Milestone 3: Questionnaires on users' needs completed and analysed

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Outline

Summary

The SEACRIFOG project promotes the EU-Africa cooperation dialogue at different levels (policy, science, society) on the following themes: land use, land use change, climate-smart agriculture, food security, carbon cycle and greenhouse gases (GHG) observations and capacity development, in order to support climate adaptation and mitigation. The project shall develop a road map towards an African network of research infrastructures (RI) for long-term observation of GHGs, climate change and environmental dynamics.

In order to engage relevant stakeholders from Africa and EU, we organized 3 stakeholder consultation workshops. In total, 73 participants from 33 organizations attended the three stakeholder's workshops (held in Kenya in May 2017, Ghana in June 2017, and Zambia in April 2018). During the world café, the participants shared their knowledge about: 1) Land use change implications on food security, 2) GHG observations, carbon stocks and climate change mitigation, 3) Clime-smart agriculture in Africa. This report summarizes the main outcomes of these participatory events.

The most prominent and common issues raised, were concerning data and metadata availability, accessibility, usability, interoperability, resolution. Capacity development particularly training programmes are needed for GHG monitoring, ArcGIS. The importance of sharing data and knowledge and the need to develop not only technologies and research infrastructures but also strong and collaborative networking was emphasized. Decision-makers at various levels need an improved access to current know-how and capabilities on new technologies and best practices. Beside scientific and technical aspects, the solution to part of constraints must be a comprehensive approach considering also socio-economic dynamics which may influence the success and the long-term sustainability of RI network Science alone is not enough, thus mediation among scientists and stakeholders along the entire chain of end users could help in facing some of the crucial aspects. A coherent and thorough analysis and prioritization of all these issues will help in developing a basket of options suitable for specific "on field" conditions, at national or regional level.

We would like to thank to SEACRIFOG project partners, who supported the workshops preparation - SASSCAL, ICOS, Thünen Institute of Climate-Smart Agriculture and WASCAL as well as to regional partners - University of Energy and Natural Resources, Ghana.

1 About SEACRIFOG project

SEACRIFOG project focuses on the design of an adaptive concept for a pan-African observational system of climate parameters and greenhouse gases (GHG). Special emphasis is put on land-use, land-use change and climate-smart agriculture. To be prepared for the future climate scenarios and potential emission trajectories, other aspects such as industrial development, and the transport and energy sectors will also be considered.

