

Annex

Sustainability Hot Spot Analysis 2.0

A participatory approach to assess the Nile perch & Irish potato value chains in Uganda

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Table of Annex

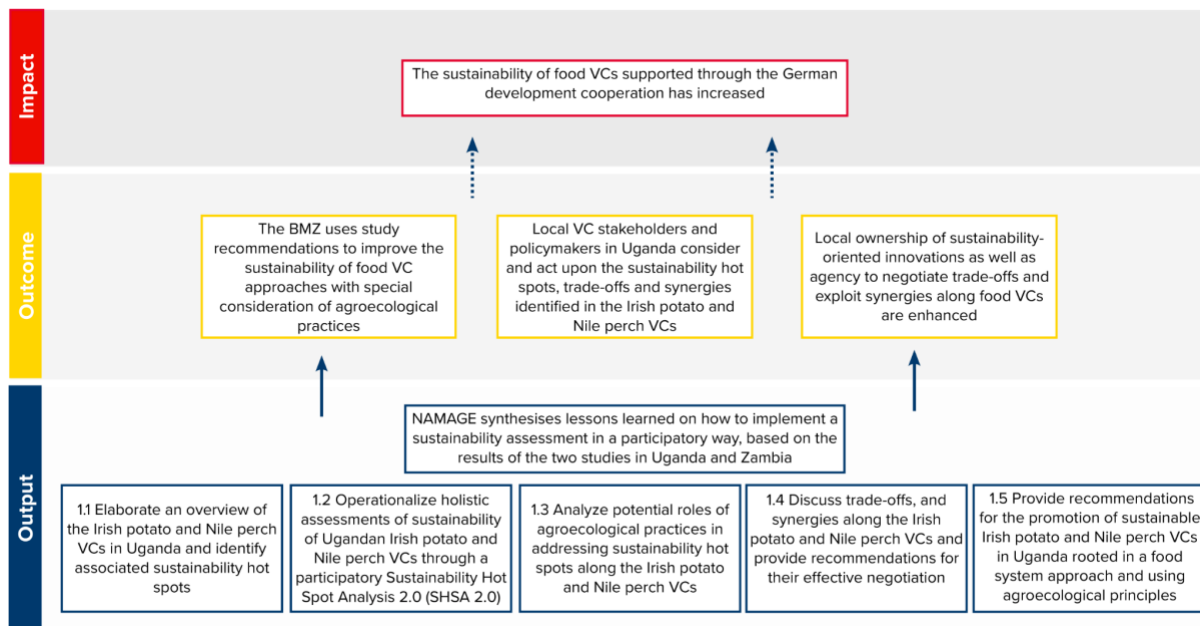
Annex 1: Study team (Name, Role and Professional Background)	1
Annex 2: Logframe of Impact, Outcomes, and Outputs of the study (Source: Own illustration)	3
Annex 3: Lists of categories presented at Irish potato and Nile perch workshops	4
Annex 4: Full list of indicators and categories in the potato value chain (bold = selected) ..	13
Annex 5: Full list of indicators and categories in the Nile Perch value chain (crossed out = deleted from initial list, italic = added suggestions from to workshop participants)	25
Annex 6: Unpublished IFDC data (key variables).....	31
Annex 7: Village lists for sampling of potato farmers	33
Annex 8: Participants in the fish stakeholder workshops	35
Annex 9: List of questions used in focus group discussions in the preliminary phase (Irish potato VC).....	38
Annex 10: List of interviews for the Irish potato value chain	40
Annex 11: List of semi-structured interviews, PhotoVoice interviews, and focus group discussions for the fish VC	43
Annex 12: List of questions for focus group discussions in the preliminary phase (fishers) ..	46
Annex 13: Photovoice results Nile perch.....	47
Annex 14: Potato Farmer Survey	49
Annex 15: Fisherfolk Survey	50
Annex 16: Recommendations received from value chain actors, extension staff, EREPP members, and representatives of the International Potato Centre and GIZ during the validation workshop (Irish potato)	51
Annex 17: List of recommendations (and discussion points) from validation workshop for the Nile perch value chain	57
Annex 18: Policy recommendations, PEST analysis (Irish potato and Nile perch)	62
Annex 19: Consent forms	68
Annex 20: Irish potato evidence-based indicator assessment for non-hot spots	79
Annex 21: Nile perch-evidence based indicator assessment for non-hotspots – Environmental Dimension.....	100
Annex 22: Checklist landing sites and results	103

Annex 1: Study team (Name, Role and Professional Background)

Name	Professional Background	Function
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Simon Mutambo	B. Sc. Agriculture	Mirror team member

Annex 2: Logframe of Impact, Outcomes, and Outputs of the study (Source: Own illustration)



Annex 3: Lists of categories presented at Irish potato and Nile perch workshops

3a: Irish Potato

Environmental dimension	Explanation	Guiding questions
<p>1.1 Biodiversity</p> <p>Maintain and enhance diversity of species and genetic resources in time and space</p>	<p>Maintain and enhance diversity of species, functional diversity, and genetic resources and thereby maintain overall agroecosystem biodiversity in time and space at field, farm, and landscape scales</p>	<p>Is the diversity (including genetic variety) of plants, animals, and microorganisms in a given area endangered (now and in future)?</p>
<p>1.2 Soil health</p> <p>Maintain and enhance soil health and functioning for improved plant growth</p>	<p>Secure and enhance soil health and functioning for improved plant growth, particularly by managing organic matter and enhancing soil biological activity</p>	<p>Is soil health (organic matter content, biological activity, topsoil) reduced?</p>
<p>1.3 Synergy</p> <p>Enhance positive ecological interaction of plants, animals, water, trees, soil</p>	<p>Enhance positive ecological interaction, synergy, integration, and complementarity among the elements of agroecosystems (animals, crops, trees, soil, and water)</p>	<p>In how far is food production detached from a wider ecosystem (landscape, territorial) management approach?</p>
<p>1.4 Input reduction</p> <p>Reduce or eliminate dependency on purchased inputs and increase self-sufficiency</p>	<p>Reduce or eliminate dependency on purchased inputs and increase self-sufficiency, benefiting the environment</p>	<p>In how far are external inputs (fertilizers, pesticides, seeds etc.) used?</p>

<p>1.5 Reduce CO₂ emission</p>	<p>Reduce CO₂ emissions associated with production, transport, and processing</p>	<p>In how far do critical GHG emissions result from the production of inputs, the production itself, transport, waste?</p>
<p>1.6 Reduce water consumption and pollution</p>	<p>Reduce water consumption and pollution associated with production and processing</p>	<p>How large is the (blue, green, grey) water footprint (amount of water used, water quality deterioration)?</p>
<p>1.7 Recycling</p> <p>Use local renewable resources and close cycles of nutrients and biomass</p>	<p>Preferentially use local renewable resources and close (insofar as possible) nutrient and biomass resource cycles</p>	<p>In how far are local resources unused, non-renewable resources used?</p>
<p>1.8 Food loss and food waste</p> <p>Reduce food losses and food waste</p>	<p>Food losses occur during production and the post-harvest stage; food waste occur during processing</p>	<p>How much produced food is lost and/ or wasted along the VC stages?</p>
<p>Social dimension</p>		
<p>2.1 Inclusion</p> <p>Ensure equitable distribution of economic value added in the value chain among vulnerable and marginalised groups</p>	<p>Ensure equity in the distribution of the economic value added in the VC for vulnerable and marginalized groups (including women), addressing their needs</p>	<p>In how far do vulnerable groups (defined in national context) suffer from VC promotion or are their needs ignored / not supported?</p>
<p>2.2 Access and use of resources</p>	<p>Secure equal access to and use of resources</p>	<p>In how far are social groups (including women) prevented from use of and access to</p>

Ensure equal access to and use of resources		resources (such as land, water, air quality)?
<p>2.3 Social values and diets</p> <p>Food systems are based on identity, social and gender equity as well as healthy, diversified, and seasonally and culturally appropriate diets of local communities and livelihoods.</p>	Build food systems that provide healthy, diversified, and seasonally and culturally appropriate diets	Does the VC oppose dietary-related social needs or decrease dietary diversity and nutrition?
<p>2.4 Fairness</p> <p>Support a dignified way of life for all actors in the value chain</p>	Support dignified and robust livelihoods for all actors engaged in food systems, especially small-scale food producers, based on fair trade, fair employment, and fair treatment of intellectual property rights	How unfair (as perceived by VC actors and according to available standards) are trade and employment within the value chain?
<p>2.5 Co-creation of knowledge</p> <p>Enhance co-creation and knowledge sharing</p>	Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange	In how far is knowledge (incl. traditional / indigenous) ignored and not shared among VC actors, esp. between farmers?
<p>2.6 Empowerment/ Agency</p>	Promote empowerment of stakeholders along the food value chain	In how far are stakeholders along the VC constrained in their agency (due to debts, power concentration /

		dominance of one actor, etc.)?
2.7 Participation Encourage social organization and greater participation in decision making by food producers and consumers	Encourage social organization and greater participation in decision making by food producers and consumers to support decentralized governance and local adaptive management of agricultural and food systems	In how far are producers and consumers not involved in food-related decisions?
2.8 Legal framework and institutional support		
Economic Dimension		
3.1 Economic diversification Diversify incomes	Diversify incomes by ensuring that actors along the value chains have greater financial independence and value addition opportunities while enabling them to respond to demand from consumers	In how far does VC promotion prevent greater diversification income?
3.2 Economic resilience	Build the capacity to either withstand, recover quickly, or avoid economic shocks	In how far are VC actors able to cope with economic shocks?

3.3 Connectivity Ensure proximity and trust between producers and consumers	Ensure proximity and confidence between producers and consumers through promotion of fair and short distribution networks and by re-embedding food systems into local economies	In how far is the VC dislodged from the local economy? How long is the VC (geographically and physically)?
3.4 Commercial viability	Ensure the ability to compete and make profit	Are the value chain actors able to make profit? Are they able to compete sustainably?
3.5 Economic benefits for all stakeholders	Ensure fair (not necessarily equal) distribution of profits for all actors along the value chain.	In how far are VC actors able to earn and sustain a livelihood from their involvement in the VC?
Source: NAMAGE (adapted and complemented by the research team)		

3b Nile perch

Environmental dimension	Explanation	Guiding questions
1.1 Biodiversity Maintain and enhance diversity of species and genetic resources in time and space	Maintain and enhance diversity of species, functional diversity, and genetic resources and thereby maintain overall agroecosystem biodiversity in	Is the diversity (including genetic variety) of plants, animals, and microorganisms in a given area endangered (now and in future)?

	time and space at field, farm, and landscape scales	
1.2 Water quality Maintain and enhance the water quality and functioning for improved plant growth	Secure and enhance water quality and functioning for improved plant growth, particularly by reducing dangerous inflows	Is there an issue of microplastic pollution, heavy metals or eutrophication at the lake?
1.3 Synergy Enhance positive ecological interaction of plants, animals, water, trees, soil	Enhance positive ecological interaction, synergy, integration, and complementarity among the elements of agroecosystems (animals, crops, trees, soil, and water)	Is food production detached from a wider ecosystem management approach?
1.4 Equipment Reduce the use of harmful fishing equipment	Reduce or eliminate the use of small-meshed fishing gear? Use of boats with outboard engines/ legally sized boats	Which type of nets are used? Which boat size is used? Does the boat have an engine?
1.5 Carbon footprint Reduce carbon dioxide emissions	Reduce CO ₂ emissions associated with production, transport, and processing	To what extent do critical GHG emissions result from the production of inputs, the production itself, transport, waste?
1.6 Water footprint Reduce water consumption	Reduce water consumption and pollution associated with production and processing	How large is the (blue, green, grey) water footprint (amount of water used, water quality deterioration)?

<p>1.7 Recycling & Food loss</p> <p>Use local renewable resources and reduce food losses and food waste</p>	<p>Use of local renewable resources and degree of food losses (during production and the post-harvest stage) and food waste (during processing)</p>	<p>In how far are local resources unused, non-renewable resources used? How much produced food is lost and/ or wasted along the VC stages?</p>
<p>1.8 Animal welfare</p> <p>Ensure a harmless treatment of animals</p>	<p>Ensure that animal handling does not do harm to the animal for livestock keeping, catching and slaughtering</p>	<p>Which catching methods are used?</p>
<p>Social dimension</p>		
<p>2.1 Access and use of resources</p> <p>Ensure equal access to and use of resources</p>	<p>Secure equal access to and use of resources</p>	<p>In how far are different actors along the VC prevented from use of and access to resources (such as boats, fuel, equipment)?</p>
<p>2.2 Social values and diets</p> <p>Food systems are based on identity, social and gender equity as well as healthy, diversified, and seasonally and culturally appropriate diets of local communities and livelihoods.</p>	<p>Build food systems that provide healthy, diversified, and seasonally and culturally appropriate diets</p>	<p>Does the VC oppose dietary-related social needs or decrease dietary diversity and nutrition?</p>

<p>2.3 Fairness</p> <p>Support a dignified way of life for all actors in the value chain</p>	<p>Support dignified and robust livelihoods for all actors engaged in food systems, especially small-scale food producers, based on fair trade, fair employment, and fair treatment of intellectual property rights</p>	<p>How fair (as perceived by VC actors and according to available standards) are trade and employment within the value chain?</p>
<p>2.4 Co-creation of knowledge</p> <p>Enhance co-creation and knowledge sharing</p>	<p>Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange</p>	<p>Is knowledge (including traditional / indigenous knowledge) ignored or not shared among VC actors, especially between farmers?</p>
<p>2.5 Agency</p> <p>Promote empowerment of stakeholders along the food value chain</p>	<p>Promote organization and minimize dependencies of stakeholders along the food value chain</p>	<p>Is stakeholder agency along the VC constrained (due to a lack of organization or power concentration / dominance of actors, etc.)?</p>
<p>2.6 Participation & Inclusion</p> <p>Encourage greater participation in decision making by food producers and consumers and inclusion of vulnerable groups</p>	<p>Encourage greater participation in decision making by food producers and consumers and vulnerable groups to support local adaptive management of agricultural and food systems and make more people benefit from the VCs benefits</p>	<p>Are producers and consumers involved in food-related decisions? To what extent are vulnerable groups integrated into VC activities?</p>
<p>2.7 Legal framework</p> <p>Encourage appropriate legal framework of agricultural activities</p>	<p>Encourage appropriate legal framework of agricultural activities that ensures equality and environmental protection</p>	<p>To what extent do suitable laws exist and are enforced?</p>

<p>Economic Dimension</p> <p>3.1 Economic diversification</p> <p>Diversify incomes</p>	<p>Diversify incomes by ensuring that actors along the value chains have greater financial independence and value addition opportunities while enabling them to respond to demand from consumers</p>	<p>Does VC promotion prevent greater diversification income?</p>
<p>3.2 Economic resilience</p> <p>Enhance crisis stabilization</p>	<p>Build the capacity to either withstand, recover quickly, or avoid economic shocks</p>	<p>Are VC actors able to cope with economic shocks?</p>
<p>3.3 Connectivity</p> <p>Ensure proximity and trust between producers and consumers</p>	<p>Ensure proximity and confidence between producers and consumers through promotion of fair and short distribution networks and by re-embedding food systems into local economies</p>	<p>Is the VC dislodged from the local economy? How long is the VC (geographically and physically)?</p>
<p>3.4 Commercial viability</p>	<p>Ensure the ability to compete and make profit</p>	<p>Are the value chain actors able to make profit? Are they able to compete sustainably?</p> <p>Are there monopolies/ concentrated market power in the value chain?</p>
<p>3.5 Economic benefits for all stakeholders</p>	<p>Ensure fair (not necessarily equal) distribution of profits for all actors along the value chain.</p>	<p>Are VC actors able to earn and sustain a livelihood from their involvement in the VC?</p>

