources. These involve local NGOs, Ugandan national organizations and international organizations. NRM projects target forest conservation, agroforestry, sustainable land, water and other NRM activities (Annex XII). The Nakaseke Rural Youth Sustainable Livelihoods Initiative in particular aims at strengthening rural youth employment opportunities in agriculture and ICTs, improving their health standards and their livelihoods.

Opportunities, risks and constraints to attain Humidtropics IDOs

As shown in the production systems section, up to 80% of Uganda's population is engaged in agriculture as a main source of cash and subsistence income. These are predominantly extensive farmers that seek increased production by increasing acreage. This scenario means that agricultural production can be antagonistic to sustainable natural resource management and the environment.

There are a number of constraints to sustainable management of natural resource and the environment. The main one is limited financial and human capacity because of a perennially low resource envelop allocated to the NRM sector. Major risks from this are degeneration of forest cover and wetlands. Humidtropics field sites and indeed the central districts of Uganda have the highest risk of degeneration nationally because these are areas with intense economic activities including agricultural expansion, brisk charcoal and firewood trade, furniture industry, and small-scale manufacturing industries (bakeries, brick making). Nearly all the forests remaining in these districts are those in central forest reserves. The main drivers of degeneration of natural resources and the environment are the lack of clearly defined ownership, access rights (particularly for natural resources on customary land), increase in human and livestock populations, and the growth of the economy. The main threats are forest clearance for agriculture, uncontrolled charcoal and firewood production, uncontrolled timber extraction and grazing.

However, there are some opportunities for the proper management of natural resources and the environment. First, the government appreciates the key role the environment and natural resources sector play in growth, employment and prosperity for all. It has put in place policy and planning frameworks that support the sector; for example, the National Development Plan has a stated objective of harnessing natural resources and the environment for sustainable development. Second, institutions exist at national and local levels which have concern for the management of natural resources and the environment as a core mandate: NFA, FSSD, National Environmental Management Authority (NEMA), MWE at national level and DFS, NGOs, CBOs and university departments at local level.

Some of the key issues which emerge in regards to NRM and the environment in Humidtropics sites in Uganda are:

- Significant degeneration of forests and wetlands are observed mainly because of increased human and livestock populations resulting in increased demand on land resources for agriculture and industrial development. Moreover, this demand is growing while local administrations have limited financial and human capacities, and thus are relatively weak or quite disempowered to support or enforce proper management of natural resources.
- Demand for wood and wood products has been on a steady rise as manufacturing and household energy needs are growing. Current infrastructure make it difficult for businesses and households to afford hydro-electricity power or other energy alternatives like solar power.

-
- Though reforestation has been championed by SPGS, plantation forests tend to compete for land suitable for crop production; this is exacerbated by the misperceptions about trees in relation to soil water and fertility.
 - There are several agencies funding or working on different aspects of NRM. These complement local practices and, as such, provide opportunities for better management of the natural resources. However there is hardly any coordination between the activities of these would-be partners. For example, NGOs and CBOs do not currently cooperate with the local governments. The latter are hardly aware of what the former two are doing in the districts, yet they are in a better position to know the needs of their localities and can monitor projects and programs intervening locally.
 - Amongst the local practices, particularly important is the traditional maintenance of trees on farm, which provides multiple opportunities including soil and water conservation, enhancing the sustainability of production systems, diversification of farm produce and some agro-processing possibilities.
 - The issue of declining soil fertility is still a challenge that needs to be addressed, probably through better raising the awareness of farmers on the various ways of replenishing soil fertility through innovations in sustainable intensification of production systems.
 - Water harvesting, storage and utilization are also key issues, which still require some attention.

Conclusions

The primary and secondary data collected and analysed for the Humidtropics situational analysis in Uganda reveal that farmers within the complex production, marketing and NRM multi-stakeholder systems are especially vulnerable to various risks (under-aged motherhood, land degradation and encroachment, low market prices in glut periods, deforestation, etc.). Humidtropics R4D activities should thus address the risks faced by farmers in the field sites. Given the expertise and experience gathered within the Ugandan R4D platform to address the issues identified in the situational analysis, Humidtropics activities can be organized along five major themes.

Innovations for sustainable systems intensification

Humidtropics can undertake participatory research on crop-livestock integration and agro-forestry mixed production systems to tap into local knowledge and the expertise of national and international researchers. This is likely to lead to identifying the best options available for sustainable intensification of agricultural production systems for Ugandan Humidtropics field sites.

The R4D platforms could undertake some of the following field activities on sustainable intensification of mixed production systems:

- Developing integrated soil fertility management packages and options for vegetables
- Developing integrated pest management packages and options for the vegetables and soybean-maize mixed cropping system
- Modelling sustainable intensification pathways for crop-livestock-tree subsystems into 'safe operating spaces'
- Undertaking participatory assessments of production systems combinations (e.g. vegetables + small livestock species, aquaponics + crops, forages + livestock)
- Developing indicators of sustainable intensification
- Carrying out periodic surveys on productivity and profitability gaps
- Conducting system function analysis, social network analysis and risk analysis of technology impacts on local innovation platforms in a 'safe operating space' for sustainable intensification
- Enhancing enterprise and product diversification
- Optimizing the crop-livestock-agroforestry-energy nexus.