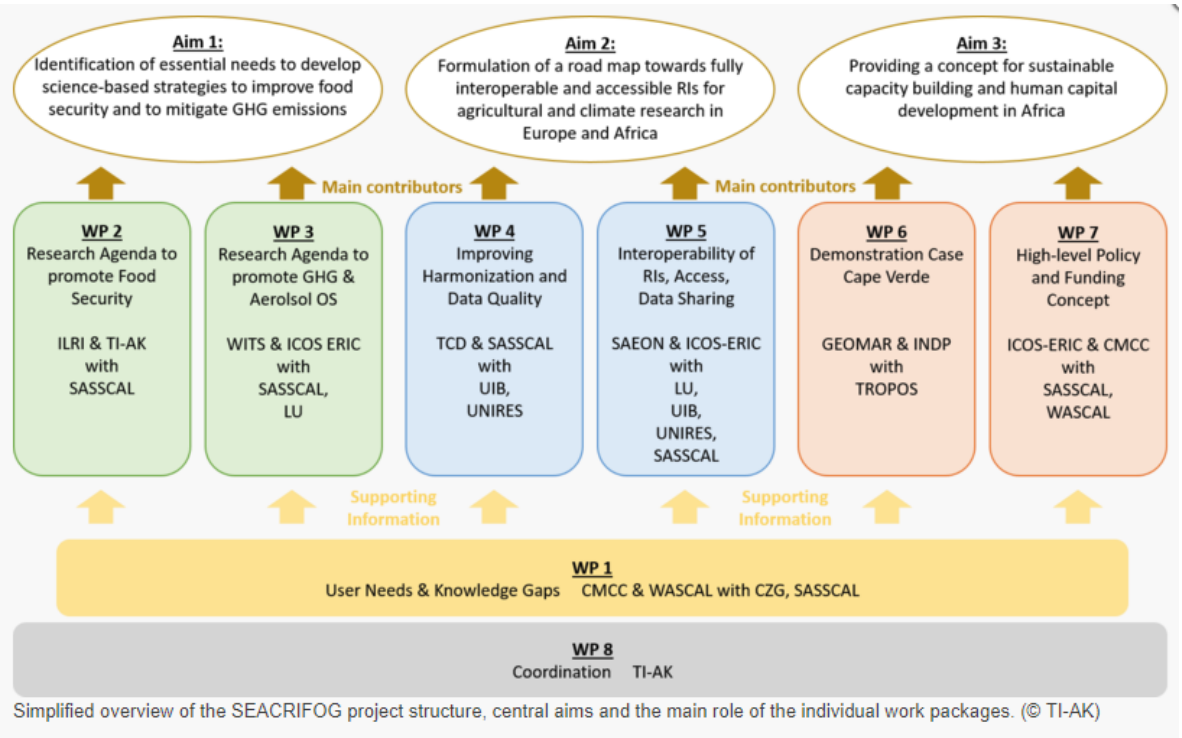

Figure 1: SEACRIFOG project structure

Access to and interoperability of emission data are crucial elements to the project, as these data are fundamental to the development of future climate-smart mitigation options. Within the design study SEACRIFOG connect three major groups of stakeholders at the national/international level: the data providers (research organizations, infrastructures, networks, statistical offices, private sector), the users of these data (scientific organizations, climate modellers, CORDEX-type downscaling communities, bodies in charge of greenhouse gas inventory reporting, NGOs) and possible funders of the proposed project recommendations.

2 SEACRIFOG project Stakeholder Consultation Workshops

SEACRIFOG project recognize the important role of stakeholders' engagement and knowledge co-production when designing an adaptive concept for a pan-African observational system of climate parameters and greenhouse gases (López-Ballesteros *et al.*, 2018).

Therefore, three regional Stakeholders Consultation Workshops were organized in Nairobi (Kenya - East Africa, 31 May 2017), Sunyani (Ghana - West Africa, 16 June 2017) and Lusaka (Zambia - South Africa, 18 April 2018), see Figure 2. The aim of the workshop was to identify general user needs and knowledge gaps in the area of research infrastructure related to land use change (LUC), food security, greenhouse gases (GHGs), and relevant capacity development. The target audience were key stakeholders connected to these areas in Eastern, Western and Southern Africa. The workshop had a format of participative stakeholder consultation workshop, in world-café mode, where participants actively discussed the above-mentioned topics.

Figure 2: Overview of SEACRIFOG Stakeholder Consultation Workshops

2.1 World café format

Participatory Stakeholder Consultation Workshops used world café format to identify and discuss general user needs and knowledge gaps in the area of research infrastructure related land use

change (LUC), food security, GHGs, and relevant capacity development. With the world café format everyone got the chance to participate in all the themes discussed.

The World Café is a structured conversational process intended to facilitate discussion, initially in small groups and then linking ideas within a larger group to access the collective intelligence or collective wisdom in the room (Brown and Isaacs, 2005). Organisers of a World Café formulate questions before an event, related to its goals, which are discussed by participants as they move between a series of tables. The name of the process relates to atmosphere seek to create, as a means to facilitate conversation. As well as speaking and listening, individuals are encouraged to write on a paper or flipchart, so when people change tables they can see what previous members have expressed in their own words and images.

The World Café methodology is a simple, effective, and flexible format for hosting large group dialogue and has several essential elements:

i. ***Setting*****:** Create a "special" environment, most often modelled after a café, i.e. small round tables, butcher block paper, coloured pens, a vase of flowers, and optional "talking stick" item.
ii. ***Welcome and Introduction*****:** The host begins with a warm welcome and an introduction to the World Café process, setting the context, sharing the Cafe Etiquette, and putting participants at ease.
iii. ***Small Group Rounds:*** The process begins with the first of three or more 30 minute rounds of conversation for the small group seated around a table. At the end of the 30 minutes, each member of the group moves to a different new table.
iv. ***Questions*****:** Each round is prefaced with a **question** designed for the specific context and desired purpose of the session. The same questions can be used for more than one round, or they can be built upon each other to focus the conversation or guide its direction.
v. ***Harvest*****:** At the end, after the presentation of thematic tables, individuals are invited to share insights or other results from their conversations with the rest of the large group. These results are reflected visually in a variety of ways, most often using graphic recorders in the front of the room.