Source: NAMAGE (adapted and complemented by the research team)

Annex 4: Full list of indicators and categories in the potato value chain (bold = selected)

Dimension	Category	Indicator	Production	Aggregation	Processing	Distribution	Consumption
Ecological	Biodiversity	Intercropping / Alley Cropping					
Ecological	Biodiversity	Crop rotation	x				x
Ecological	Biodiversity	Use of local varieties	x				x
Ecological	Biodiversity	Pesticide application					
Ecological	Biodiversity	Deforestation in the last 5 years					
Ecological	Biodiversity	Wetland protection					
Ecological	Biodiversity	Inorganic fertilizer application					
Ecological	Soil health	Composting / Manuring	x				
Ecological	Soil health	Mulching	x				
Ecological	Soil health	Contouring against landslides					

Ecological	Soil health	Agroforestry					
Ecological	Soil health	Erosion					
Ecological	Soil health	Soil poisoning					
Ecological	Soil health	Soil fertility (Decline/Incline in soil fertility in last 10 years)					
Ecological	Synergy	Landscape approach					
Ecological	Synergy	Agroforestry	x				
Ecological	Synergy	Afforestation	x				
Ecological	Synergy	Intercropping / Alley Cropping					
Ecological	Input use	Quality seed production	x				
Ecological	Input use	Use of high-quality seeds & alternative sources	x				
Ecological	Input use	Seed renewal frequency					
Ecological	Input use	Pesticide application					
Ecological	Input use	Inorganic fertilizer application					

Ecological	Input use	Fake/counterfeit input use					
Ecological	Input use	Access to agrochemicals					
Ecological	Input use	Level of mechanization					
Ecological	Carbon Footprint	GHG emissions	x				
Ecological	Carbon Footprint	Access to clean energy	x				
Ecological	Water footprint	Water usage					
Ecological	Water footprint	Access to water storage	x				
Ecological	Water footprint	Water recycling	x				
Ecological	Water footprint	Rainfed agriculture					
Ecological	Water footprint	Access to irrigation					
Ecological	Recycling	Composting / manuring	x				
Ecological	Recycling	Waste management (burning, separation)	x				
Ecological	Recycling	Use of non-recyclable/-biodegradable material					

Ecological	Recycling	Use of solar-powered equipment					
Ecological	Food loss and food waste	Post-harvest management	x	x	x	x	x
Ecological	Food loss and food waste	Use/Availability of storage facility e.g. granary (on-farm & off-farm)	x	x	x	x	x
Ecological	Food loss and food waste	% food waste (including processing & later stages)					
Ecological	Food loss and food waste	% food loss (production & aggregation > % potato lost on field + % potato lost while storing)					
Social	Inclusion	Jobs for women, youth, unskilled laborers	x				
Social	Inclusion	Fairness of profit distribution (across social groups = women, youth, etc.)					
Social	Inclusion	Joint-household decision making	x				
Social	Inclusion	Corporate social responsibility (for e.g. hiring vulnerable groups)					

Social	Inclusion	Affordability of products for poor households					
Social	Inclusion	Access to financial services (for vulnerable groups)					
Social	Access and use of resources	Land tenure					
Social	Access and use of resources	Proximity to water body					
Social	Access and use of resources	Land fragmentation					
Social	Access and use of resources	Access to electricity					
Social	Access and use of resources	Proximity to polluted areas					
Social	Access and use of resources	Availability/ Use of protective gears					
Social	Access and use of resources	Access to clean water (drinking, irrigation, washing, etc)					
Social	Access and use of resources	Irrigation frequency					

Social	Access and use of resources	Access to clean energy (cooking, processing, etc)					
Social	Social values and diets	Alignment of food production with traditional diversity and farmers' identity					
Social	Social values and diets	Alignment of processed foods with local and national culture					
Social	Social values and diets	Diverse diet, Malnutrition					
Social	Social values and diets	Undernutrition					
Social	Social values and diets	Micronutrient value of dishes					
Social	Social values and diets	Preference of local/imported potato varieties					
Social	Fairness	Fairness of profit distribution (across VC stages and across regions) - Price disparity farmer:middlemen:processor:consumer			x		x
Social	Fairness	Fair employment (social security, living wages, workers health and safety)			x		x

Social	Fairness	School attendance (child labour)					
Social	Co-creation of knowledge	Horizontal exchange (e.g. farmer to farmer)	x	x	x	x	
Social	Co-creation of knowledge	Vertical exchange (e.g. dealer to farmer and vice versa)					
Social	Co-creation of knowledge	Access to quality extension services	x	x	x	x	
Social	Co-creation of knowledge	Access to research and innovation					
Social	Co-creation of knowledge	Intellectual property rights					
Social	Co-creation of knowledge	Inclusion of local/indigenous knowledge (ITKs)					
Social	Agency	Capacities to define the desired food system					
Social	Agency	Presence of and membership in trade unions / associations	x	x	x		x
Social	Agency	Market concentration/-monopolization					

Social	Agency	Presence of civil society / community-based organizations					
Social	Agency	Procurement choice (e.g. input shops)					
Social	Agency	Living Income					
Social	Agency	Access to market price information	x	x	x		x
Social	Participation	Participation in decisions on what to produce and how	x	x	x		
Social	Participation	Participation in farmers organisations, cooperatives, women's groups	x	x	x		
Social	Participation	Membership to a registered farmer body e.g NPP, regional platforms etc					
Social	Participation	Quality/Services of farmers organisations, cooperatives, women's groups					
Social	Participation	Living Income					
Social	Legal framework and institutional support	Existence of legal framework and regulations	x	x		x	

Social	Legal framework and institutional support	Enforcement of laws and regulations					
Social	Legal framework and institutional support	Equitable land rights					
Social	Legal framework and institutional support	Access to quality extension services	x	x		x	
Social	Legal framework and institutional support	Received support from government agencies (e.g NAADS), NGOs, development cooperation partners					
Economic	Economic diversification	Livestock					
Economic	Economic diversification	Number of crops	x				
Economic	Economic diversification	Opportunity costs					
Economic	Economic diversification	Home-based processing (value addition)					

Economic	Economic diversification	Off-farm income/activities	x				
Economic	Economic resilience	Access to insurance				x	
Economic	Economic resilience	Access to electricity					
Economic	Economic resilience	Contracts (in farming or processing)				x	
Economic	Economic resilience	Access to affordable financial services					
Economic	Economic resilience	Access to storage facilities					
Economic	Economic resilience	Access to high-quality education					
Economic	Economic resilience	Access to transport network					
Economic	Connectivity	Proximity of producers and consumers (or processors)	x		x	x	
Economic	Connectivity	Trust between producers and consumers	x		x	x	
Economic	Connectivity	Ability to choose business partners (e.g. middlemen/suppliers/customers)					

Economic	Connectivity	Marketing channels (Formal/informal/farm gate)					
Economic	Connectivity	Market information access					
Economic	Connectivity	Access to smart phones + Internet (Use of digital tools, e.g. Apps)					
Economic	Connectivity	Market access					
Economic	Connectivity	Access to transport network (Distance to the nearest tarmac road, presence to murrum roads)					
Economic	Commercial viability	Capacities to compete sustainably	x	x	x	x	
Economic	Commercial viability	Competitiveness against imported products	x	x	x	x	
Economic	Commercial viability	Competitiveness against other staple foods					
Economic	Commercial viability	Export opportunities					
Economic	Economic benefits for all stakeholders	(Annual) net income (revenue)					

Economic	Economic benefits for all stakeholders	(Annual) profits	x		x		
Economic	Economic benefits for all stakeholders	Price fluctuations					
Economic	Economic benefits for all stakeholders	Tax payments					
Economic	Economic benefits for all stakeholders	Number of employees/ Wage levels					
Economic	Economic benefits for all stakeholders	Export opportunities					
Economic	Economic benefits for all stakeholders	Ability to invest in business opportunities	x		x		
Source: own data							

Annex 5: Full list of indicators and categories in the Nile Perch value chain (crossed out = deleted from initial list, italic = added suggestions from to workshop participants)

Dimension	Category	Indicator	Production	Aggregation	Processing	Distribution	Consumption
Ecological	Biodiversity	Intact fish breeding grounds		x			
Ecological	Biodiversity	Intact fish breeding grounds (1)	x	x	x	x	
Ecological	Biodiversity	Fish species diversity					
Ecological	Biodiversity	Abundance of fish					
Ecological	Biodiversity	Undersized/ immature fish					
Ecological	Water quality	Eutrophication	x		x		x
Ecological	Water quality	Microplastic					
Ecological	Water quality	<i>Heavy Metals</i>					
Ecological	Synergy	Water level	x				
Ecological	Synergy	Buffer zones	x				
Ecological	Synergy	<i>Benthic</i>	x				
Ecological	Equipment	Boats with/without motors	x	x	x	x	

Dimension	Category	Indicator	Production	Aggregation	Processing	Distribution	Consumption
Ecological	Equipment	Gill nets					
Ecological	Carbon Footprint	GHG emissions	x				
Ecological	Water footprint	Water use	x		x		x
Ecological	Water footprint	Chemical inflows					
Ecological	Recycling & Food loss	Use of fish processing by-products	x		x	x	x
Ecological	Recycling & Food loss	Use of non-fish waste material					
Ecological	Animal welfare	Catching methods	x		x		
Ecological	Animal welfare	By-catch					
Ecological	Animal welfare	Undersized/ immature and oversized fish					
Social	Access and use of resources	Access to boats	x	x	x	x	x
Social	Access and use of resources	<i>Access to gears</i>					

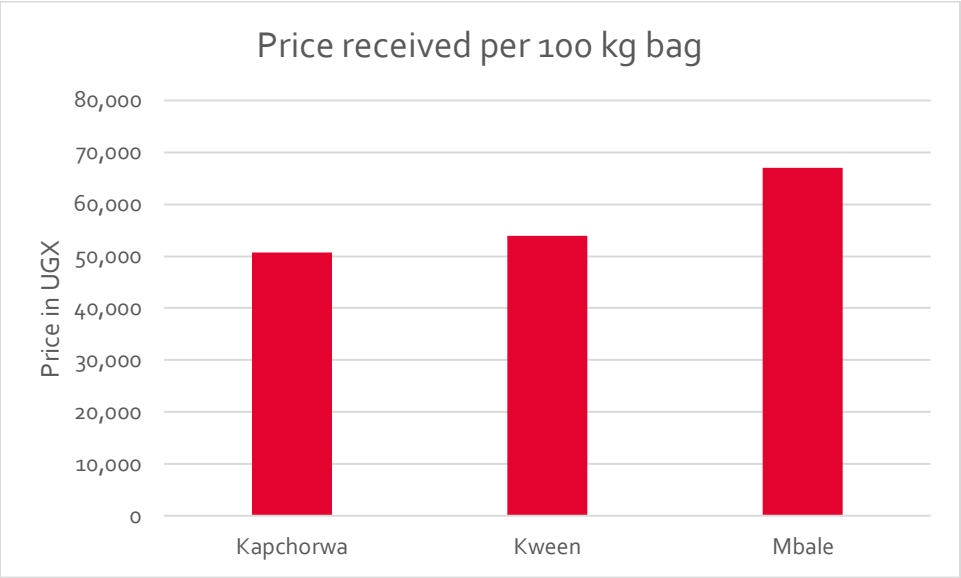
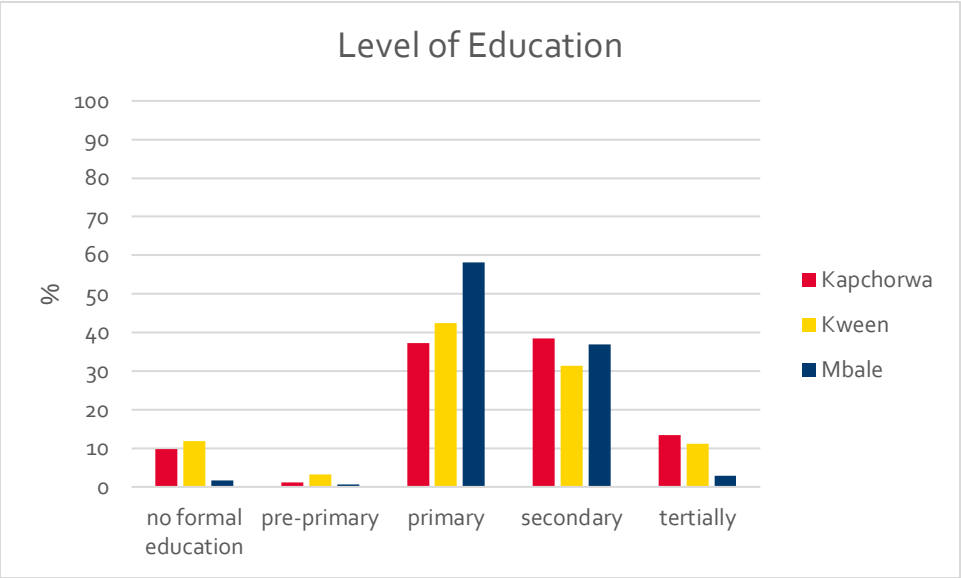
Dimension	Category	Indicator	Production	Aggregation	Processing	Distribution	Consumption
Social	Access and use of resources	Access to fuel					
Social	Access and use of resources	Hygienic handling					
Social	Access and use of resources	Proximity to polluted areas/ exposed areas					
Social	Social values and diets	Tradition and Identity	x				x
Social	Social values and diets	Cultural Taboos and Norms					
Social	Social values and diets	Food and Nutrition Security					
Social	Fairness	Profit distribution	x	x	x	x	
Social	Fairness	Fair employment					
Social	Fairness	Corruption					
Social	Fairness	Condition of women and children					
Social	Co-creation of knowledge	Horizontal exchange	x	x	x	x	
Social	Co-creation of knowledge	Vertical exchange					