Foster equitable market participation by all value chain stakeholders

While smallholder farmers are vulnerable to low market prices when their crop is ready for market, this risk can be easily mitigated by improving storage and post-harvest activities that will enable farmers to store their crops until market prices are more favourable, or to add value to their produce so as to tap into a different market segment. The situational analysis has identified many opportunities that can lead to market development and that can be equitable for all actors involved in the value chains. In particular, by encouraging farmers, traders and processors to improve the quality of their products, Humidtropics is likely to contribute to improving their market access.

As a result, the Uganda R4D platform plans to undertake the following activities on markets and institutions:

- Understanding major socio-economic and institutional factors constraining young people and women in attaining improved livelihoods
- Value chain assessments for participatory mapping of the value chains
- Linking farmers to markets through the promotion of contractual arrangements, memoranda of understandings and institutional innovations.

Encourage agri-food enterprise development for greater nutrition, diet-diversity and youth employment

Given the local knowledge of using various types of agricultural products into a diversified diet, Humidtropics can identify the opportunities for local communities to undertake mixed crop-livestock and agroforestry enterprises as well as small-and-medium agro-processing businesses. The creation of small agribusinesses is likely to foster a more diverse diet and improve the nutritional status of populations in both peri-urban and rural districts. New agro-processing ventures in particular, will contribute to creating employment for youth, especially in peri-urban districts, and will help pull agricultural production by creating a market for raw produce.

Accordingly, the Uganda R4D platform has planned the following concrete activities on mixed farm enterprise or agro-processing development:

- Identifying utilization options for linking vegetables and livestock
- Identifying utilization options for linking soybean, maize and livestock
- Developing promising socio-economic and technological packages for improved livelihoods
- Making feeds from and fostering post-harvest handling of vegetables and soybean-maize
- Waste reutilization for generating energy and feeding soil and livestock
- Training farmers on human nutrition and making feeds for livestock.

Institutional strengthening and coordination

Although the situational analysis has identified that there were many R4D partners already active in providing support to improving the sustainability of integrated production systems in Uganda, their activities are rarely coordinated. By creating information sharing mechanisms across R4D partners, Humidtropics will strengthen the institutional network supporting agri-food systems development. The R4D platform is by definition a space for greater information sharing and coordination of activities among R4D partners.

The R4D platform has planned the following coordination of partner activities:

- Identifying existing groups of women and youths and training them in integrated agricultural research for development
- Fostering organizational development and strengthening linkages with other stakeholders within an innovation platform
- Conducting training in selected areas (e.g. organizational capacity development, self-help groups for credit, access to improved planting materials, addition technologies).

Develop approaches for inclusive policy formulation and implementation

Finally, all the recommendations above cannot lead to a sustainable outcome without the participation of the public sector to help steer the agri-food industry through inclusive policies that are effectively implemented. The R4D platform is again the ideal space for policymakers to become aware of the issues faced by the actors of the agri-food production, marketing and NRM systems. The platform can also foster a multi-stakeholder discussion to identify the most relevant options for inclusive policy formulation and sustainable implementation.

Accordingly, the Ugandan R4D platform has elaborated plans to work on coordination of policy decision-making:

- Identification of enabling policies and institutional arrangements
- Harmonization with existing policies
- Sensitization of stakeholders on the new byelaws and institutional arrangement.