2.2 World café topics and questions

i. Land use change implications for food security

Topics focusing on land use and land use changes, adaptive land management and climate-smart agriculture, with the objective to support food security in Africa

- What are the main trends in land use and land cover change in Southern Africa?
- What observational network and data is used to monitor these trends?
- What research infrastructure (observational network) is currently lacking?
- What limits food production in your country / region today?
- What are the expected impacts of land use change on agricultural production?
- What are possible responses to the impacts of land use change on agricultural production? (e.g. through adaptive land management, clime-smart agriculture…).
- What data are needed to support decisions regarding adaptive management, while ensuring food security?
- Are these data available and easily accessible/sharable among different stakeholders categories?

ii. GHG observations, carbon stocks and climate change mitigation

Topics focusing on researcher infrastructure for GHG measurements and carbon cycle, and their implication to climate change mitigation.

- What is the actual situation in Southern Africa concerning GHG observation infrastructure?
- What kind of research infrastructure (observational network) for GHG observation is available in your country?
- What research infrastructure (observational network) is currently lacking?
- What data (e.g. on-site measurements, satellite data, model projections,…) are used to compile GHG emission inventories in Southern Africa?
- What are additional data needs and constraints?
- What resources are needed to develop a comprehensive GHG observation system for African continent?
- Who are the major stakeholders for GHG observation/climate change research in your country / region?

*iii. **Climate-smart agriculture** (topic in Nairobi/Kenya, Sunyani/Ghana)*

Topics related to clime-smart agriculture and adaptation measures.

- How do you understand clime-smart agriculture?
- What clime-smart agriculture measures are undertaken?
- What climate smart agricultural practices should be promoted?
- How to communicate and share know-how concerning climate-smart agricultural practices across diverse stakeholders?

*iv. **Capacity development** (topic in Lusaka/Zambia)*

Topics focusing on training, educational programmes and other methods to develop the capacities needed to manage the above topics.

- Who are the end user groups that should receive information related to LUC and GHG observations?
- Are the results of the research sufficiently transferred to these groups? Through which channels are the results communicated?
- Do the potential users have the capacity to interpret and apply research results? What is missing to make research results applicable in effective way by potential users?
- What capacities are needed to better address LUC and implications to food security / GHG observations and climate change mitigation?
- What training and educational programmes are needed?
- Who can supply this training and educational programmes? (science, research institutes and universities)

Cross-cutting issues discussed within the thematic groups included:

a) ***Research infrastructures*** (current RI on the thematic groups topics, leading institutes, available research services – national, international platforms, what´s lacking, what´s needed to be developed, etc.)
b) ***Data and knowledge needs and gaps*** (what data are available respect to which data are used/needed, what are the knowledge gaps, data policy - access to data)
c) ***User needs*** (from perspectives of particular stakeholders – e.g. scientist, practitioners, farmers)
d) ***Capacity-building*** (personal, institutional capacity and political willingness, outreach of scientific outcomes, good practice etc.)
e) ***Barriers and opportunities***

2.2 Workshop participants

Three SEACRIFOG Stakeholder Consultation Workshops were organized in 2017-2018. In total, 73 participants from 33 organizations attended the three stakeholder's workshops. The workshops were held in Eastern Africa - Nairobi/Kenya (31 May 2017), Western Africa - Sunyani/Ghana (16 June 2017) and Southern Africa - Lusaka/Zambia (18 April 2018). The following section provides overview of workshop organizing partners and participants.

2.2.1 Eastern Africa – SEACRIFOG Stakeholder Consultation Workshop

SEACRIFOG Project Stakeholder Consultation Workshop on ***Needs and knowledge gaps in the area of LUC, food security, GHGs, and clime-smart agriculture*** was held on 31 May 2017 at International Livestock Research Institute, Nairobi, Kenya. The workshop was organized by SEACRIFOG project partners (CMCC, CzechGlobe and ILRI).