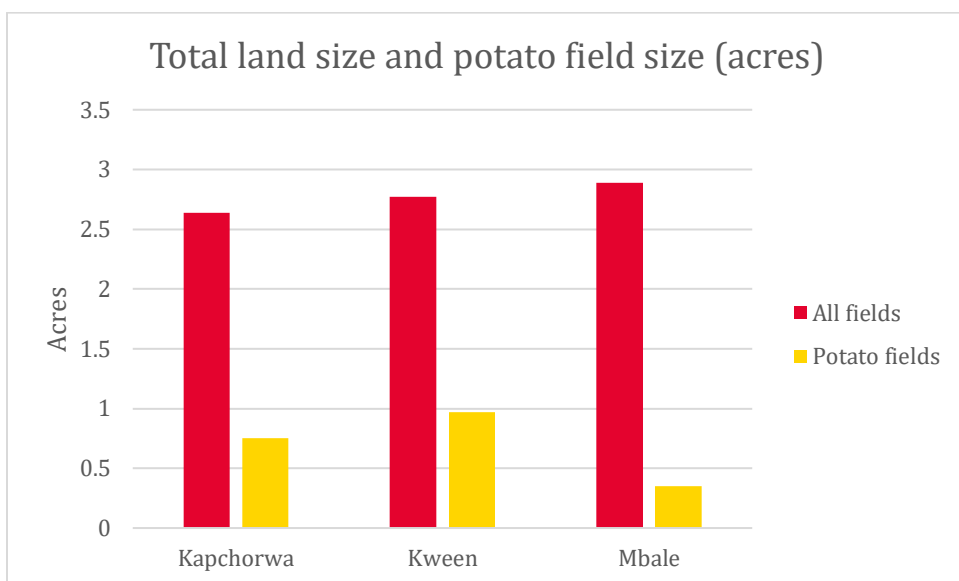
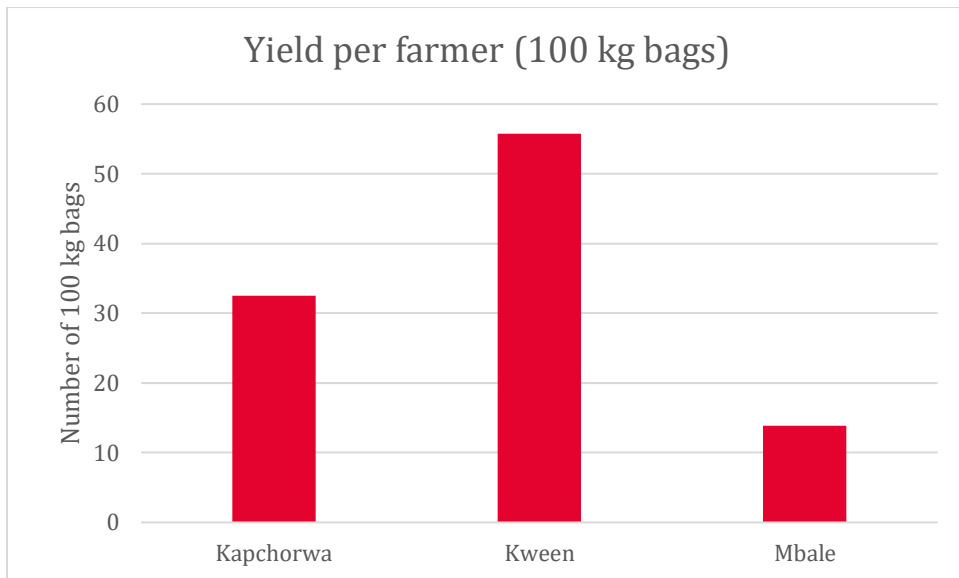
Dimension	Category	Indicator	Production	Aggregation	Processing	Distribution	Consumption
Social	Co-creation of knowledge	Traditional knowledge					
Social	Co-creation of knowledge	Extension services					
Social	Agency	Organisation	x	x	x	x	
Social	Agency	Dependencies					
Social	Participation & Inclusion	Participation in decision-making	x	x	x	x	
Social	Participation & Inclusion	Inclusion of vulnerable groups					
Social	Legal framework	Existence of legal framework	x	x	x	x	
Social	Legal framework	Application/execution of laws					
Social	Legal framework	Permit					
Social	Legal framework	Boat license & size					
Social	Legal framework	Containment of IUU fishing					
Economic	Economic diversification	Different methods and fish species	x	x	x	x	x

Dimension	Category	Indicator	Production	Aggregation	Processing	Distribution	Consumption
Economic	Economic diversification	Processing					
Economic	Economic diversification	Fish maw business					
Economic	Economic resilience	Non-fishing income/activities	x	x	x	x	
Economic	Economic resilience	Insurance					
Economic	Economic resilience	Contracts					
Economic	Economic resilience	Financial services					
Economic	Economic resilience	<i>Governmental support</i>					
Economic	Connectivity	Trust	x	x	x	x	x
Economic	Connectivity	Marketing channels					
Economic	Connectivity	Digital tools					
Economic	Connectivity	Market access					
Economic	Connectivity	Market information					
Economic	Commercial Viability	Market concentration/ monopolization	x	x	x	x	

Dimension	Category	Indicator	Production	Aggregation	Processing	Distribution	Consumption
Economic	Commercial Viability	Competitiveness with export market					
Economic	Commercial Viability	Capacities to compete sustainably					
Economic	Economic benefits	Income	x	x	x	x	
Economic	Economic benefits	Profitability					
Economic	Economic benefits	Price volatility					
Economic	Economic benefits	Tax payments					
Economic	Economic benefits	Number of employees					

Annex 6: Unpublished IFDC data (key variables)





Annex 7: Village lists for sampling of potato farmers

Village	District	Distance class*
Barawa	Kapchorwa	medium
Kapchesi	Kapchorwa	medium
Kaplak	Kapchorwa	far
Kutung	Kapchorwa	close
Sipi	Kapchorwa	close
Tegeres	Kapchorwa	far
Alomani	Kween	close
Kapnarkut	Kween	medium
Korosi	Kween	close
Kwosir	Kween	medium
Mengya	Kween	far
Terempoi	Kween	far

Busanu; Bufooto	Mbale	far
Bunawazi	Mbale	medium
Bunosi	Mbale	medium
Busano	Mbale	far
Bunatsoma	Mbale	close
Bushiuyo	Mbale	close
<p>Source: Own data * close = <5km to primary road , medium = <10 km to primary road, far = >10 km to primary road</p>		

Annex 8: Participants in the fish stakeholder workshops

Professional role	Criteria/Perspective ¹	Level
Representative of the Directorate of Fisheries at the Ministry of Agriculture (MAAIF)	Institutional	National level
President of the Uganda National Women's Fish Organization (UNWFO)	Gender perspective, social perspective	National level
Vice-chairperson of the Association of Fishers and Lake Users of Uganda (AFALU)	Production stage (fishing)	National level
Member of the Uganda Fish Processors and Exporters Association (UFPEA) / Factory owner	Economic perspective, processing and distribution stage	National level
Senior District Environmental Officer, Jinja	Environmental perspective	Regional Level
Fisheries Inspector / Founder of a women's artisanal processing association	Processing stage (artisanal), gender perspective, cooperatives	Local level

¹ Within these characteristics for the stakeholders perspectives are expressed concerning the VC stages (production, aggregation, processing, distribution, consumption), dimensions (environmental, social, economic), or specific topics (like gender, cooperatives, water use).

Environmental researcher (NaFIRRI)	Research/environmental perspective	All
Socio-economic researcher (NaFIRRI)	Research/ social and economic perspective	All
Member of the National Water & Sewerage Corporation, Jinja (NWSC)	Environmental perspective, water use	Regional level
Fisher	Production stage	Local level
Fish maw trader	Aggregation stage	Local level
Saleswoman for Nile Perch in Jinja market	Distribution and consumption stage, gender perspective	Local level
Founder, Uganda Fisheries and Fish Conservation Association (UFFCA)	Social perspective, non-governmental organization	National level
GIZ representatives	Institutional and economic perspective	All
Fisheries Secretary, Masese	Production stage, overview catch statistics at landing site	Local level
Chairperson, Quality Assurance Managers Association	Processing and distribution stage, economic perspective	National level

District Fishery Office, Jinja	Licencing, Overview landing sites in district	Regional level
Source: Own data		

Annex 9: List of questions used in focus group discussions in the preliminary phase (Irish potato VC)

Livelihoods

- What is your job? What are your main sources of income?
- How large is your household?
- How do you share responsibilities?
- Who has the decision-making power in the household?
- What are the most pressing key challenges in your community?
- How could these challenges be solved?

Farming & Potato Production

- What are the three most important crops you grow for home consumption?
- What are the three most important crops you grow for income generation?
- How much of your potato production do you consume? How much do you sell?
- How many times do you consume potatoes per week? Does consumption vary between seasons?
- Who owns the land you cultivate?
- How has your life as a potato farmer changed over the last 10 years?
- What are your biggest constraints in growing potatoes?
- How could these constraints be addressed?
- How much do you earn from potatoes?
- How could you earn more?
- What kind of inputs (equipment, tools, knowledge, pesticides, fertilizer, seeds) do you use?
- Do you have access to finance or insurance?

- How do you store your potato yields? How much of your yield do you usually lose after harvest? (Late blight, etc.)
- Are you part of a farmers organisation/group? / additional for Women FGD: how do you mutually support each other (as women)?
- What is the role of this (farmers) group?

Sustainability and value

- What do you wish for the future of your work?
- What do you wish for the future of your community?

Annex 10: List of interviews for the Irish potato value chain

Exploratory phase				
Date	Location	Position / Title	Organisation	VC Stage
06.09.2021	Mbale	Chairperson	MEPP - Mount Elgon Potato Platform	Other / All
06.09.2021	Mbale	Chairperson, Mbale Potato Trader Association & member of MEPP	MPODA & MEPP	Aggregation/ Trading
07.09.2021	Kapchorwa	Managing Director	Noah's Ark Hotel	Consumption
09.09.2021	Phone	Research Officer (Seed Production)	NARO - National Agricultural Research Organisation	Seed Production
09.09.2021	Mbale (online)	Individual trader	None	Aggregation/ Trading
10.09.2021	Mbale	Mbale Production and Marketing Officer	Mbale District Local Government	Other
10.09.2021	Kampala	Crop Development Officer	NAADS - National Agricultural Advisory Services	Seed Provider/Extension service

Indicator assessment				
08.10.2021	Mbale	Member	Kapchorwa Seed Potato Producers Association	Production (seed multiplication)
08.10.2021	Mbale	Member	KWINSIPA	Production (seed multiplication)
08.10.2021	Mbale	Member	WASWAPA	Production (seed multiplication)
08.10.2021	Mbale	Member and individual trader	Kween Seed Potato Producers	Distribution
08.10.2021	Mbale	Individual trader	None	Distribution
08.10.2021	Mbale	Member and middleman	Bugole market business organisation	Aggregation
08.10.2021	Mbale	Member and middleman	Bufumbo Irish potato traders (unregistered)	Aggregation
08.10.2021	Mbale	Member and middleman	Mount Elgon Potato Platform	Aggregation
08.10.2021	Mbale	Individual distributor	None	Distribution
08.10.2021	Mbale	Member and individual distributor	Bukwana Farmer Group	Distribution
08.10.2021	Mbale	Individual distributor	None	Distribution

08.10.2021	Mbale	Business owner	Prime Hope Enterprises	Processing
08.10.2021	Mbale	Worker	Cipher Food Company	Processing
08.10.2021	Mbale	Business owner	Four Points Restaurant	Processing
13.10.2021	Kampala	CEO	Psalms Food Industries	Processing
18.10.2021	Phone	Senior Agricultural Officer Kween District	Local government	All
20.10.2021	Phone	Production and Marketing Officer Kapchorwa District	Local government	All

Annex 11: List of semi-structured interviews, PhotoVoice interviews, and focus group discussions for the fish VC

ID	Actor	Date	Place	Method
MA1	Landing site officer	31.08.21	Masese	Key informant interview
MA2	Maw trader	31.08.21	Masese	Key informant interview
KY1	Female fisheries officer/ womens association director	01.09.21	Kiyindi	Key informant interview
KY2	Boat owner	01.09.21	Kiyindi	Key informant interview
KY3	Fish trader	01.09.21	Kiyindi	Key informant interview
JN1	Saleswoman market	01.09.21	Jinja	Photovoice interview
KS1	Female fish trader	02.09.21	Kisima 1	Key informant interview
KS2	Fishermen	02.09.21	Kisima 1	Focus Group discussion
MA3	Fishermen	02.09.21	Masese	Photovoice interview
KY4	Woman processor	02.09.21	Kiyindi	Photovoice interview
JN2	GIZ experts	03.09.21	Jinja	Expert Interview
JN3	Researchers (NaFFIRI)	24.09.21	Jinja	Expert interview
KY5	Fisheries inspector	29.09.21	Kiyindi	Key informant Interview
KY6	Fish trader (Factory)	29.09.21	Kiyindi	Key informant Interview
KY7	Fisherman	29.09.21	Kiyindi	Key informant Interview
KY8	Artisanal women processors (smoking)	29.09.21	Kiyindi	FGD + Survey
KY9	Maw trader	29.09.21	Kiyindi	Key informant Interview

MA4	Fishermen	30.09.21	Masese	FGD + Survey
MA5	Fish maw collector/ trader	30.09.21	Masese	Key informant Interview
MA6	Boat builder/ fishing gear	30.09.21	Masese	Key informant Interview
JN4	Restaurant manager	30.09.21	Jinja	Key informant Interview
MA7	Fisherman	01.10.21	Masese	Key informant interview and participant observation
KS3	Fishermen	01.10.21	Kisima 1	FGD + Survey
KS4	Female fish monger	01.10.21	Kisima 1	Key informant Interview
JN5	LVFO director	01.10.21	Jinja	Expert interview
JN6	Saleswoman market	01.10.21	Jinja	Key informant Interview
KA1	Chairman fishers	04.10.21	Kasenye (Entebbe)	Key informant Interview
KA2	Inspector (assistant)	04.10.21	Kasenye (Entebbe)	Key informant Interview
KA3	chairwoman input provider	04.10.21	Kasenye (Entebbe)	Key informant Interview
KA4	Chairman trader	04.10.21	Kasenye (Entebbe)	Key informant Interview
KA5	Maw trader	04.10.21	Kasenye (Entebbe)	Key informant Interview
KA6	Fish monger	04.10.21	Kasenye (Entebbe)	Key informant Interview
EN1	Fish factory management	05.10.21	Entebbe town	Key informant Interview
KL1	District fisheries officer Ssese islands	07.10.21	Kalangala	Expert interview

NA1	Fishermen	07.10.21	Nakatiba	FGD + Survey
NA2	Female landing site owner/boat owner	07.10.21	Nakatiba	Key informant Interview
NA3	Fisheries inspector	07.10.21	Nakatiba	Key informant Interview
NY1	Fishermen	08.10.21	Nyoga	FGD + Survey
NY2	Fish monger/ son of Boatowner	08.10.21	Nyoga	Key informant Interview
NY3	Fisherman	08.10.21	Nyoga	Key informant interview and participant observation
KM1	By-product processors association member	12.10.21	Kampala	Key informant Interview
KM2	Chairman AFALU	12.10.21	Kampala	Expert Interview
KM3	Factory owner	12.10.21	Kampala	Key informant Interview
KM4	Founder UFFCA	13.10.21	Kampala	Expert interview
KM5	UFPEA founder (ex member)	13.10.21	Kampala	Expert Interview

Annex 12: List of questions for focus group discussions in the preliminary phase (fishers)

- What is your role/occupation in the organization?
- What does your daily work look like?
- Which fish species are you fishing?
- How many people go on a fishing boat?
- How many fishing boats are on the island?
- How has the fishing industry changed in the last ten years?
- What is your daily/weekly income?
- Where do you sell your harvest?
- Do you sell some fish on this island?
- How often do you and your family consume fish per week?
- What are the three main challenges in your work?
- Are fisherfolk licensed on this landing site?
- What works well for you?
- So you don't have your own boats?