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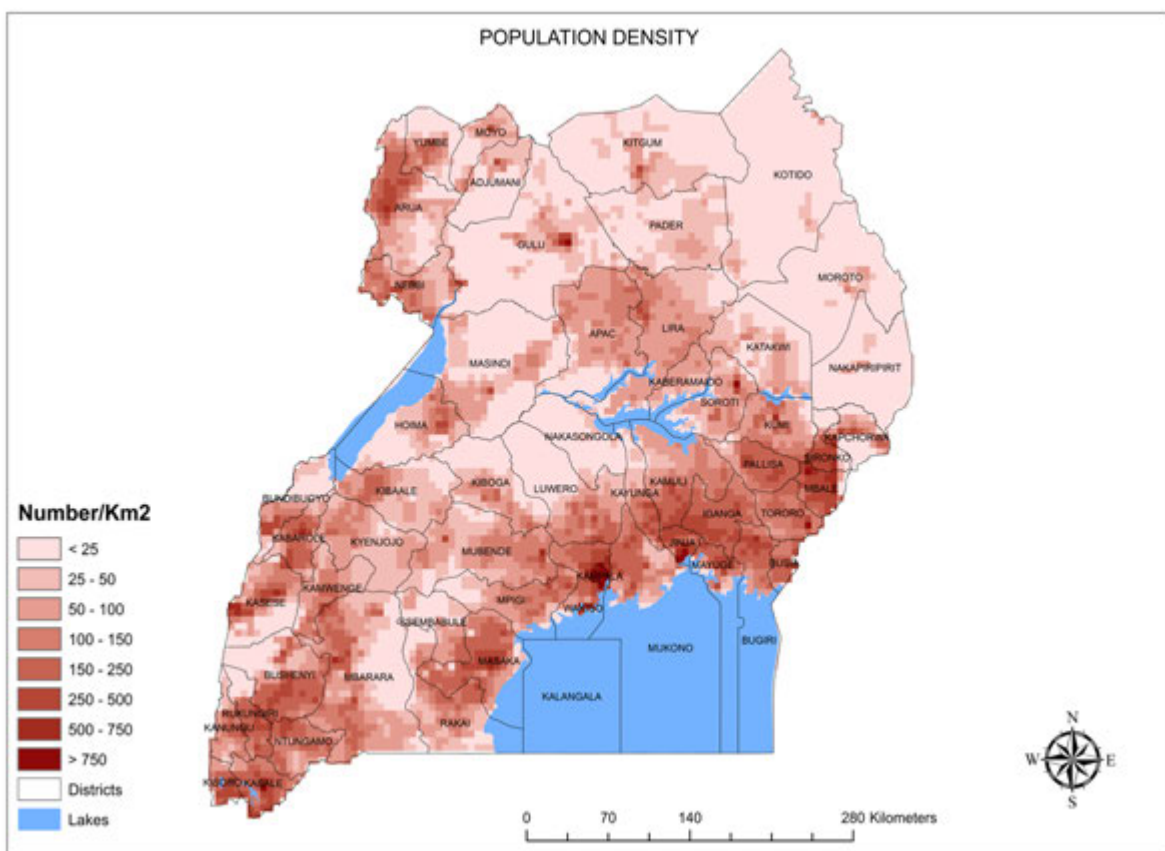
Annexes

Annex I: Population size by gender, household size and population density in Humidtropics sites

| District | Total population (persons) | Men (persons) | Women (persons) | Area (in km ² excluding open water, permanent seasonal wetlands) | Urban population (%) | Population density (persons/ km ²) |
|------------|----------------------------|---------------|-----------------|---|----------------------|--|
| Wakiso | 2,007,700 | 952,781 | 1,054,919 | 1665 | 32% | 1206 |
| Mukono | 599,817 | 291,890 | 307,927 | 3110 | 27% | 192 |
| Luwero | 458,158 | 225,728 | 232,430 | 2854 | 21% | 161 |
| Nakaseke | 197,703 | 104,096 | 93,607 | 2588 | 20% | 76 |
| Kiboga | 148,606 | 75,339 | 73,267 | 1664 | 22% | 89 |
| Kyankwanzi | 214,057 | 110,580 | 103,477 | 2239 | 11% | 96 |
| Rakai | 518,008 | 253,054 | 264,954 | 3928 | 7% | 132 |
| Masaka | 296,649 | 144,231 | 152,418 | 3149 | 35% | 94 |
| National | 34,856,813 | 16,935,456 | 17,921,357 | 197,328 | 19% | 177 |

Source: UBOS 2014.

Annex II: Population density



Annex III: Population employed in agriculture in Humidtropics sites

| District | % population employed in Agriculture |
|------------|--------------------------------------|
| Wakiso | 27%* |
| Mukono | 59%* |
| Luwero | 75.7% |
| Nakaseke | 88% |
| Kiboga | 85% |
| Kyankwanzi | 88% |
| Rakai | 85% |
| Masaka | 72.8% |
| National | 66%# |

Note: * Figure obtained from 2002 census; # Figure obtained from (UBOS 2012a); For Rakai, data was obtained from (Kyazze, F.B. and Kristjanson P. 2011); For Masaka, information shown was obtained from (MasakaDDP 2011); Employment in agriculture figures for Luwero obtained from (Luwero-HLGSA 2009).

Annex IV: Education access and quality for period 2009–10

| District | Primary education | | | | Secondary education | | | |
|------------|--------------------------|-----------------------------|----------------------------|------------------------------|--------------------------|-----------------------------|-----------------------------|-------------------------------|
| | Net intake rate for 2010 | Net enrolment rate for 2010 | Pupil : Teacher Ratio 2010 | Pupil : Classroom Ratio 2010 | Net intake rate for 2010 | Net enrolment rate for 2010 | Student: Teacher Ratio 2010 | Student: Classroom Ratio 2010 |
| Wakiso | 40 | 73 | 28 | 35 | 17 | 41 | 17 | 30 |
| Mukono | 74 | 98 | 39 | 47 | 20 | 49 | 18 | 44 |
| Luwero | 108 | 120 | 44 | 52 | 18 | 48 | 18 | 39 |
| Nakaseke | 99 | 109 | 47 | 50 | 11 | 29 | 15 | 36 |
| Kiboga | 47 | 72 | 37 | 44 | 7 | 23 | 18 | 41 |
| Kyankwanzi | 63 | 85 | 47 | 49 | 2 | 11 | 15 | 37 |
| Rakai | 86 | 104 | 42 | 56 | 9 | 23 | 19 | 46 |
| Masaka | 83 | 99 | 36 | 45 | 18 | 43 | 19 | 44 |
| National | | | 49 | 58 | 7 | 25 | 19 | 45 |

Source: UBOS 2013.