The aim of the first SEACRIFOG Stakeholders Consultation Workshop was to involve and interact with relevant partners to identify general ***user needs and knowledge gaps in the area of research infrastructure related to needs and knowledge gaps in the area of LUC, food security, GHGs, and clime-smart agriculture***. The target audience was key stakeholders connected to these areas in Africa.

Figure 3: SEACRIFOG Stakeholder Consultation Workshops participants, Nairobi

Figure 4 shows workshop participants by organization type, for detailed stakeholder composition see Annex 1.

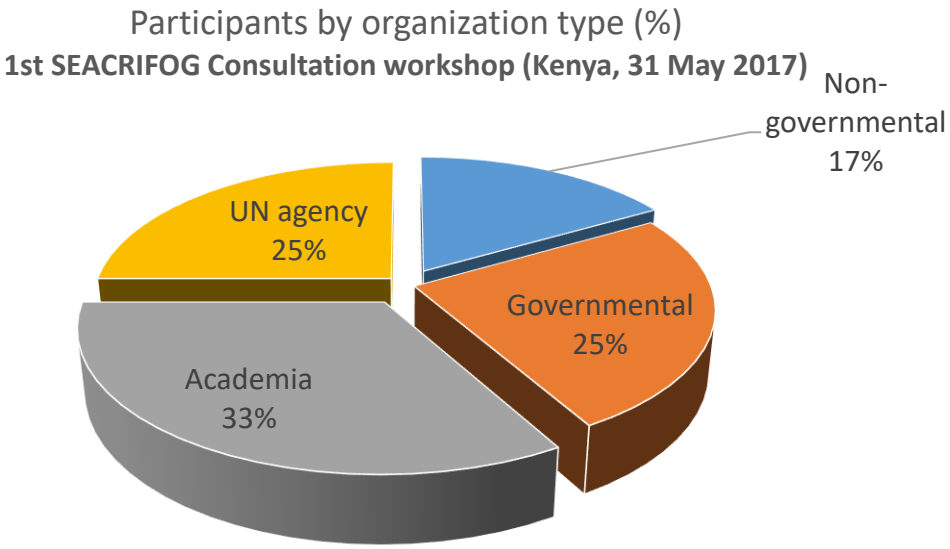

Figure 4: SEACRIFOG Stakeholder Consultation Workshop participants by organization type (Kenya, 31 May 2017)

2.2.2 Western Africa – SEACRIFOG Stakeholder Consultation Workshop

2nd SEACRIFOG Stakeholder Consultation Workshop took place on 16th June 2017 at University of Energy and Natural Resources (UENR), Sunyani, Ghana. The workshop was organized by SEACRIFOG project partners (CMCC, CzechGlobe, WASCAL, ICOS) together with University of Energy and Natural Resources.

Figure 5: Photo of participants of 2nd SEACRIFOG workshop

The aim of the workshop was to identify general ***needs and knowledge gaps in the area of research infrastructure related to land use change (LUC), food security, GHGs, and clime-smart agriculture***. The target audience were key stakeholders connected to these areas in Africa, mostly represented at the AfriGEOSS symposium (13th – 15th June 2017, Sunyani). Overall, 31 participants attended the stakeholder workshop and provided feedback and crosscutting outcomes. Figure 6 shows workshop participants by organization type, for detailed stakeholder composition see Annex 1.