Annex 13: Photovoice results Nile perch

Name	Value Chain Stage	Location	Format	1. What is important for you as a fisher/ fish trader?	2. What is important for your fisherfolk community?	3. What are your hopes for the future of your work?	4. What are your hopes for the future of the fishing sector?
PV Participant 1	Distribution (Fish Trading/Selling)	Jinja Fish Market	Single interview	Picture of: silverfish Chosen because: it is the main economic support with which she can feed her children	Picture of: Tilapia Chosen because: represents the increase of the fish industries which creates jobs	Picture of: Fresh Nile perch Chosen because: it stands for the youth who should sell fresh fish in the future (+ own children)	Picture of: her family Chosen because: she calls upon all fish actors to work sustainably that their children can also have their business with the lake
PV Participant 2	Production (Fishing)	Masese Landing Site	Focus Group	Picture of: Fishing boats on lake Chosen because: his boat is most important to him because he gets his catch and income from that	Picture of: truck loaded with charcoal Chosen because: it represents employment opportunities around the lake and on the islands	Picture of: a road in bad conditions/main road that goes to town Chosen because: it should be in better conditions, wishes better infrastructure	Picture of: factory that is currently not working Chosen because: there is not enough fish for processing and hopes that factory works again and that transport costs are reduced
PV Participant 3	Production (Fishing)	Masese Landing Site	Focus Group	Picture of: Landing site, fisherboats Chosen because: has an engine boat which is valuable to him because he can go fast, less work	Picture of: Fish factory Chosen because: it is important to renovate factory, stable fish supply gives better prices which creates employment and people who are not in the fishing sector can be employed	Picture of: Lake/nature Chosen because: nature is important, provides fresh air, conservation of lake and forest is important	Picture of: a school Chosen because: he wants his children to be educated that they can find another job in another industry (not fishing)

PV Participant4	Production (Fishing)	Masese Landing Site	Focus Group	<p>Picture of: Lake</p> <p>Chosen because: since 1991 he has gotten everything from the lake (family, house, can pay school fees)</p>	<p>Picture of: Silverfish dry on net</p> <p>Chosen because: it is important for the community to have income alternatives when there is no Nile perch</p>	<p>Picture of: Women on a boat</p> <p>Chosen because: women should be involved more in fishing</p>	<p>Picture of: small nile perch</p> <p>Chosen because: he wants to never see people again fishing small Nile perch, wants that everyone does better fishing practices that the fishing can be sustainable</p>
PV Participant5	Processing (artisanal)	Kiyindi Landing Site	Single Interview	<p>Picture of: Boat for silverfish fishing</p> <p>Chosen because: important for association, would like to have a boat for Tilapia</p>	<p>Picture of: Silverfish (wanted actually a picture of a women selling nile perch)</p> <p>Chosen because: she likes women to sustain her family, women empowerment means economic empowerment</p>	<p>Picture of: Fishermen & buyer exchanging money/fish</p> <p>Chosen because: she wants to earn enough money to provide for her future (buy land and cow)</p>	<p>Picture of: Boat for nile perch fishing</p> <p>Chosen because: she wants to expand the fishing ground for Nile perch because it had been centralized, more nile perch fishing for small scale</p>

Annex 14: Potato Farmer Survey, Kobodatabase Variable Format

<https://kobo.humanitarianresponse.info/#/forms/aorVPVfbMxWE4m3PpSgTZ7>

Annex 15: Fisherfolk Survey, Kobodatabase Variable Format

<https://kf.kobotoolbox.org/#/forms/aLtkahCXiznBEGQktrmzRn>

Annex 16: Recommendations received from value chain actors, extension staff, EREPP members, and representatives of the International Potato Centre and GIZ during the validation workshop (Irish potato)

Category	Value chain stage	Recommendation
Soil health	Production	Promotion of anti-erosion measures such as terracing, construction of contour and grass bands, and agroforestry
		Conduct research on appropriate rotation regimes
		Integration of crop rotation into the farming system
		Soil testing to guide decision making on soil amendment
		Promotion of integrated soil fertility management practices such as appropriate use of both organic and inorganic fertilizers
		Promotion of safe ways of Agro-chemical use
Input use (seeds)	Production	Agriculture extension staff should provide information about the varieties that are suitable to the fields in different locations
		Promote use of improved and certified seed varieties that are suitable to the different locations
		Identify strategies for increasing seed production in a coordinated way (need for more planning and certification)
		Regulated use of imported seed [4]

Food loss/ waste	Production	Promote better storage facilities at farmer level Improve transport accessibility, for example roads
		Promotion of proper agronomic practices
		Train farmers in proper post-harvest handling practices [5]
		Dehaulming (cutting off the leaves for 2 weeks before harvest). [6]
	Distribution	Availability of safe stores for ware potato to business/traders
		Use of safe packaging bags such as sisal bags for transportation of potatoes
		Proper transportation means
		Construction of all-weather roads that connect to rural farms
		Sorting and grading potatoes, and use of proper weighing scales
		Establishing a distribution network for information sharing and market linkages
	Aggregation	Improve road network to protect farming communities and prevent trucks from breaking down.
		Encourage (?) farmers to operate in groups/ Associations.
		Establishment of community bulking centers

		Strengthen linkages to off takers
		Provision of knowledge on varieties required in the market
		Train aggregators in business practices
		Use of right packaging materials and measurements
		Traceability of source of potato [7]
	Processing	Improved processing equipment
		Improved storage facilities for processors
		Use of better recommended packaging materials [8]
		Provision of knowledge about good varieties to processors
		Ensure health standards during processing
Fairness	Processing	Provision of market information and ensuring market linkages across the value chain (sharing of market information). This can be done by government extension staff, researchers, non-government organizations, traders or through trade unions
		Ensuring gender equity and equality (empowerment of women, youth and people living with HIV/AIDS)

		Organizing financial literacy courses for the processors
Co-creation of knowledge	Production	Integrate existing structures while transferring knowledge to farmers. The existing structures include agriculture extension services, farmer to farmer experience sharing
		Organize field days. This brings different stakeholders together
		Organize farmer field schools
		Prepare brochures that can ease knowledge transfer
		Promotion of female lead farmer approach
		Prepare posters with illustrations
		Organize farmer exchange visits
Agency/ empowerment	Production	Organizing farmers into Working groups for easy service delivery to farmers and market information sharing
		Facilitating farmers with unregistered groups to acquire legal status for their groups
		Ensuring proper co-ordination among farmers
		Encouraging farmers to form saving groups
		Facilitating farmers to form bulking centers

		Creating awareness on the production calendar
Economic resilience	Distribution	Encouraging distributors register with the insurance companies
		Work with producers to initiate contract farming
		Encouraging distributors to ensure personal liquidity
		Encouraging them to access credit at a reduced interest rate of not more than 6 %
Connectivity	Production	Facilitate farmers to conduct market survey
		Facilitate farmers to understand the other stakeholders in the value chain
		Encourage farmers to visit traders and or consumers to exchange contacts and understand the varieties they need
		Organizational development of farmer-based organizations
		Profiling all value chain actors
		Promoting multi stakeholder innovation platforms (MSIPs)
Economic benefits for all stakeholders	Production	Need for transparency among the value chain actors
		Ensure quality and quantity of the products

		Ensure proper packaging of potatoes (development and implementation of regulations on packaging)
		Development of a database that can easily be accessed and utilized by all stakeholders.
Source: Own data, obtained from value chain actors and stakeholders in Mbale		

Annex 17: List of recommendations (and discussion points) from validation workshop for the Nile perch value chain

Environmental dimension

Carbon footprint

- There is limited knowledge about the emissions in the Nile perch fisheries
- More research and resources should be allocated for a proper assessment

Breeding grounds

- Demarcate breeding grounds on land and water and supervise compliance

Collaborative approach

- Enforcement by FPU has no long-term perspective
- Enforcement should be collaborative between communities, FPU, and other authorities
- communities should not accept non-compliance of regulations

Soft enforcement

- People need to be sensitized on why it makes sense to stick to rules and enforcers should be trained in understanding why they implement enforcement

Strict standards for gear supply

- Stricter standards and traceability for import of raw materials for illegal gears
- Locate the sources of illegal fishing gear and sanction the suppliers as well as the the users of this gear
- Collaborate with the MAAIF, Ministry of Trade, UNBS, URA

Alternative livelihoods

- Create alternative livelihood opportunities to decrease pressure on resources and increase compliance with legal standards
- Support business incentives to attract fishers to higher value-adding activities
- Jobs in aquaculture, processing, and tourism

- Support of technological progress which is less harmful to the environment, within the legal framework, that creates alternative employment

Control pollution

- A lot of illegal pollution by factories (e.g. release of untreated water) remains unregistered. Make more effort in supervising point sources of pollution.

Social dimension

Capacity building/Community empowerment

- Nutrition and food (nutritional benefits of fish, *mukene*, for breastfeeding women) → Lack of knowledge: Some people think *mukene* is young fish of other species, others think it's food for dogs
- Trainings on resource management
- Promote gender sensitiveness (empower women/change misconceptions such as: boats are not stable for women, women don't want to go at night because of family responsibilities, women need to be respected as bosses) also including men to understand roles of women in fishing

→ Challenge outdated beliefs, for example, when a woman jumps over a net, it doesn't catch fish anymore

→ Challenge women's stigmatization as prostitutes

→ Sensitize for environmental care (own the process/ownership of environmental issues) → through TV/radio, community leaders

Build and promote organisations (and co-management structures)

→ In the area of fishing, marketing, trading

- Promote strong organizations (fishers speak with one voice)
- Include organizations in policy making (representatives)

→ bottom-up approach to policy level

- Clear distribution of tasks (government ← → fisheries)

Public fund for fisheries sector (as they exist in other sectors)

- Emyooga
- Youth livelihood programme

- Women Empowerment Programme

Use of indigenous/local knowledge in policy making

- Fishers know a lot and should not be shy to bring their voices forward

Provision of proper handling facilities from the ministry

- Not run away from this responsibility

Restriction on use of microplastics

Comments:

- How can we streamline interventions against domestic violence and HIV
- The role of female fishers is a strong point to be considered (empowerment), according to Moses T. "time to bring mothers on board; they will be good managers"
- Areas around landing sites are heavily affected by HIV and gender-based violence as a result of fishers' relatively high cash income
- Upcoming cage farm in Kiyindi: the presence of very young girls with babies is notable (often third wives of men who have money)
 - women are never out of their cycle of poverty
 - establish fisheries management trainings
 - promote saving organizations against poverty
 - Improve access to health services, infrastructure

Economic dimension

Economic resilience

Financial services

- Fishing facilities
- Adoption of cooperative models (face challenges of inputs (costs and availability))→ financial security (under a comparative model, build synergies, minimise risks)
- Extension services becomes easier
- Training skilling of fisherfolks (men and women) → bookkeeping, financial management, hygienic handling

- Access to financial facilities/banks

Alternative livelihoods

- *mukene*
- Agriculture
- Processing (post-harvest management, artisanal processing)

→ lots of fish lost under post-harvest losses (recommendations how to handle post-harvest losses)

Contracts

- Good for bargaining
- Work under cooperative model

Subsidized inputs

- Fishing gear, boats

Insurance

- Expensive

Governmental support

- Appropriate policies/update (big challenge of outdated laws)

Marketing alternative

- Snails (?)
- Value addition

Eco labeling (certification for quality)

- This will help improve competitiveness
- Promote Nile perch through advertising at international trade shows

Mentorship/capacity building

- Trading/negotiation/marketing

Local processing

- Processing logo (for local processors)

Monopolization

- "Dominated by people who don't want us"

Modern and appropriate equipment

Good infrastructure

Hygienic facilities

Saving cultures

Tax payments

- There are many informal taxes that government doesn't know → harmonize to only official taxes

Minimal wage/good working environment

Comments

- Public-private partnerships
- Only standards for small-scale, how to upscale?
→ how would that work at the national level?
→ yes, it would work

How can we synergize

- Reports mid-term evaluation report (evaluation of projects)
- A lot of dialogue and sensitization

Annex 18: Policy recommendations, PEST analysis (Irish potato and Nile perch)

PEST analysis for Irish potato:

No	Recommendation	Political/ adminis- trative feasibility	Social impact	Environ- mental impact	Econo- mic impact	Technical feasibil- ity	Rele- vance
1	Promotion of anti-erosion measures such as terracing, construction of contour and grass bands, and agroforestry	1.75	1.75	2	1.75	1.75	1.75
2	Conduct research on appropriate rotation regimes	1.75	1.75	1.75	2	1.5	1.96
3	Integration of crop rotation into the farming system	1.5	1.75	2	2	2	1.25
4	Soil testing to guide decision making on soil amendment	1.25	1.5	2	1.75	1.75	1.92
5	Promotion of integrated soil fertility management practices such as appropriate use of both organic and inorganic fertilizers	1.5	2	2	2	1.75	1.71
6	Promotion of safe ways of Agro-chemical use	1.5	2	2	2	2	1.96
7	Agriculture extension staff should provide information about the varieties that are suitable to the fields in different locations	1.5	1.5	1.75	2	1.75	1.96
8	Promote use of improved and certified seed varieties that are suitable to the different locations	1.5	1.75	1.75	2	1.5	2
9	Identify strategies for increasing seed production in a coordinated way (need for more planning and certification)	2	1.5	1.5	2	1.5	1.92
10	Regulated use of imported seed	1.25	1.25	1.25	1.25	0.5	1.17
11	Promote better storage facilities at farmer level	1.75	1.75	1.5	1.75	1.75	1.88
12	Promotion of proper agronomic practices	1.5	1.75	2	2	2	2
13	Train farmers in proper post-harvest handling practices and onfarm value addition	1.75	1.75	1.75	2	2	2
14	Dehaulming (cutting off the leaves for 2 weeks before harvest)	1.25	1.5	1.5	1.75	1.75	1.71
15	Availability of safe stores for ware potato to business/traders	1.75	1.75	1.75	2	1.75	1.92
16	Use of safe packaging bags such as sisal bags for transportation of potatoes	1	1.25	1.25	2	1.75	1.46

17	Proper transportation means	1.25	1.5	1.5	1.75	1.25	1.38
18	Construction of all-weather roads that connect to rural farms	1.5	1.75	1.5	1.75	1.25	1.88
19	Sorting and grading potatoes, and use of proper weighing scales	1.75	1.5	1.25	2	1.75	1.96
20	Establishing a distribution network for information sharing and market linkages	1.5	1.5	1.5	2	1.25	1.96
21	Improve road network to protect farming communities and prevent trucks from breaking down.	1.5	1.5	1.25	1.75	1.25	1.88
22	Encourage (?) farmers to operate in groups/ Associations.	1.5	1.75	1.5	2	1.25	1.71
23	Establishment of community bulking centers	1.75	1.5	1.25	2	1.5	1.96
24	strengthen existing farmer organisations e.g awareness on importance of group registration, labour pooling and collective marketing	1.75	1.75	1.5	2	1.5	1.96
25	Strengthen linkages to off takers	1	1.5	1	1.5	0.67	1
26	popularise the use of the existing digital marketing apps among farmers with smartphones to bridge the price information gaps and also the accessibility of farming information instantly especially in light of the COVID19 restrictions	1.33	1.75	1.25	2	1.75	2
27	Provision of knowledge on varieties required in the market	1.25	1.75	1.25	2	1	1.96
28	Train aggregators in business practices	1.5	1.5	1.25	2	1.25	1.96
29	Use of right packaging materials and measurements	1.25	1.25	1.25	2	1.75	1.42
30	Traceability of source of potato	1.25	1.75	1.75	1.75	1.25	1.63
31	Improved processing equipment	1	1.75	1.25	1.75	1.5	1.92
32	Improved storage facilities for processors	1	1.5	1.5	2	1.75	1.96
33	Use of better recommended packaging materials	1	1	1.25	1.75	1.25	1.21
34	Provision of knowledge about good varieties to processors	1.5	1.25	1.25	2	1.25	1.71
35	Ensure health standards during processing	1.25	2	1.25	1.5	1.25	1.75
36	Provision of market information and ensuring market linkages across the value chain (sharing of market information). This can be done by Government extension staff, researchers, non-government organizations, traders, through trade unions	1.5	1.5	1.25	2	1	1.71

37	Ensuring gender equity and equality (empowerment of women, youth and people living with HIV/AIDS)	1.25	1.5	1.5	1.75	1	1.71
38	Organizing financial literacy courses for the processors	1.5	1.5	1.25	2	1.25	1.71
39	Integrate existing structures while transferring knowledge to farmers. the existing structures include agriculture extension services, farmer to farmer experience sharing	1.75	1.75	2	2	1.5	1.96
40	Organize field days. This brings different stakeholders together	1.75	1.25	1.25	1.75	1	1.67
41	Organize farmer field schools	1.75	1.75	1.75	1.75	1.5	2
42	Prepare brochures that can ease knowledge transfer	1.25	1.5	1.5	1.5	1.25	1.38
43	Promotion of female lead farmer approach	1.25	1.75	1.25	1.75	1	1.96
44	Prepare posters with illustrations	1.25	1.5	1.5	1.75	1.5	1.33
45	Organize farmer exchange visits	1.75	2	1.75	1.75	1.5	1.75
46	Organizing farmers into Working groups for easy service delivery to farmers and market information sharing	1.75	1.75	1.5	2	1.5	1.71
47	Facilitating farmers with unregistered groups to acquire legal status for their groups	1.5	1.75	1.25	2	1.5	1.63
48	Ensuring proper co-ordination among farmers	1.25	1.5	1.75	1.75	1.5	1.92
49	Encouraging farmers to form saving groups	1.5	1.75	1.25	2	1.25	1.42
50	Facilitating farmers to form bulking centers	1.5	1.75	1.5	2	1.5	1.96
51	Creating awareness on the production calendar	1.5	1.5	1.75	2	1.5	1.5
52	Encouraging distributors register with the insurance companies	1.25	1.5	1.25	1.5	1.75	1.38
53	Work with producers to initiate contract farming	1.5	1.5	1.25	2	1.75	1.71
54	sensitise farmers on the available agricultural insurance schemes suitable for smallholder farmers	1.5	1.75	1.25	1.75	1.75	1.96
55	Encouraging distributors to ensure personal liquidity	1	1	1	2	1	#DIV/o!
56	Encouraging them to access credit at a reduced interest rate of not more than 6%	1	1.25	1.25	1.5	1.5	1.38
57	Facilitate farmers to conduct market survey	1.25	1.25	1.25	1.75	1.25	1.08
58	Facilitate farmers to understand the other stakeholders in the value chain	1.25	1.75	1.25	1.75	1	1.58