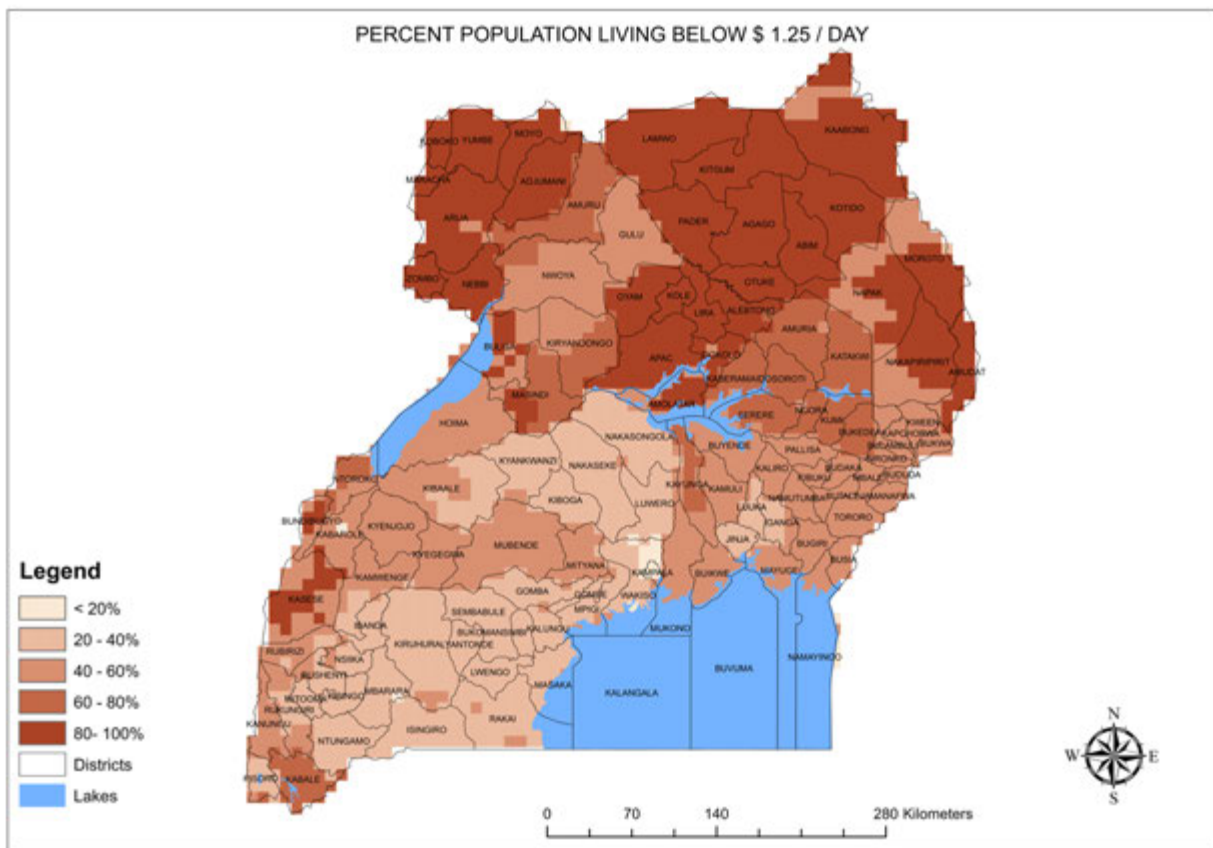
Note: Net enrolment rate = The ratio of pupils in primary school aged 6–12 to the country total population aged 6–12 years. Net intake = The ratio of the pupils aged six in primary one to the country total population aged 6 years.

Annex V: Primary and secondary school enrolment for period 2008–09

| Year | Primary school enrolment | | | | | |
|----------|----------------------------|-----------|-----------|-----------|-----------|-----------|
| | 2008 | | 2009 | | 2010 | |
| | Male | Female | Male | Female | Male | Female |
| P1 | 951,501 | 945,613 | 976,078 | 970,240 | 974,209 | 969,343 |
| P2 | 660,991 | 657,247 | 675,731 | 673,625 | 668,145 | 667,451 |
| P3 | 644,365 | 635,535 | 686,897 | 680,462 | 666,162 | 663,527 |
| P4 | 580,015 | 584,625 | 604,523 | 607,659 | 646,705 | 656,279 |
| P5 | 491,947 | 501,390 | 515,663 | 526,838 | 526,687 | 539,245 |
| P6 | 394,135 | 400,886 | 413,376 | 420,183 | 420,405 | 431,959 |
| P7 | 264,206 | 251,523 | 277,769 | 268,736 | 276,935 | 267,596 |
| National | 3,987,160 | 3,976,819 | 4,150,037 | 4,147,743 | 4,179,248 | 4,195,400 |
| | Secondary school enrolment | | | | | |
| S1 | 154,923 | 136,874 | 155,822 | 140,578 | 167,882 | 156,605 |
| S2 | 146,477 | 125,339 | 149,681 | 130,345 | 145,640 | 131,705 |
| S3 | 104,910 | 93,887 | 140,143 | 117,987 | 136,763 | 119,622 |
| S4 | 96,228 | 80,608 | 103,983 | 89,175 | 119,501 | 100,840 |
| S5 | 44,842 | 32,904 | 51,172 | 35,842 | 44,722 | 33,966 |
| S6 | 41,978 | 29,774 | 47,213 | 32,513 | 40,463 | 27,983 |
| National | 589,358 | 499,386 | 648,014 | 546,440 | 654,971 | 570,721 |