59	Encourage farmers to visit traders and or consumers to exchange contacts and understand the varieties they need	1.5	1.5	1.25	1.75	1.25	1.96
60	Organizational development of farmer-based organizations	1.5	1.75	1.5	2	1.5	1.71
61	Profiling all value chain actors	1.5	1.5	1.5	1.5	1.5	1.71
62	Promoting multi stakeholder innovation platforms (MSIPs)	1.25	1.75	2	2	1.25	1.42
63	Need for transparency among the value chain actors	1.75	1.75	1.25	2	1.75	1.71
64	Ensure quality and quantity of the products	1.25	1.5	1.5	1.75	1.5	1.67
65	Ensure proper packaging of potatoes (development and implementation of regulations on packaging)	1.25	1.25	1.5	1.75	1	1.58
66	Development of a database that can easily be accessed and utilized by all stakeholders .	1.5	1.5	1.25	1.75	1.5	1.42
67	Install irrigation systems (in combination with storage facility, it would give the opportunity to benefit from higher prices --> standing on shaky ground though not knowing about cost-benefit ratio) (Maybe analyze and compare farmer profits from those farmers who benefit from IFDC/CIP installed irrigation systems)	1	1.5	1	1.75	1.25	1.63
68	Ensure legal enforcement in the area of input fraud (decreasing input costs = increasing profits)	1.5	1.5	1.75	2	1.5	1.92
69	Evaluate existing microfinance schemes --> make information accessible for farmers/develop suitable microfinance options for ss farmers	1.5	1.75	1.5	2	1.25	1.92
70	Empower farmers to identify and manage diseases	1.5	1.5	1.5	1.75	1.25	1.71
71	Integrated Pest Control	1	1.75	2	2	1.75	1.96
72	Make market prices available for farmers	1.5	1.75	1.75	2	1.25	1.96
73	Improve farmer groups to also include information/training on post-harvest handling, marketing, and financing	1.5	1.75	1.5	2	1.25	1.96
74	Improve extension service to also include information/training on post-harvest handling, marketing, and financing	1.75	1.75	1.5	2	1.75	1.96
75	Make quality extension services available to remote farmers	1.75	1.75	1.75	2	1.75	1.96
76	Promote post-harvest handling (cleaning, etc. to increase prices)	1.5	1.75	2	2	2	1.92
77	Make on-farm storage available to farmers	1.25	1.5	1.5	2	1.75	1.71

78	Promote farmer to farmer exchange on prices and unionization	1.5	1.75	1.5	2	1.5	1.92
79	Promote pre-harvest handling to increase resistance to diseases (e.g. dehaulming)	1.25	1.75	1.5	1.75	1.75	1.92
80	Accelerate development of clean seed production sector	1.5	1.25	2	2	1.75	1.71
81	Organise trainings in record keeping and profit calculation for farmers	1.75	1.75	1.75	2	1.25	1.96
82	Encourage farmers to join the seed multiplication business for more quality seed production at a lower price	1.5	1.5	1.25	2	1.5	1.96
83	Development partners should support sector coordination	1.5	1.5	1.75	2	1	1.96

PEST analysis for Nile Perch:

No	Recommendation	Political/administrative feasibility	Social impact	Environmental impact	Economic impact	Technical feasibility	Relevance	Average
1	More research on carbon footprint	2	1	2	0	2	1	1.3333333333
2	Demarcate breeding grounds on land and water and supervise compliance	1	1	2	0	2	2	1.3333333333
3	Sensitise lake users and law enforcers on environmental issues / why it is important to stick to rules	2	2	2	1	2	2	1.8333333333
4	Enforce Sstrict standards for gear supply (traceability of inflows. sanction supplier/user. collaboration MAAIF/Ministry of Trade. UNBS. URA	1	2	2	0	2	2	1.5
5	Control pollution by enacting and supervising enforcement laws (e.g. for factories)	1	1	2	1	1	1	1.1666666667
6	Restrict use of microplastics	1	1	2	0	1	1	1

7	Capacity building / community empowerment	2	2	1	1	2	2	1.6666666 67
8	Build and promote organizations (co-management structures)	1	2	2	1	2	2	1.6666666 67
9	Public fund for the fisheries sector	1	1	1	2	2	1	1.3333333 3
10	Use indigenous/local knowledge within policy making	1	2	1	1	1	1	1.1666666 67
11	Provide proper handling facilities	2	2	1	2	2	1	1.6666666 67
12	Implement joint law enforcement between communities' FPU and other authorities	1	2	2	2	1	2	1.6666666 67
13	Initiate programs for alternative livelihoods	1	2	1	2	1	2	1.5
14	Create financial services for stakeholders in the fishing sector	1	1	1	2	1	1	1.1666666 67
15	Promote local processing / Support start ups	1	2	2	2	1	1	1.5
16	Harmonize taxes (only one official tax that everybody pays)	1	1	1	2	1	1	1.1666666 67
17	Incentivize public-private partnerships	1	1	1	2	1	1	1.1666666 67
18	Public investments in infrastructure	1	2	0	2	1	1	1.1666666 67

Annex 19: Consent forms

Consent forms

Fish Photovoice

Humboldt University of Berlin

Centre for Rural Development

August 2021

INFORMED CONSENT FORM AS A RESEARCH RESPONDENT

Title of Research Project: The value(s) of food: Promoting sustainable food value chains. A case study from the potato and fish value chains in Uganda

Name of Principal Investigator: Jasmin Ahmed, Lukas Eichelter, Deous Mary Ekyaligonza, Hendrik Hänke, Felix Hegeler, Ronald Kabbiri, Joanita Kataike, Violet Kisakye, Eva Kirmes, Muhangane Lauben, Flavia Marà, Joshua Wesana

Project

We are a German-Ugandan Research team which conducts research on sustainability of the fish and potato value chain in Uganda. The German research members are part of a programme at the Centre for Rural Development at Humboldt University in Germany. We work in cooperation with the German development cooperation. The objective of this study is to understand how the value chain works and what can be improved. Afterwards we aim to give recommendations to the government and the different value chain actors.

Method

The method you are going to perform is called photovoice. You are taking pictures with a camera and in this way answer questions related to your daily life and fish and afterwards we discuss the photos you took. The objective of this method is to capture your personal beliefs and values connected to your work in the fishing sector.

Questions

1. What is important for you as a fisherman?

2. What is important for your community as a fisherfolk?
3. What do you wish for the future of your work?
4. What do you wish for the future of the fishing sector?

This will take approximately 20 minutes of your time for the explanation of the methods and when we meet at a later stage for another hour to discuss the photos. The interview session will be audio recorded. The interview will probably be conducted with one or two other fishermen on the appointment date.

Confidentiality

The records from this study will be kept as confidential as possible. Individual identities/names will be used only with your permission (see below). Research information will be kept in locked files at all times. Only research personnel will have access to the files and only those with an essential need to see names or other identifying information will have access to that particular file.

Benefits and Safety

In return for your contribution and in order to safely conduct the activity we will provide you with:

- printouts of your favorite photos
- masks, a test and sanitizer before participating
- snacks during the discussion

Consent

I have read the whole document and all my questions have been answered. I know that my participation is voluntary and I can leave at any time.

[] You can use my first name/ full name for the purpose of the study

Name _____(optional)

Phone Number _____

Date, Place _____

Signature _____

INFORMED CONSENT FORM AS A RESEARCH RESPONDENT

Title of Research Project: The value(s) of food: Promoting sustainable food value chains. A case study from the potato and fish value chains in Uganda

Name of Principal Investigator: Jasmin Ahmed, Lukas Eichelter, Deous Mary Ekyaligonza, Hendrik Hänke, Felix Hegeler, Ronald Kabbiri, Joanita Kataike, Violet Kisakye, Eva Kirmes, Muhangane Lauben, Flavia Marà, Joshua Wesana

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We will ask you a couple of questions concerning your work in fishing and your role in the fish value chain. This will take approximately 30 to 60 minutes. The interview session will be audio recorded.

Confidentiality

The records from this study will be kept as confidential as possible. Individual identities/names will be used only with your permission (see below). Research information will be kept in locked files at all times. Only research personnel will have access to the files and only those with an essential need to see names or other identifying information will have access to that particular file.

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Name of Principal Investigator: Jasmin Ahmed, Lukas Eichelter, Deous Mary Ekyaligonza, Hendrik Hänke, Felix Hegeler, Ronald Kabbiri, Joanita Kataike, Violet Kisakye, Eva Kirmes, Muhangane Lauben, Flavia Marà, Joshua Wesana

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Method

The method you are going to perform is called photovoice. You are taking pictures with a camera and in this way answer questions related to your daily life and potato farming. Afterwards we discuss the photos you took. The objective of this method is to capture your personal beliefs and values connected to your work in the potato production and its value chain.

Questions

1. What is important for you as a farmer?
2. What is important for your community?
3. What do you wish for the future of your work?
4. What do you wish for the future of the potato sector?

This will take approximately 20 minutes of your time for the explanation of the methods and when we meet at a later stage for another hour to discuss the photos. The interview session will be audio recorded. The interview will probably be conducted with one or two other farmers on the appointment date.

Confidentiality

The records from this study will be kept as confidential as possible. Individual identities/names will be used only with your permission (see below). Research information will be kept in locked files at all times. Only research personnel will have access to the files and only those with an essential need to see names or other identifying information will have access to that particular file.

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Name _____(optional)

Phone Number _____

Date, Place _____

Signature _____

INFORMED CONSENT FORM AS A RESEARCH RESPONDENT

Title of Research Project: The value(s) of food: Promoting sustainable food value chains. A case study from the potato and fish value chains in Uganda

Name of Principal Investigator: Jasmin Ahmed, Lukas Eichelter, Deous Mary Ekyaligonza, Hendrik Hänke, Felix Hegeler, Ronald Kabbiri, Joanita Kataike, Violet Kisakye, Eva Kirmes, Muhangane Lauben, Flavia Marà, Joshua Wesana

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We are a German-Ugandan Research team which conducts research on sustainability of the fish and potato value chain in Uganda. The German research members are part of a programme at Centre for Rural Development at Humboldt University in Germany. We work in cooperation with the German development cooperation. The objective of this study is to understand how the value chain works and what can be improved. Afterwards we aim to give recommendations to the government and the different value chain actors.

We will ask you a couple of questions concerning your work and your role in the potato value chain. This will take approximately 30 to 60 minutes. The interview session will be audio recorded.

Confidentiality

The records from this study will be kept as confidential as possible. Individual identities/names will be used only with your permission (see below). Research information will be kept in locked files at all times. Only research personnel will have access to the files and only those with an essential need to see names or other identifying information will have access to that particular file.

Benefits and Safety

In return for your contribution and in order to safely conduct the activity we will provide you with:

- a mask, sanitizer and the possibility of taking a rapid test before participating
- snacks during the interview

Consent

I have read the whole document and all my questions have been answered. I know that my participation is voluntary and I can leave at any time.

[] You can use my first name/ full name for the purpose of the study

Name _____(optional)

Phone Number _____

Date, Place _____

Signature _____

Focus Group Discussion both

Humboldt University of Berlin

Centre for Rural Development

September 2021

INFORMED CONSENT FORM AS A RESEARCH RESPONDENT

Title of Research Project: The value(s) of food: Promoting sustainable food value chains. A case study from the potato and fish value chains in Uganda

Name of Principal Investigator: Jasmin Ahmed, Lukas Eichelter, Deous Mary Ekyaligonza, Hendrik Hänke, Felix Hegeler, Ronald Kabbiri, Joanita Kataike, Violet Kisakye, Eva Kirmes, Muhangane Lauben, Flavia Marà, Joshua Wesana

Project

We are a German-Ugandan Research team which conducts research on sustainability of the fish and potato value chain in Uganda. The German research members are part of a programme at the Centre for Rural Development at Humboldt University in Germany. We work in cooperation with the German development cooperation. The objective of this study is to understand how the value chain works and what can be improved.

Method

The method you are going to perform is called Focus Group Discussion. We will ask you as a group a few questions concerning your work and your role in the potato value chain. This will take approximately 60 to 90 minutes. The interview session will be audio recorded.

Confidentiality

The records from this study will be kept as confidential as possible. Individual identities/names will be used only with your permission (see below). Research information will be kept in locked files at all times. Only research personnel will have access to the files and only those with an essential need to see names or other identifying information will have access to that particular file.

Benefits and Safety

In return for your contribution and in order to safely conduct the activity we will provide you with:

- a mask, sanitizer and the possibility of taking a rapid test before participating
- snacks during the interview

Consent

I have read the whole document and all my questions have been answered. I know that my participation is voluntary and I can leave at any time.

You can use my first name/ full name for the purpose of the study

Name _____(optional)

Phone Number _____

Date, Place _____

Signature _____

Annex 20: Irish potato evidence-based indicator assessment for non-hot spots

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Biodiversity	Production	Crop rotation; Use of local varieties	2.8	2	5.6

Our survey showed that more than 99 % of interviewed potato farmers practice crop rotation. Farmers mostly rotate Irish potatoes with beans (59 %), maize (48 %), onions (41 %), cabbage (35 %), wheat (27 %), and other crops (25 %). Also, rotation of other crops is widespread with 36 % of farmers indicating they rotate all other crops, most other crops grown (37 %), some other crops 24 %, and less than 3 % rotating none.

According to the literature, the potato varieties planted in Uganda include Rwangume, Victoria, Kinigi, Rwashaki, Mumba, Sutama, Kimuli, Rutuku, Cruza, Mitare, and Kacport¹ (Kajunju et al., 2021). Victoria, Kachpot¹, Rwangume, Kinigi, and Rutuku were bred for fast maturity and disease resistance (Mbowa & Mwesigye, 2016a) by the Kachwekano Zonal Agricultural Research and Development Institute (KAZARDI), which is a public agency in Uganda. Resource-poor farmers in some parts of the country still cultivate local landraces such as Byumba (Kisakye et al., 2020). Late blight and bacterial wilt infections, reduced productivity and market demand, and the widespread introduction of new high-yielding potato varieties has led to the abandonment of other potato varieties such as Cruza, Bumbamagara, Kimuri, Rutuku, Singo, Sutama, Sangema, Marierahinda, Kabale, Kabera, and Meru (Namugga et al., 2017). Moreover, farmers responded to late blight and bacterial wilt infections with a lot of fungicides, a strategy that is expensive and has negative environmental consequences (Namugga et al., 2017) [\[LE1\]](#)

Our survey data shows that the majority (65 %) of the surveyed farmers grow the Rwangume that was officially released in 2016 by the Ugandan National Agricultural Research Organisation (NARO) as NAROPOT 4. It is a locally developed variety suitable for processing. The second-most grown (18 %) variety is Kabale, which was released by NARO in 1991. According to the local agricultural extension officers, however, the farmers referred to this as Kabale, referring to the origin of the seeds in the Kabale district. The extension officers pointed out that the variety could have actually been Rwangume. Knowledge about varieties appears low among farmers. This is also very likely for the 4 % listing "Kampala" as their grown variety. Other varieties that farmers grow include Victoria (7 %) which was released officially in 1991 and Wanale (4 %) that has never been officially released.