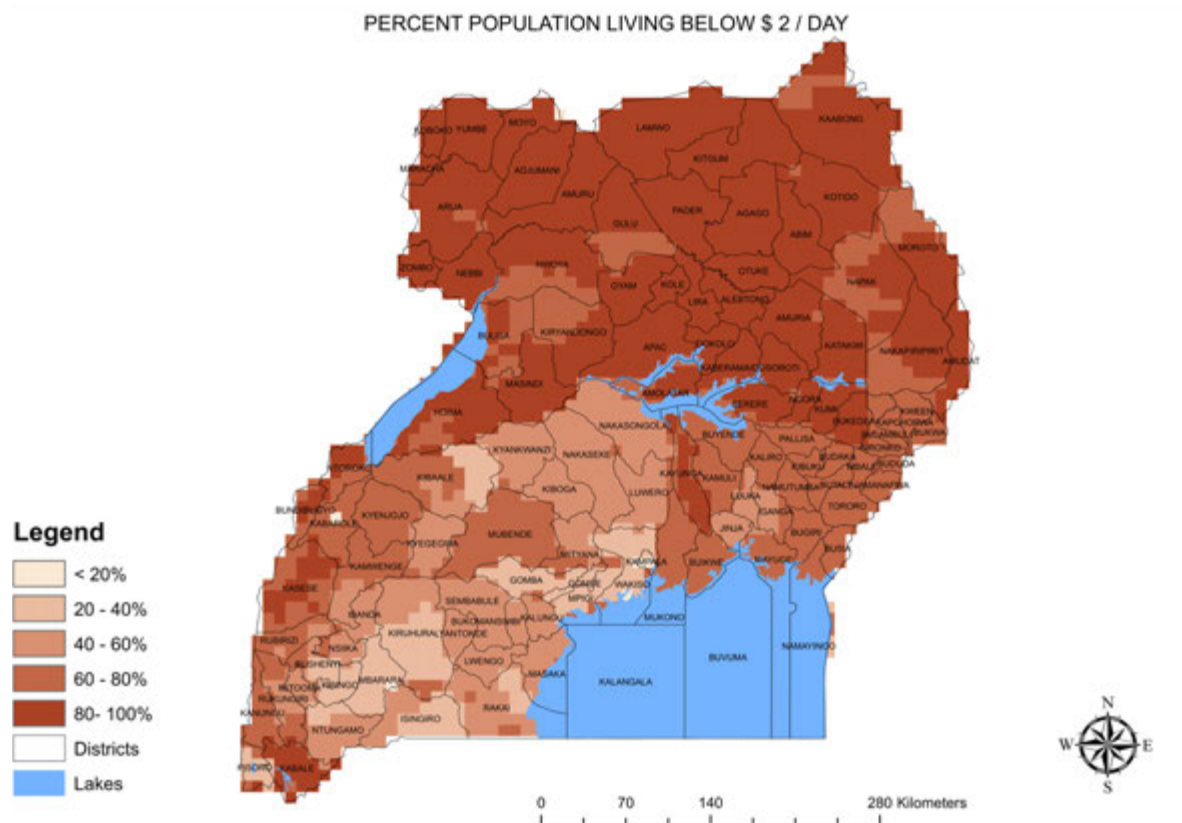
Source: (UBOS 2012a).

Annex VI. Population living below USD 1.25/day



Data source: Azzarri et al. (2012).

Annex VII. Population living below USD 2/day



Data source: Azzarri et al. (2012).