With almost all farmers practicing crop rotation, but almost exclusive use of Rwangume, we note a lack of biodiversity and suggest an overall medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Biodiversity	Consumption	Crop Rotation; Use of local varieties	2.0	1	2.0
<p>Crop rotation is not applicable at the consumption stage. The demand for Ugandan varieties on the other hand is high (see 6.2 on the consumption stage). Victoria, Kachpot¹, Rwangume, Kinigi, and Rutuku are in particularly high demand (Mbowa & Mwesigye, 2016a). These varieties are less susceptible to bacterial wilt in comparison to other varieties (Namugga et al., 2017). Overall, we suggest a low (1) impact score. [LE2]</p>					
Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Synergy	Production	Agroforestry; Afforestation	2.9	2	5.8

Agroforestry is a land-use system and practice in which woody perennials are deliberately integrated with crops and/or animals on the same land unit (Leakey, 1996). A well-planned agroforestry system can enhance synergy since trees can control soil erosion, improve soil fertility, and provide fodder for livestock, firewood, construction wood, income, and other ecosystem services (FAO, 2018). A recent study conducted in Bangladesh confirms that agroforestry can increase potato productivity (Amin et al., 2021).

Basamba et al., (2016) report that the main agroforestry technologies adopted by farmers in the eastern agroecological zone of Uganda include boundary planting, scattered tree planting, row planting, and homestead gardening. The authors further note that adoption of agroforestry farming systems depended on the farmers' age, sex, and education level; access to financial services; participation in farmer groups; and access to extension services. Siriri and Raussen (2003) report that, depending on the type of tree species planted, agroforestry has the potential to significantly improve soil nitrogen and consequently yields, suppress weeds, and provide other benefits such as animal fodder and firewood. In the southwestern Kigezi highlands of Uganda, Siriri and Raussen (2003) demonstrated that the benefits of planted tree fallows are greatest at higher zones than lower zones, possibly due to the high nutrient status of the lowlands. Lower zones tend to benefit from deposition of nutrients washed out from upper zones. The authors note that *Sesbania*, *Calliandra*, and *Alnus* species produced positive annual net benefits. Although planting the right agroforestry species is important, their management affects the benefits obtained. Siriri et al. (2010) demonstrated that simple agronomic activities like root and shoot pruning significantly affects crop yields. The authors note that shoot and root pruning is necessary after two years.

We found that 49 % of the farmers grow trees on their potato fields. Among those who had trees, the majority maintained them to provide firewood (79 %), boundary marking (44 %), and construction material (43 %). More farmers maintained trees to obtain provisioning services than regulatory services such as soil erosion control (41 %) and windbreaks (34 %). The trees planted on potato fields include *Cordia Africana* (35.7 %), fruit trees (42.9 %), *Grevillea robusta*, *Maesopsis eminii* (14.7 %), and *Markhamia lutea* (5.3 %). Exotic trees such as *Eucalyptus spp.* (46.6 %) and *Pinus spp.* (13.3 %) were integrated on potato fields by farmers; however, their integration is not beneficial as their leaf litter and root exudates have allelopathic effects (Zhang & Fu, 2010). Farmers' introduction of crops under *Eucalyptus* trees could indicate limited awareness of suitable and sustainable tree-crop combinations.

Planting trees outside of fields, as an indicator for afforestation and hence synergy, is widespread with 86 % of farmers reporting to do so. The purpose of growing trees, namely firewood (84 %), construction (60 %), fruit (43 %), and other (35 %: timber and sales) reveals that afforestation is mainly done for provisioning services, particularly commercial purposes. This is underlined by the most used species being eucalyptus (76 %), fruit trees (51 %), and pine species (40 %). [HH3]

Given the importance of trees in farming and ecosystems at large, the spread of agroforestry, and afforestation for provisioning services, we suggest a medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Carbon Footprint	Production	GHG emissions; access to clean energy	2.3	2	4.6

Greenhouse gas emissions in Uganda potato production could result from agrochemical application (pesticides and fertilizers), transportation of seed and ware potatoes, and energy used during production. Pesticide application is becoming a common practice (adopted by 73 % of the sampled population), posing threats to human and environmental health (Okonya & Kroschel, 2015; Priegnitz et al., 2019). Moreover, manufacturing, transportation, and application of pesticides have been reported to cause substantial greenhouse gas emissions (Heimpel et al., 2013). Some potato farmers (55 % of the sample) have adopted synthetic fertilizer application in their cropping system (Priegnitz et al., 2019), which is a cause of GHG emissions in agriculture (Yu et al., 2021).

GHG emission production during seed and ware potato transportation could be low since most seed and ware potatoes are bought and consumed within Uganda (Mbowa & Mwesigye, 2016). Results from our study show that Uganda imports potatoes from Kenya, especially during times of low production. Importation of food is likely to increase food miles, which, in turn, is likely to contribute to GHG emissions. The challenge is the lack of precise data on the quantity of potatoes transported and imported since the sector is mainly informal and the volume of carbon emitted during the process is unknown.

The hilly terrain in our study area makes all mechanization difficult (Wasukira et al., 2017). Our survey data showed that a mere 3 % of interviewed farmers use tractors, while 65 % use draught animal power, and 86 % use their own manual labour. Such manual labor induces no carbon emissions.

Given the medium GHG emissions in production, mainly stemming from agrochemical use and transportation, and the high use of clean energy on the farms, we suggest an overall medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Water Footprint	Production	Access to water storage; water recycling	2.5	1	2.5

Virtually all surveyed farmers practice rainfed agriculture; the use of irrigation systems is uncommon (Uganda Bureau of Statistics, 2020). The selected indicators of access to water storage and water recycling were, therefore, underpinned by an already low water usage. Our survey showed that slightly more than three-quarters (76 %) of farmers store rainwater with an average storing capacity of 111 Liters. Rainwater is mostly used for domestic use (99 %), livestock (44 %), and only 12 % for irrigation. As most farmers with larger stores use rainwater for irrigation, they, on average, use 197 Liters for irrigating potatoes per day. The average water use of households only slightly exceeds the storing capacity with 120 liters. Water recycling is comparatively scarce with 17 % of farmers using it mainly for irrigation and domestic use. Only 28 % of farmers recycle an average of 17 Liters of water per day, mainly for domestic use and livestock. [\[HH4\]](#) [\[LE5\]](#)

Given the generally high existence of rainwater collection, the low amount of water used, the abundance of water in the two rainy seasons, and the almost exclusive reliance on rainfed agriculture, we suggest a low (1) impact score for the water footprint of potato production.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Recycling	Production	Composting/Manuring; waste management	2.5	2	5.0

The first indicator selected for recycling was the prevalence of composting and manuring described under the hot spot of soil health in Chapter 5.4.

In terms of the other indicator of waste management, 90 % of farmers produce plastic waste and 86 % polyethylene. 77 % of the plastic is burnt and only 13 % is reused or recycled. Polyethylene is mostly burnt (90 %), while only 6 % is recycled or reused. During farm visits, not a lot of plastic and polythene was observed to be used by farmers, especially in rural areas.

Almost 85 % of farmers have crop residues, which they dispose of on the farm as mulch (54 %), use for composting (37 %), or use otherwise (36 %), mostly as animal fodder. Only 69 % have leftover food, which they mostly use for animal fodder. Only 5 % of the farmers reported other types of waste, which is why other types of waste are not included in the impact assessment.

Given the medium spread of composting, widespread practice of manuring, good treatment of organic waste, but problematic disposal of plastic waste, we suggest an overall medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
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Food loss and waste	Consumption	Post-harvest management; Use/availability of storage facilities	2.7	2	5.4
<p>Food loss at household level in Eastern Uganda is estimated at about 5 to 9 %. This is attributed to poor quality potatoes and inconsistencies in the varieties grown. For instance, potatoes with deep eyes, blemishes, and thick skin can produce large losses during peeling because more has to be cut to leave a cleanly peeled, desirable potato (Tatwangire & Nabukeera, 2017). Other food loss at household level is caused by rotting of potatoes during storage due to factors originating mostly at the production level e.g. harvest of premature potatoes and poor post-harvest management. Our findings show that over 69 % of the households reported having leftover food which they mostly used as animal fodder. A study on solid waste management in Soroti district located in eastern Uganda reported that garden waste and leftover food constitutes 40.4 % and 37.1 % of the municipal solid waste (Apolot, 2011). This is indicative of the proportion of food waste in the neighbouring districts of Mbale, Kapchorwa, and Kween; however, there is no literature to indicate the main composition of household food waste in eastern Uganda and, therefore, the actual waste attributed to potato loss at consumption is unknown. We therefore suggest an overall medium impact score.</p>					
Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Inclusion	Production	Jobs for women, youth, unskilled laborers; joint household decision-making	2.8	2	5.6

More than 88 % of farmers use family members as laborers on their farms; 80 % also employ workers, all but 1 % of whom are hired seasonally. On average, potato farmers hire around 10 workers per cropping season and pay them an average salary of 4,800 UGX (1.15 EUR) for a typical 8-hour work day. While 39 % of farmers hire people under the age of 18, 92 % rely on workers aged 18 to 35, and 48 % also employ people older than 35 years old. Most farmers indicated they employ both male and female (47 %) daily labourers or majority female (47 %). Most women are employed in activities involving weeding (95 %), sowing (85 %), harvesting (68 %), and preparing the land (52 %). Less than half of them (46 %) apply fertilizer and only a fifth (22%) of them apply pesticides. Youth and children mainly practice weeding (64 %), harvesting (57 %), sowing (53 %), fertilizer application (51 %), and land preparation (46 %). More than half (55 %) of farmers report tasking children and youth with spraying pesticides. Farmers reported they hardly spend money on protective gear; general use of protective equipment and clothing is very low. In potato production in Uganda, side effects from chemical inputs are widespread among users (Okonya and Kroschel 2015).

Even though average daily wages are just scratching the national poverty line (Ugandan national poverty line is \$0.88 – 1.04 US per person per day, devinit.org 2021), the potato VC provides seasonal labour for women, youth, and unskilled labour.

In two thirds (66 %) of the households, the man (husband) takes major household decisions. In a quarter of the households, both the man and woman (husband and wife) make household decisions together. In a mere 7% of households, the woman (wife) makes the household decisions. A similar pattern can be observed with decisions on purchasing potato production inputs (50 % men, 40 % joint, 8 % women), and selling potatoes (51 % male, 38 % joint, 7 % female). Decisions on potato production, in general, were made 46% of the time jointly, 41% by males, and 11% by females. Decisions around how income was spent within the household were made jointly in 55 % of households, by men in 34 % of the households, and by women in 9 % of the households. While the survey gave a number of options to describe the main decision makers in a household (in addition to female, male, or joint female/male), they were infrequently selected by respondents (“oldest son” was selected in 2-3 % of households).

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Fairness	Consumption	Fairness of profit distribution; fair employment	2.8	Not applicable	0
Both selected indicators are not applicable to the consumption phase.					
Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score

Co-creation of knowledge	Aggregation	Horizontal exchange; access to quality extension services	2.8	2	5.6
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Our qualitative data shows that while horizontal exchange between aggregators seemed to be prevalent, they exchanged knowledge on prices, varieties, transport, storage, and sometimes financing. They exchanged via phone, in groups, or on the market about once per week in the high seasons. Two aggregators reported accessing extension services when needed, while a third one claimed that there are no extension services available to aggregators. Overall, we therefore suggest a medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Co-creation of knowledge	Processing	Horizontal exchange; access to quality extension services	2.9	2	5.8

According to our qualitative data, horizontal knowledge exchange between processors varied vastly. One processor argued that they were too scattered to exchange, while most others regularly exchanged information on pricing, profits, processing, and quality assurance. None of the processors reportedly had access to extension services, except for one who said IFDC's training positively impacted their business through better potato quality. Given this mixed picture, we suggest an overall medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Co-creation of knowledge	Distribution	Horizontal exchange; access to quality extension services	2.8	2	5.6

Horizontal knowledge exchange between distributors and traders was common and included information on storage, prices, transportation, consumer preferences, and business development. Information was shared usually on the market in person or via phone and happened frequently. On the downside, none of the distributors and traders reported having access to extension or advisory services. The only reported access to extension services was by distributors who were also farmers. Given the high horizontal exchange of knowledge, but low access to extension or advisory services, we suggest a medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Agency	Aggregation	Presence of trade unions / associations; access to market price information	2.8	2	5.6

All interviewed aggregators were part of a group with varying degrees of organization: official umbrella organizations for processors, informal groups, and savings groups. In these groups they discuss prices, transportation, storage, and marketing, usually at the market or via phone. One aggregator flagged that his membership and associated meetings were only possible if he had funds available. Access to market price information was prevalent for local and regional prices and some aggregators also knew the prices in Kampala from trusted business partners. Other reported market price information sources included the local government, other middlepersons, and Gulamin Foundation.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Agency	Processing	Presence of trade unions / associations; access to market price information	2.8	2	5.6

Trade unions, associations, or group memberships varied largely among interviewed processors, with some being highly connected on the regional and national levels to some not having access to any exchange platforms. Access to market price information showed a similar pattern: some interviewed processors did not have any market price information beyond their local suppliers and consumers and some exchanged a lot of knowledge. Therefore, we suggest an overall medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Agency	Consumption	Presence of trade unions / associations; access to market price information	2.8	Not applicable	0

Both selected indicators are not applicable to the consumption phase.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Participation	Production	Participation in decisions on what to produce and how; participation in farmers organisations, cooperatives, women's groups	2.9	2	5.8

As shown above under the category of inclusion, household-level decisions in potato-producing families are mostly taken by men. However, decisions specifically around production more frequently were made jointly (46 % of households), by a male household member (41 %), or by a female (11 %). Our qualitative data suggests that seed suppliers felt they can partake in production decisions. As also shown above under the category of agency, membership in organized groups is comparatively high, although these groups underdeliver in some key areas. Also all interviewed seed multipliers were part of an organized group or association. Given the gender inequality in decision making at the production stage and the shortfalls of organizations and associations described above, we suggest an overall medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Participation	Aggregation	Participation in decisions on what to produce and how; participation in farmers organisations, cooperatives, women's groups	2.9	1	2.9

One interviewed aggregator reported not having influence over what potato variety farmers grow. The other two aggregators advised farmers on which seeds and varieties to grow and farmers took their advice. All interviewed aggregators were part of organized groups or associations and regularly exchanged information on profits, prices, markets, financing, and transportation. We hence suggest an overall low (1) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Participation	Processing	Participation in decisions on what to produce and how; participation in farmers organisations, cooperatives, women's groups	2.9	2	5.8
<p>While one processor reported handing out seeds for his preferred potato variety to farmers and encouraging them to grow according to his needs, most other processors lacked this access. They were only able to influence quality by placing their orders with sellers and deciding how to process potatoes. All interviewed processors were part of organized groups, however, leading to a suggested overall medium (2) impact score.</p>					
Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Legal framework and institutional support	Production	Existence of legal framework and regulations; access to quality extension services	2.9	2	5.8

Uganda's third National Development Plan (NPA, 2020) provides overall developmental guidance for Uganda. The main goal of the plan is "to Increase Household Incomes and Improve Quality of Life of Ugandans". The plan is governed by 18 programmes among which are the agro industrialization programme, integrated Transport Infrastructure and Services Programme, and Digital Transformation Programme. The agro industrialization programme aims to increase the competitiveness of agricultural production by ensuring increased labour productivity efficiency. Government efforts toward agricultural transformation emphasize value addition as a pathway to higher household incomes and poverty eradication. The integrated Transport Infrastructure and Services Programme aims at improvement of transport infrastructure to reduce travel time, which is crucial for shortening the value chain. The Digital Transformation Programme aims at increasing the use of ICT in service delivery through the reduction of costs of ICT services. For actors along the agricultural value chain, increased use of ICT bridges the gap between producers and consumers. For the agricultural industry, Uganda's national development plan is very clear about the direction the country should take. Its implementation, however, is debatable. For instance, as much as the government clearly advocates for increased use of ICT in service delivery, they also approved a 12 % tax on the internet which counters the aim of the Digital Transformation Programme.