Annex VIII: Access to electricity and water in Humidtropics sites

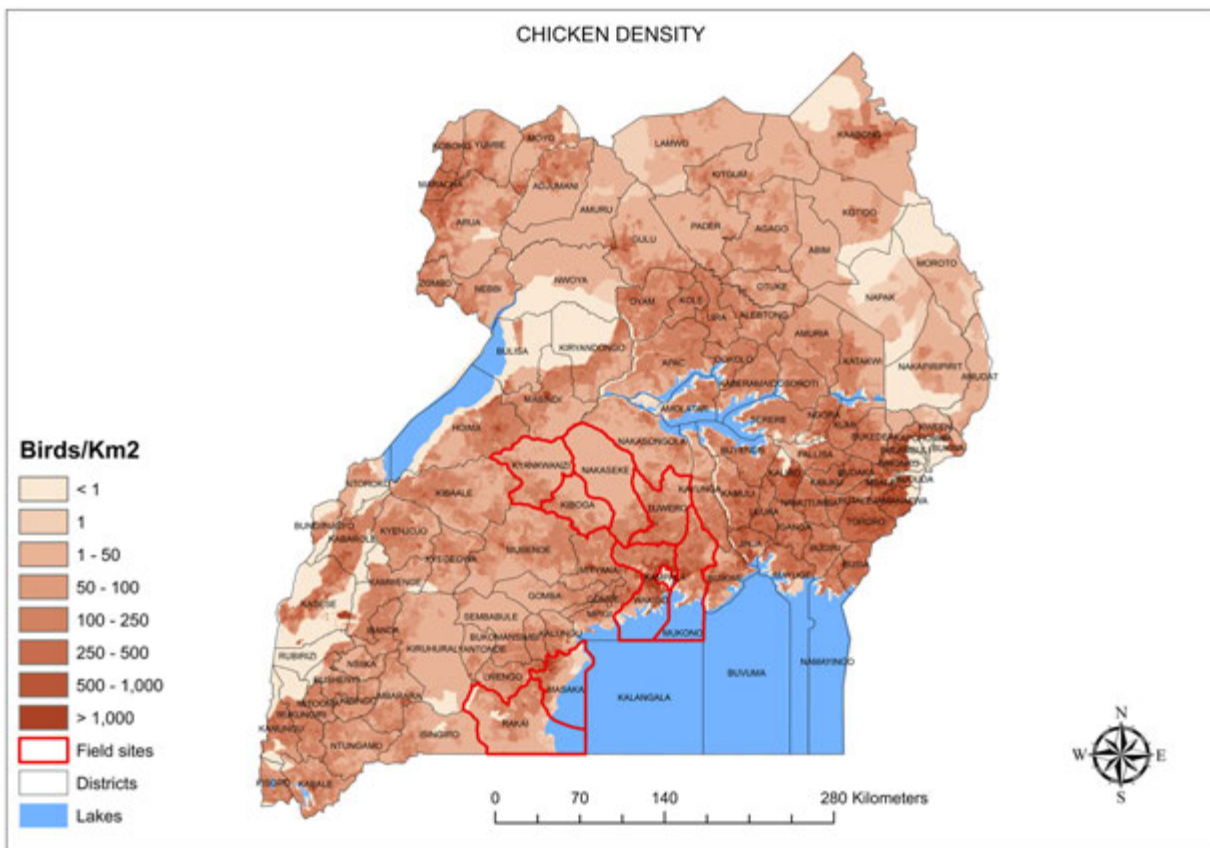
| District | % of households with access to national electricity grid | % of households with access to piped water | % of households with access to borehole water | % of households with access to safe water | Water supply to by NWSC and MWE 2011/2012 (m ³) |
|------------|--|--|---|---|---|
| Wakiso | | 30% | 17% | 47% | 4,043,707 |
| Mukono | | | | | 22,512,330+ |
| Luwero | 9%* | | | 57% | 74,120 |
| Nakaseke | | | | | |
| Kiboga | | 13% | 45.5% | 58.5% | 21,492 |
| Kyankwanzi | | | | | |
| Rakai | 3.2% | 3% | 34.1% | 37.1% | 21,787 |
| Masaka | 5.7% | | | 44%* | 1,535,220 |
| National | 6% | | | | 81,616,265 |

Note: * Figure obtained from 2002 census; National electricity data is obtained from (EPU 2014); For Rakai, information on safe water is obtained from (UCSD 2013); Safe water coverage for Luwero is obtained from (Luwero-HLGSA 2009); For Wakiso, safe water access is obtained from (Wakiso-HLGSA 2009); For Kiboga, water source information is obtained from (Kiboga-DDP 2011) and (DWD-MWE 2010b); For Masaka, information is obtained from (MasakaDDP 2011); +Includes some parts of Kampala.