The National Agricultural Policy (MAAIF, 2013) provides guidance to the agriculture industry in Uganda. The policy mission is to "Transform subsistence farming to sustainable commercial agriculture." (MAAIF, 2013, p.15). The main objective of the policy is "to achieve food and nutrition security and improve household incomes through coordinated interventions that focus on enhancing sustainable agricultural productivity and value addition; providing employment opportunities, and promoting domestic and international trade" (p. X). Just as the National Development Plan, the National Agricultural policy is guided by six specific objectives, all aimed at improving food and nutrition security, increasing household incomes through value addition, promoting domestic and international trade, and building capacity in the agricultural sector. The policy also earmarks several other government support policies and institutions essential for the required transformation.

In addition to the Ministry of Agriculture, Animal Industry and Fisheries, the National Agricultural Policy also outlines ministries that provide support to the sector's transformation. These institutions include the Ministry of Energy, Ministry of Transport and Infrastructure, and the Ministry of Trade and Industry, among others. Other relevant laws applicable to agricultural production include the Agricultural Seeds and Plant Act, The Consumer Protection Act, and the Food and Drug Act (MAAIF, n.d.-b; n.d.-a; 1997). The national agricultural policy spells out clear objectives and implementation strategies required for the transformation of the sector. Decentralization of this policy to workable units in the district- or sub-county-levels is slow and this has hindered the transformation of the sector. While legal frameworks and regulations exist, an assessment of their execution is beyond the scope of this research.

In our own farmer survey, we asked about land rights as a vital legal foundation for farming. Almost all (92 %) farmers own the land they farm, with 69 % having customary land tenure and 24 % being freeholders. A third (34 %) of farmers rent land. Land ownership is most often

heralded by men (57 %), followed by families (32 %), and women (7 %). While land is generally respected by the community (90 %), only 4 % of farmers have a government-issued land title, exposing them to potential future land disputes. On average, control group farmers reported less respect for their own land (82 %) than IFDC farmers (95 %).

One interviewed seed multiplier didn't know of legal frameworks or regulations, while the two others were aware of how to get their business registered and their seeds certified.

Data on the second indicator of access to quality extension services was discussed above under the category of co-creation of knowledge, where we suggested an overall medium impact score. Given this and the existence of legal regulations and frameworks, but almost a fifth of non-IFDC farmers experiencing lack of respect for their land by the community, we suggest an overall medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Legal framework and institutional support	Aggregation	Existence of legal framework and regulations; access to quality extension services	2.9	2	5.8
<p>No interviewed aggregators knew of regulations or legal frameworks specific to their work, which means they also did not feel hindered by them. Data on the second indicator of access to quality extension services was discussed above under the category of co-creation of knowledge, where we pointed out that most interviewed aggregators had access to extension services. Given these heterogenous findings on the two indicators, we suggest an overall medium (2) impact score.</p>					
Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Legal framework and institutional support	Distribution	Existence of legal framework and regulations; access to quality extension services	2.9	2	5.8
<p>All interviewed traders reported that they had no knowledge of regulations or legal frameworks governing their work. Likewise, only one interviewed trader reported market product distribution control measures. Therefore, their work was also not hindered or frustrated by legal frameworks. Data on the second indicator of access to quality extension services was discussed above under the category of co-creation of knowledge, where we pointed out that this access was generally quite low.</p> <p>Even though these results might allow for a high impact score, our qualitative data suggests that most distributors would not see this as a major challenge in the value chain and we therefore suggest a medium (2) impact score.</p>					
Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Economic Diversification	Production	Number of crops; off-farm income/activities	2.9	2	5.8

On average, farmers grew 10.5 different crops on their farm including fruit trees. Next to Irish potatoes, most farmers grow beans (96 %), maize (91 %), bananas/matoke (81 %), leafy vegetables called *Sukumawiki* (71 %), coffee (66 %), fruit trees (64 %), cabbage (63 %), and onions (59 %). Some of them grow tomatoes (41 %), cowpeas (36 %), pumpkins (36 %), sweet potatoes (36 %), cassava (32 %), yam (31 %), other vegetables (30 %), other crops (23 %), and wheat (23 %). This shows a good mixture of cash and food crops pointing at comparatively large economic diversification. Moreover, almost 98 % of farmers own livestock. Almost all farmers (93 %) own cows, just under 86 % own chicken, and 74% own goats. Other animals are less common, with 13 % of farmers owning pigs, 13 % rabbits, 9 % sheep, and 8% donkeys. Given the small average plot size of 1.1 ha (2.7 acre) in the Mt. Elgon area (IFDC unpublished dataset 2021), this is a high number of crops and livestock.

Only around 46 % of farmers have other sources of income than farming. This number is considerably higher among IFDC farmers (54 %) than non-IFDC farmers (35 %), which does not translate into higher savings, as outlined below, however. Among these off-farm income generating activities, owning a shop (35 %) is followed by holding a civil service position (15 %), doing small-scale transportation (13 %), sales or hawking (13 %), support from family members (9 %), owning a small restaurant (7 %), or being formally employed (6 %). Quite a large number (22 %) indicated other sources such as tailoring, selling animals or animal products, or selling firewood.

Given the high number of crops but the low off-farm income alternatives, we suggest an overall medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Connectivity	Processing	Proximity of producers and consumers (or processors); confidence between producers and consumers	2.9	2	5.8

Most of the interviewed processors buy from intermediaries, traders and distributors, and sometimes directly from farmers. They generally trusted their potato suppliers and were satisfied with the relationship. They mainly sold to supermarkets, schools, or directly to consumers and reported to enjoy a highly trusting relationship with them. We therefore could not identify any issues from the perspective of the we interviewed and suggest a low (1) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
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Connectivity	Distribution	Proximity of producers and consumers (or processors); confidence between producers and consumers	2.8	1	2.8
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Like processors, all interviewed distributors reported to know their producers and customers and to have trust and confidence in their business partners. They frequently re-use existing business contacts. We therefore suggest a low (1) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Commercial viability	Production	Capacities to compete sustainably; competitiveness against imported products	2.9	2	5.8

Under the category of economic benefits for all stakeholders below, farmers have low annual profits and low savings, which is why we also assess the capacity to compete sustainably as low.

Regarding the indicator of competitiveness against imported products, potato production in Uganda in 2013 fell about 200,000 metric tonnes short of the domestic demand of over 400,000 metric tonnes (Kajunju et al., 2021). The deficit was covered by imports from South Africa or Egypt, mainly feeding the large supermarket chains and high-end hotels and restaurants. According to Tatwangire & Nabukeera, (2017) and the European Commission (2001), some fast-food outlets rely on imported frozen French fries from South Africa and Egypt. In 2017, the country imported 18,000 metric tonnes of fresh or frozen potatoes which translated to a value of \$4.8 million (Kajunju et al., 2021). While the imported frozen fries are sold at \$3.37 USD/kg, local French fries are sold at \$0.84 USD/kg which creates a price difference of over 300 % (Witte, 2013). Although there is insufficient data on potato imports from neighbouring countries, it is estimated at about \$1.6 million (UBOS, 2019).

However, there is limited information on potato trade between Uganda and its neighbors at the two border points in Rwanda and Kenya. According to Tesfaye et al. (2010), some traders import potatoes from Rwanda to Uganda through the Katuna border with some informal trading also taking place in the smaller, porous borders. However, the Katuna border between Uganda and Rwanda has been closed to both human and cargo traffic for close to two years, which has halted the formal potato trade between the two countries. According to the World Bank, in 2019 Uganda imported 9000 kg of vegetables, seed potatoes (fresh or chilled) from Kenya (WTIS, 2019).

However, due to the porous nature of the border, more unregistered informal trade in potatoes between Uganda and Kenya may be taking place at unmonitored border points. Tatwangire and Nabukeera (2017) report that the Shangi potato variety from Kenya is often imported in eastern Uganda during periods of low supply between February and April. The imported potatoes are sold at a relatively higher price of 800 shs/kg and sold for 1000 shs/kg in Mbale. Some distributors in our study revealed that the Kenyan potatoes are already on the market in Mbale and are considered of higher quality and sold at a higher price. They report that a 50kg bag of Kenyan potatoes is bought at the same price as a bag of 100kg of Ugandan potatoes. They attribute this to better quality and packaging.

Notably, there are different types of consumers for different products (i.e imported potatoes and local potatoes) due to the glaring price disparity. This makes the local potatoes competitive in the local market despite the existence of imported potato products in urban areas. For instance, while middle-class, high-income earners can afford imported potatoes, the larger group of urban poor and rural consumers can only afford local varieties. Moreover, the Elgon region lacks large supermarket chains that rely on imported French fries while major hotels like Noah's Ark in Kapchorwa rely on locally produced potatoes. Therefore, although some imported potatoes from Kenya are sold in Uganda, they are not a significant threat to the local potato industry since they are more expensive and thus only afforded by higher-end consumers. In fact, our own data shows that about 54 % of farmers in Mbale, Kapchorwa, and Kween did not know about imported potatoes at all. Of those who were familiar with imported potatoes, only 14 % considered them to be cheaper than local ones and even less that 9 % thought that they were of a better quality. Therefore, local products' ability to compete with imported products seems to be high from farmers' perspectives. This means that the impact score is low.

Interviewed seed multipliers reported to be particularly competitive with imported seed potato from Kenya, since imports have stopped due a disease outbreak across the border. Given that farmers, as will be argued below, make low profit and can save little, but seem to be very competitive against imported potatoes, we suggest an overall medium (2) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Commercial viability	Aggregation	Capacities to compete sustainably; competitiveness against imported products	2.9	1	2.9

Interviewed aggregators either did not know about imported potatoes or felt able to compete for the reasons listed above. They mostly reported buying imported potatoes during times of local supply shortages. We therefore suggest a low (1) impact score.

Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Commercial viability	Processing	Capacities to compete sustainably; competitiveness against imported products	2.8	2	5.6
<p>Most interviewed processors indicated they are able to compete sustainably and to be competitive against imported products. One processor, however, pointed to the middle class preferring imported potato chips from international brands. Without available data on processed potato imports, we therefore suggest a medium (2) impact score.</p>					
Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Commercial viability	Distribution	Capacities to compete sustainably; competitiveness against imported products	2.9	1	2.9
<p>One interviewed distributor reported his biggest competition to be other intermediaries buying at higher prices or farmers selling directly to transporters. Another said that, while paying slightly higher prices to farmers than his competitors, he was still able to save money and reinvest it in the business. Other distributors reported they were able to access bank loans and invest their own profit in the business to compete sustainably.</p> <p>While most distributors said that Ugandan potatoes dominate the market and they would not usually buy and sell Kenyan potatoes themselves, one distributor indicated that competitors distribute Kenyan potatoes that are double the price and good for chip processing. Nobody seemed to see Kenyan potatoes as a threat to their own business.</p>					
Category	VC Stage	Selected Indicators	Relevance Score	Impact Score	Sustainability Hot Spot Score
Economic benefits for all stakeholders	Processing	(Annual) profits; Ability to invest in business opportunities	2.8	2	5.6

While varying highly between large-scale potato chip processors and small-scale restaurants, all interviewed processors reported high monthly savings in relation to farmers and indicated a high ability to reinvest in their own business. Given the lack of data, however, we suggest a medium (2) impact score.

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Annex 21: Nile perch-evidence based indicator assessment for non-hotspots – Environmental Dimension

VC Stage Category	Production			Aggregation			Processing			Distribution			Consumption		
	Relevance	Impact	SHSA	Relevance	Impact	SHSA	Relevance	Impact	SHSA	Relevance	Impact	SHSA	Relevance	Impact	SHSA
1.1. Biodiversity	3.00	3	9.00	2.12	2	4.24	2.06	3	6.18	2.06	2	4.12	1.88*		
<i>Indicators:</i> Breeding grounds, Species diversity, Immature fish, Abundance			SHS1	No direct impact on lake ecosystems. No direct causes of supply pressure, only extended arm of processors.					SHS2	High reliance on stable Nile perch supply from healthy lake ecosystem. Selling other fish is a viable alternative. (KA2, KM2, KM5)			* No impact assessment *		
1.2. Water quality	2.88	3	8.65	1.12*			2.47	0	0	1.47*			2.35	2	4.71
<i>Indicators:</i> Eutrophication, Heavy metals, Microplastic			SHS3	* No impact assessment *			Release of chemicals at landing sites and factories (e.g. chlorines, waste water) allegedly occurs, but no data. (JN2, JN3, KY5)			* No impact assessment *			Heavy metal loads (e.g. Mercury) in Nile perch are prevalent but not above a critical level. (JN3)		
1.3. Synergy	2.76	3	8.29	0.71*			1.53*			0.88*			1.82*		
<i>Indicators:</i> Water level, Benthic, Buffer zones			SHS4	* No impact assessment *			* No impact assessment *			* No impact assessment *			* No impact assessment *		
1.4. Equipment	2.94	3	8.82	2.06	1	2.06	2	1	2.00	2.12	1	2.12	1.35*		
<i>Indicators:</i> Boats with/without motor, Gillnets			SHS5	Middlepersons sometimes supply fishers with illegal gear but that is not the norm (KA3, KS3, MA4).			Artisanal processing is involved in processing undersized Nile perch that is caught with illegal methods. (KS3, KS4, MA7)			Local market is distributing undersized Nile perch that is caught with illegal methods. (JN6, KY1)			* No impact assessment *		
1.5. Carbon Footprint	2.53	1	2.53	1.82*			1.88*			1.65*			1.53*		
<i>Indicators:</i> GHG emissions	Fishing on Lake Victoria is small-scale fishing with low level of mechanization. Only fuel inputs cause emissions. (JN3, KL1)			* No impact assessment *			* No impact assessment *			* No impact assessment *			* No impact assessment *		
1.6. Water Footprint	2.56	0	0	1.56*			2.65	2	5.30	1.53*			2.06		
<i>Indicators:</i> Chemical inflows, Water use			No data available.	* No impact assessment *			Water use per 1 kg Nile perch (for icing and cleaning): Factory: 7 liters; Artisanal: 1-2 liters (EN1, KY8)			* No impact assessment *			No data available.		
1.7. Recycling & Food Loss	2.47	1	2.47	1.76*			2.65	1	2.65	2.24			2.29		
<i>Indicators:</i> Non-fish waste, Processing by-products	Recycling of boat wood for construction; Recycling of gillnets as ropes. (KY7, KY8, NA1)			* No impact assessment *			Fish by-products are processed after factory handling to specific processors. Artisanal sector uses by-products as well. (KM1)			No data available.			No data available about consumer behaviour in export markets (e.g. Europe).		
1.8. Animal Welfare	2.59	2	5.18	1.47*			2.24	0	0	1.76*			1.88*		
<i>Indicators:</i> Catching methods, Immature fish, By-catch	Monofilament gillnets cut fish skin and catch undersized individuals; causes microplastic pollution and ghost nets. (JN3)			* No impact assessment *			Not applicable (Fish is already dead at processing stage).			* No impact assessment *			* No impact assessment *		

* No impact assessment due to low-relevance scoring by stakeholders (Relevance score < 2)