Annex IX: Definition of land systems in Uganda

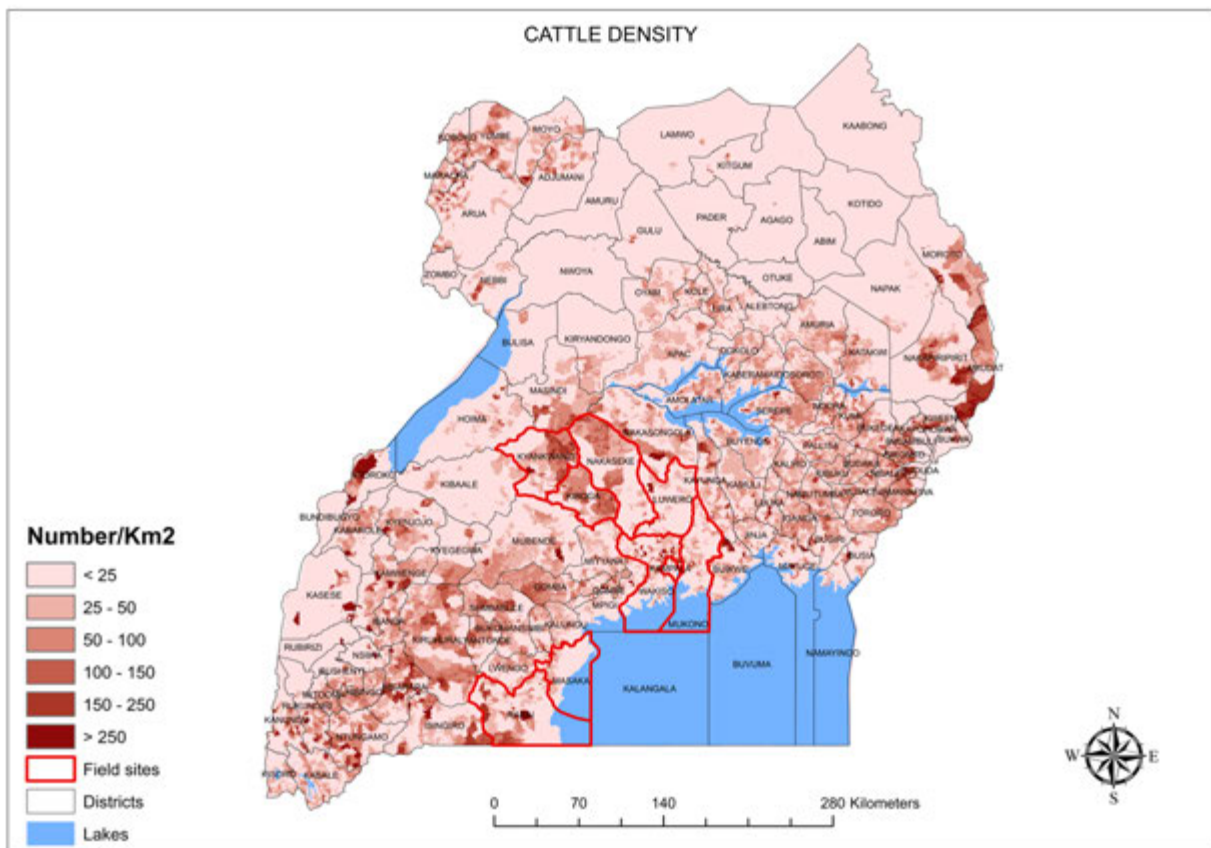
- a. **Mailo tenure:** This is a quasi-freehold tenure system established in 1900 by the British colonial government to reward colonial agents who advanced British interests in many regions of Uganda. It remains a relatively secure and well-defined system of tenure, particularly in the central region. Besides these owners having titles which are transferrable, an important feature of mailo systems is that much of the land is used by tenants (Bibanja holders) who are restricted in their security of tenure on the land they farm.
- b. **Customary tenure:** This is the most common tenure system in Uganda whereby access to land is 'governed by the customs, rules, and regulations of the community'. Holders of land under the customary system do not have a formal title to the land they use, but generally have secure tenure.
- c. **Freehold tenure:** This is a system whereby owners of the land have a title to their land, which allows them to hold the registered land indefinitely. The landowner is given complete rights to use, sell, lease, transfer, subdivide, mortgage and bequeath the land as they see fit, so long as it is done in a manner consistent with the laws of Uganda.
- d. **Leasehold tenure:** This is a system where the owner of the land grants the tenant exclusive use of the land, usually for a specific period of time. Land may also be leased from the state to individuals for typical lease periods of 5, 45, or 99 years. In return, the tenant usually pays an annual rent or service under specified terms and conditions. Leaseholders may or may not hold formal contracts with the owner.
- e. **Kabaka's land:** The Kabaka of Buganda and his Kingdom also owns huge chunks of land both privately and also on behalf of the Kingdom. Tenants are granted ownership or user rights by the Buganda Land Board for both specified and indefinite time periods.

Annex X: Map of chicken density



Data source: Robinson et al. (2014).

Annex XI: Map of cattle density



Data source: Robinson et al. (2014).

Annex XII: Organizations intervening on natural resources management in Uganda

| Agency, organization or program | Intervention |
|-------------------------------------|--|
| (i) SPGS | Working in almost all the Humidtropics sites |
| (ii) FIEFOC | <p>The Farm Income Enhancement and Forest Conservation (FIEFOC) project was designed to support the government of Uganda Plan for the Modernization of Agriculture whose aim is increasing incomes and improving the quality of life of poor subsistence farmers and their household through market-oriented agricultural production. The purpose of the project is to improve rural livelihoods, food security and incomes through sustainable NRM and agricultural enterprise development.</p> <p>Key stakeholders: The project design was hinged on community-based participation and the key players were the districts and sub-counties as focus of implementation, and the private sector as main technical service providers.</p> |
| (iii) REDD-plus | A REDD+ secretariat was established under the auspice of FSSD and Uganda's Readiness preparedness proposal (RPP) was accepted by the World Bank. There are some pilot projects implemented by NGOs. |
| (iv) National tree planting days | In an effort to address deforestation and restore the country's receding forest cover, the government of Uganda has gazetted four national tree-planting days: World Forestry Day (March 21), International Women's Day (March 8), Labour Day (May 1), and World Youth Day (August 12). Target planting sites under this initiative include CFRs, public parks, schools, places of worship, barracks and communities.. |
| (v) Projects implemented by the NFA | <p>One particularly relevant project implemented by the NFA is Collaborative Forest Management (CFM) with an express intention of involving communities in tree-planting.</p> <p>Under CFM, communities living adjacent a forest reserve form groups and enter into agreements with NFA under which they receive incentives for non-consumptive forestry projects such as boundary tree-planting, bee-keeping, woodlot establishment, eco-tourism services, contracts to maintain forest boundaries and, in some instances, support for agro-forestry.</p> <p>NFA has signed numerous MoUs with companies to plant trees under the corporate social responsibility in degraded reserves. Partners: The partners here are the NFA, local communities, and corporate bodies.</p> |
| (vi) SCC-VI Agroforestry Program | <p>The Swedish Cooperative Centre (SCC) has collaborated with Vi Agroforestry Program (ViAFP) since 2005.</p> <p>SCC-VI operates in both Masaka and Rakai.</p> <p>ViAFP aims to give people access to fuel wood, timber, fruit, fodder and other non-timber forest products while halting and reversing the trend of the forest loss and related environmental degradation.</p> <p>A merger of the two efforts offered target farmers a shot at profitable farm practices, establishment of farmer groups and access to credit (savings and loans facilities).</p> <p>The collaboration seeks to enhance the living conditions for subsistence farmer households in the area of operation.</p> |
| vii) VEDCO | <p>Within Humidtropics sites, VEDCO operates in the districts of Luwero, Mukono, Wakiso and Nakaseke. They are involved in agroforestry, crop and livestock production.</p> <p>www.vedcouganda.org</p> |

| Agency, organization or program | Intervention |
|---|---|
| (viii) LVEMP | <p>The Lake Victoria Environmental Management Project (LVEMP) operates in the Lake Victoria Basin (LVB), seeking to: (i) improve collaborative management of the transboundary natural resources of LVB; and (ii) reduce environmental stress in targeted pollution hotspots and selected degraded sub-catchments to improve the livelihoods of communities, who depend on the natural resources of LVB. Among Humidtropics districts, LVEMP operates in Mukono, Masaka, Rakai and Wakiso. The project has a watershed management component that seeks to implement sustainable soil and water management practices to reduce environmental stresses from the LVB and livelihoods improvement interventions, using community-driven development approaches, to improve water use efficiency in the LVB and generate positive externalities.</p> |
| (ix) CARP | <p>The Conservation Agriculture Regional Program (CARP) is funded by the Ministry of Foreign Affairs of the Royal Norwegian Ministry of Foreign Affairs. It works with Rural Enterprise Development Services (REDs) to promote conservation agriculture and is operational in Nakaseke.</p> |
| (x) SCI-SLM | <p>The Stimulating Community Initiatives for Sustainable Land Management (SCI-SLM) project operates in Nakaseke district. It is funded by GEF and seeks to demonstrate integration of SLM-innovative technologies in NRM using the Innovative Systems Approach (ISA).</p> |
| (xi) Caritas MADO | <p>Caritas MADDO (Masaka Diocesan Development Organization) is a faith-based organization that offers social services and development work in Masaka Diocese, but also extends into Rakai. Partners are Masaka Diocese and farmer groups.</p> <p>One of its strategic objectives is 'to promote food security and increased income through sustainable agribusiness'.</p> <p>Caritas MADDO promotes a sustainable intensification of smallholder farm production by, among others, providing improved inputs (for example pest- and drought-resistant, or fast-maturing crop varieties; improved animal breeds) to farmer groups.</p> <p>A main lesson reported as learned by Caritas MADDO over the years is the need for value addition for most of the products that farmers produce.</p> |
| (xii) Nakaseke Rural Youth Sustainable Livelihoods Initiative | <p>Aims at strengthening rural youth employment opportunities in agriculture and ICTs, improving their health standards and their livelihoods.</p> <p>https://www.facebook.com/nakasekeruralyouth</p> |
| (xiii) Private tree planting | <p>A number of private tree growers are undertaking afforestation and reforestation programs: Global woods, New Forest Co.</p> <p>Others are rehabilitating degraded rangelands: Centural Group, Heifer International.</p> |
| UGADEN | <p>Uganda Agroforestry Development Network is a voluntary NGO that brings together institutions and individuals engaged in agroforestry research, training, education and development activities in Uganda.</p> <p>www.ugaden.kabissa.org</p> |

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