Annex 21: Nile Perch evidence-based indicator assessment for non-hotspots - Social Dimension

Category \ VC Stage	Production			Aggregation			Processing			Distribution			Consumption		
	Relevance	Impact	SHSA	Relevance	Impact	SHSA	Relevance	Impact	SHSA	Relevance	Impact	SHSA	Relevance	Impact	SHSA
2.1. Access and use of resources	2.94	3	8.82	2.59	2	5.18	2.94	1	2.94	2.71	1	2.71	1.88*	0	0
<i>Indicators:</i> Access to boats; Access to gear; Access to fuel; Hygienic handling	SHS6			Islands are more isolated (less infrastructure, need of cooling facilities), but it is not a major obstacle. (NA2, KL1)	Strict hygienic standards for industrial processing forced by the export markets. (EN1, KM3)			Adapted to standards of international market. Processing plants are located in Kampala/Entebbe (good access to resources). (EN1, KM3)			Not an issue here (Food waste and Food availability fall under other categories).				
2.2. Social values and diets	2.24	3	6.71	1.35*			1.76*			1.76*			2.35	1	2.35
<i>Indicators:</i> Food and nutrition security; Tradition and identity; Cultural taboos and norms	SHS7			<i>* No impact assessment *</i>			<i>* No impact assessment *</i>			<i>* No impact assessment *</i>			Nile perch is not the preferred fish, but also less available for export reasons. Still, nutrition (fish) among our respondents is not an issue as other fish is frequently eaten. (MA7)		
2.3. Fairness	2.47	3	7.41	2.53	2	5.06	2.47	2	4.94	2.41	2	4.82	1.76*		
<i>Indicators:</i> Fair employment; Condition of women and children; Profit distribution; Corruption	SHS8			Power and corruption attributed to traders, but they also rely on factories. (KA2, NY2, MA5)	Employment is regulated through contracts, but not enough data on how fair contracts are. (EN1, KM3)			Sales are regulated through contracts with wholesalers in the respective markets. No data if corruption is an issue. (KM3)			<i>* No impact assessment *</i>				
2.4. Co-creation of knowledge	2.71	1	2.71	2.47	1	2.47	2.71	2	5.41	2.71	2	5.41	1.94*		
<i>Indicators:</i> Traditional knowledge; Horizontal exchange; Vertical exchange; Extension services	Share knowledge about prices, locations of good catch. Few traditional knowledge involved and if there is, it is not an issue (migration of fish). (NY1, KS3)			Some do not share because they feel competition but most traders have horizontal and vertical (mainly about price) interaction. (KY6, MA5, KY9)			Not much knowledge sharing between factories. There are some traditional methods in artisanal processing. (EN1, KM3)			Not much non-contractual exchange and traditional knowledge in the distribution stage. Still, vendors of artisanal processed Nile perch exchange about quality and recessions with consumers. (JN1, KM3)			<i>* No impact assessment *</i>		
2.5. Agency	2.59	3	7.76	2.47	2	4.94	2.59	2	5.18	2.47	1	2.47	1.35*		
<i>Indicators:</i> Organization; Dependencies	SHS9			Traders have some power but depend on fish deliveries from fishers and also on their loans from factories. (MA5, KY9)	Some (women) associations for artisanal processing but dependencies persist. (KY8, KM4)			Industrial processors/distributors well organised within UFPEA (KM5)			<i>* No impact assessment *</i>				
2.6. Participation & Inclusion	2.29	2	4.59	2.12	1	2.12	2.53	2	5.06	2.41	1	2.41	1.53*		
<i>Indicators:</i> Inclusion of vulnerable groups; Participation in decision-making	Household decision-making: mostly men, sometimes equally split. Most fishers feel decision-making power within their business. Women do not participate in fishing. (JN1, MA4, KS3, KY8)			Women involved in trading. Migration not an issue. People with physical limitations are included in the sector. (KY8, JN3, KY5)			Many women in artisanal processing. Not much Ugandan participation in industrial processing. (KY8, MA2, JN2)			Men and women sell in the markets. (JN1, own observation)			<i>* No impact assessment *</i>		
2.7. Legal framework	2.76	3	8.29	2.59	2	5.18	2.76	1	2.76	2.35	1	2.35	1.65*		
<i>Indicators:</i> Existence of legal framework; Application of laws; Permits	SHS10			Most traders and mongers are having licences. Maw trading is regulated but will require monitoring. Imbalance of benefits between maw trading and Nile perch trading. (Annex 14, MA4)	Export standards are well organised/ harmonisation with EU. There is also a new guidelines for artisanal processing. (KM3, KM5)			<i>* No impact assessment *</i>							

* No impact assessment due to low-relevance scoring by stakeholders (Relevance score < 2)

Annex 21: Nile Perch evidence-based indicator assessment for non-hotspots - Economic Dimension

Category	VC Stage	Production			Aggregation			Processing			Distribution			Consumption		
		Relevance	Impact	SHSA	Relevance	Impact	SHSA	Relevance	Impact	SHSA	Relevance	Impact	SHSA	Relevance	Impact	SHSA
3.1. Economic diversification		2.65	2	5.29	2.29	2	4.59	2.71	2	5.41	2.41	1	2.41	2.00	0	0
<i>Indicators:</i> Processing, Different methods and fish species, Fish maw business		Fishers do not exclusively rely on Nile perch - also Mukene and Nile tilapia can provide income and food. However, Nile perch is by far most profitable fish. (KA1, KS3, MA4)			Traders are mostly focussed on one or two fish species, but at landing sites usually all fish species could be potentially handled. Fish maw business serves as additional income opportunity. (KA5, KA6, KY6, NY2)			Industrial processing relies on Nile perch filet as economic mainstay, but also maw and by-products provide income. Artisanal processing has the chance to diversify with other fish species. (EN1, KM4, KY3)			Ugandan export business is dependent on processed Nile perch filets from factories. The local market is dominated by Mukene & Nile tilapia, Nile perch (smoked) is a minor business. (JN6, KM3, KM5, KY1)			Not applicable.		
3.2. Economic resilience		2.65	3	7.94	2.41	2	4.82	2.53	3	7.59	2.47	1	2.47	1.35*		
<i>Indicators:</i> Financial services, Non-fishing income/activities, Contracts, Governmental support, Insurance		SHS11			Middlepersons have no formal contracts with fishers or factories. Traders have low fixed costs and can work in different areas on days without fish. (KA6, KY3, KY6, NY2)			SHS12			Wholesalers in export markets are selling typically various species from different origin countries (EN1, KM3, KM5). Artisanal distributors are mostly women who also sell various products (JN1, JN6, KY4).			* No impact assesment *		
3.3. Connectivity		2.59	2	5.18	2.41	1	2.41	2.65	1	2.65	2.82	1	2.82	2.12	1	2.12
<i>Indicators:</i> Market information, Market access, Marketing channels, Market access, Trust		Access to market information is very low; usually only price info through downstream VC actor. However, level of trust and stability/reliability of business partners is very high (informal contracts). (JN6, KA1, KA3, KL1, KM1, KS3, KY6, MA4, NA1, NY2)			Industrial processors share info about regulations. Collaboration with middlepersons/fishers is stable and reliable for both sectors, artisanal and industrial. (EN1, JN5, KM3)			Formal contracts exist between industrial processors & wholesalers. Business relations are long-lasting and reliable. (EN1, KM1, KM3)			Overseas consumer usually do not know exact origin of fish but can rely on standards and traceability of regulations. Local consumers can compare prices on-site. (KM5)					
3.4. Commercial Viability		2.71	2	5.41	2.41	1	2.41	2.53	3	7.59	2.47	1	2.47	1.76*		
<i>Indicators:</i> Capacities to compete sustainably, Market power concentration, Competitiveness with export market		Sustainability of fishing is regarded as task of the government. High entry barriers for crew members since landing sites are often dominated by few boat owners. (KM2, KM4, KS3, MA4, NY3)			Landing site business is often distributed among few middlepersons, but in general buying the trading license is only entry condition (KA4, KY5, KY6). Potential influence on sustainability of fishing is low in this sector.			SHS13			Export competitiveness is high; Nile perch demand is continuous. Export markets are well organized and have harmonized standards. More regulations could be undertaken for a shift towards sustainable fishing. (KM4, KM5)			* No impact assesment *		
3.5. Economic benefits		3.00	3	9.00	2.71	2	5.41	2.65	2	5.29	2.53	2	5.06	1.88*		
<i>Indicators:</i> Profitability, Price volatility, Income, Tax payments, Number of employees		SHS14			Middlepersons profits are very high, risk is calculable and fixed costs low. Lack of fish also threatens their business since they give loans/investments to fishers in advance. (JN3, KM2, NY2)			If Nile perch supply is stable, the processing business is very profitable. In times of resource scarcity fixed costs (e.g., factory worker wages) are high. Price volatility is high but not extreme. (EN1, KM3, KM5, KY4)			Overfishing and fish scarcity means a severe blow for the whole Nile perch VC. In times of fish supply exporting Nile perch is a profitable business. (KM5)			* No impact assesment *		

* No impact assessment due to low-relevance scoring by stakeholders (Relevance score < 2)

Annex 22: Checklist landing sites and results

No	Characteristics		Landing site XY
Date			Yes = 1, No = 0
1	Management	Official landing site inspector/officer	
		Mainly adequate boat size	
		Record keeping/ statistics	
		Up-to-date statistics (on fish catch)	
		Fish lifters/handlers	
2	hygienic/protection standards	Coats	
		Rubber boots	
		Adequate handling/storage (waste removed quickly, fish not on the floor)	
		Sinks/ clean water	
		Toilets	
		Roof	
		Fenced area	
3	Infrastructure	Weighing station	

		Electricity	
		Loading ramp/ trucks	
		Ice plant	
		Connected to paved road	
		Situated on island	
4	Connection/Environment	Social services (schools, hospitals)	
5		project/NGO support?	
Source: Own source			

Results:

Count of Response			Response		
Landing site	Characteristics	Attribute	No	Yes	Grand Total
Kasenyi	Connection/Environment	Project/NGO support		1	1
		Social services (schools, hospitals)		1	1
	Connection/Environment Total			2	2
	Hygienic/protection standards	Adequate handling/storage (waste removed quickly, fish not on the floor)		1	1
		Coats		1	1
		Fenced area		1	1
		Roof		1	1
		Rubber boots		1	1
		Sinks/ clean water		1	1
		Toilets		1	1

	Hygienic/protection standards Total			7	7
	Infrastructure	Connected to paved road	1		1
		Electricity		1	1
		Ice plant		1	1
		Loading ramp/ trucks		1	1
		Situated on island	1		1
		Weighing station		1	1
	Infrastructure Total		2	4	6
	Management	Fish lifters/handlers		1	1
		Mainly adequate boot size		1	1
		Official landing site inspector/officer		1	1
		Record keeping/ statistics		1	1
		Up-to-date statistics (on fish catch)		1	1

	Management Total			5	5
Kasenyi Total			2	18	20
Kisima 1	Connection/Environment	Project/NGO support		1	1
		Social services (schools, hospitals)	1		1
	Connection/Environment Total		1	1	2
	Hygienic/protection standards	Adequate handling/storage (waste removed quickly, fish not on the floor)	1		1
		Coats	1		1
		Fenced area	1		1
		Roof	1		1
		Rubber boots	1		1
		Sinks/ clean water	1		1
		Toilets		1	1
	Hygienic/protection standards Total		6	1	7

	Infrastructure	Connected to paved road	1		1
		Electricity	1		1
		Ice plant	1		1
		Loading ramp/ trucks	1		1
		Situated on island		1	1
		Weighing station	1		1
	Infrastructure Total		5	1	6
	Management	Fish lifters/handlers		1	1
		Mainly adequate boot size	1		1
		Official landing site inspector/officer	1		1
		Record keeping/ statistics	1		1
		Up-to-date statistics (on fish catch)		1	1
	Management Total		3	2	5

Kisima 1 Total			15	5	20
Kiyindi	Connection/Environment	Project/NGO support		1	1
		Social services (schools, hospitals)		1	1
	Connection/Environment Total			2	2
	Hygienic/protection standards	Adequate handling/storage (waste removed quickly, fish not on the floor)		1	1
		Coats		1	1
		Fenced area		1	1
		Roof		1	1
		Rubber boots		1	1
		Sinks/ clean water		1	1
		Toilets		1	1
	Hygienic/protection standards Total			7	7
	Infrastructure	Connected to paved road	1		1

		Electricity		1	1
		Ice plant		1	1
		Loading ramp/ trucks		1	1
		Situated on island	1		1
		Weighing station		1	1
	Infrastructure Total		2	4	6
	Management	Fish lifters/handlers		1	1
		Mainly adequate boot size		1	1
		Official landing site inspector/officer		1	1
		Record keeping/ statistics		1	1
		Up-to-date statistics (on fish catch)		1	1
	Management Total			5	5
Kiyindi Total			2	18	20

Masese	Connection/Environment	Project/NGO support		1	1
		Social services (schools, hospitals)	1		1
	Connection/Environment Total		1	1	2
	Hygienic/protection standards	Adequate handling/storage (waste removed quickly, fish not on the floor)	1		1
		Coats		1	1
		Fenced area	1		1
		Roof		1	1
		Rubber boots		1	1
		Sinks/ clean water	1		1
		Toilets		1	1
	Hygienic/protection standards Total		3	4	7
	Infrastructure	Connected to paved road	1		1
		Electricity	1		1

		Ice plant	1		1
		Loading ramp/ trucks	1		1
		Situated on island	1		1
		Weighing station		1	1
	Infrastructure Total		5	1	6
	Management	Fish lifters/handlers	1		1
		Mainly adequate boat size		1	1
		Official landing site inspector/officer		1	1
		Record keeping/ statistics		1	1
		Up-to-date statistics (on fish catch)		1	1
	Management Total		1	4	5
Masese Total			10	10	20
Nakitiba	Connection/Environment	Project/NGO support		1	1

		Social services (schools, hospitals)		1	1
	Connection/Environment Total			2	2
	Hygienic/protection standards	Adequate handling/storae (waste removed quickly, fish not on the floor)		1	1
		Coats		1	1
		Fenced area		1	1
		Roof		1	1
		Rubber boots		1	1
		Sinks/ clean water		1	1
		Toilets		1	1
	Hygienic/protection standards Total			7	7
	Infrastructure	Connected to paved road	1		1
		Electricity		1	1
		Ice plant	1		1

		Loading ramp/ trucks		1	1
		Situated on island		1	1
		Weighing station		1	1
	Infrastructure Total		2	4	6
	Management	Fish lifters/handlers		1	1
		Mainly adequate boat size		1	1
		Official landing site inspector/officer		1	1
		Record keeping/ statistics		1	1
		Up-to-date statistics (on fish catch)		1	1
	Management Total			5	5
Nakitiba Total			2	18	20
Njoga	Connection/Environment	Project/NGO support	1		1
		Social services (schools, hospitals)	1		1

	Connection/Environment Total		2		2
	Hygienic/protection standards	Adequate handling/storage (waste removed quickly, fish not on the floor)	1		1
		Coats	1		1
		Fenced area	1		1
		Roof	1		1
		Rubber boots	1		1
		Sinks/ clean water	1		1
		Toilets		1	1
	Hygienic/protection standards Total		6	1	7
	Infrastructure	Connected to paved road	1		1
		Electricity		1	1
		Ice plant	1		1
		Loading ramp/ trucks	1		1

		Situated on island		1	1
		Weighing station	1		1
	Infrastructure Total		4	2	6
	Management	Fish lifters/handlers	1		1
		Mainly adequate boot size		1	1
		Official landing site inspector/officer		1	1
		Record keeping/ statistics		1	1
		Up-to-date statistics (on fish catch)		1	1
	Management Total		1	4	5
Njoga Total			13	7	20
Grand Total			44	76	120
Source: Own data					



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