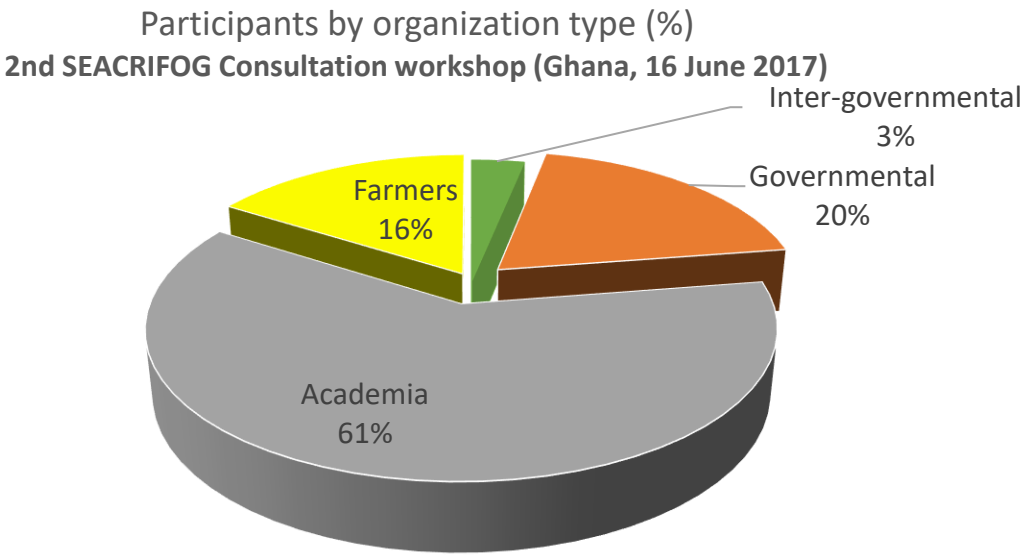

Figure 6: SEACRIFOG Stakeholder Consultation Workshop participants by organization type (Ghana, 16 June 2017)

2.2.3 Southern Africa – SEACRIFOG Stakeholder Consultation Workshop

SEACRIFOG Project 3rd Stakeholder Consultation Workshop took place on 18th April 2018 as a side event of SASSCAL Science Symposium 2018, which took place at Mulungushi International Conference Center, Lusaka, Zambia. The workshop was organized by SEACRIFOG project partners (CMCC, CzechGlobe, SASSCAL, ICOS and Thünen Institute of Climate-Smart Agriculture).

The aim of the workshop was to identify general ***needs and knowledge gaps in the area of research infrastructure related to land use change (LUC), food security, GHGs observations, carbon stocks, climate change mitigation and capacity development.*** The target audience were key stakeholders connected to these areas in Southern-Africa, represented at the SASSCAL Science Symposium 2018 (16th – 20th April 2018, Lusaka).

Figure 7: Photo of participants of 3rd SEACRIFOG workshop *(author: Meshach Shikabeta, Zambia)*

In total, 29 participants from academia, non-governmental and governmental sector attended the stakeholder workshop, see Figure 8, for detailed stakeholder composition see Annex 1.

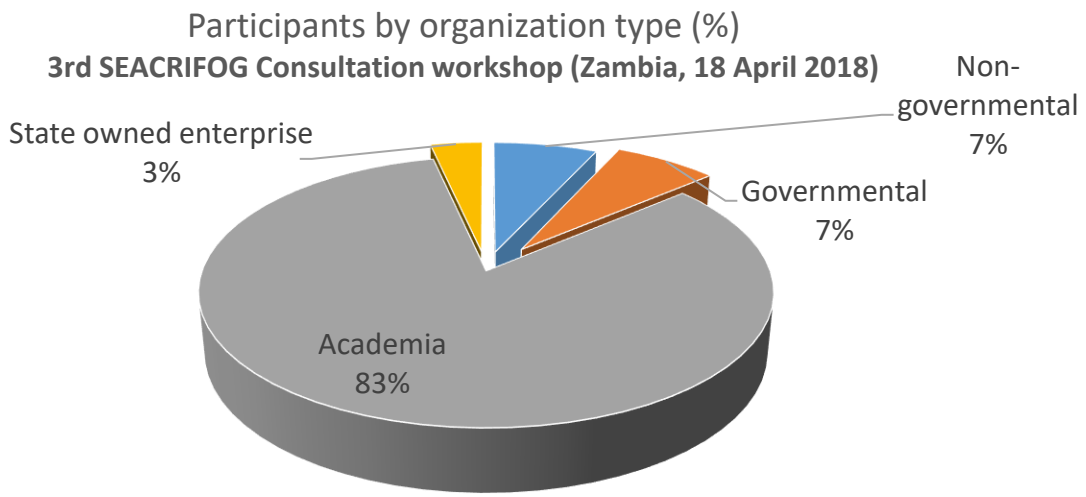

Figure 8: SEACRIFOG Stakeholder Consultation Workshop participants by organization type (Zambia, 18 April 2018)

3 Outcomes of the SEACRIFOG consultation workshops

3.1 Outcomes of the 1st SEACRIFOG Stakeholder Consultation Workshop

Table 1: Summary of world café thematic discussions – 1st SEACRIFOG Stakeholder Consultation Workshop (Nairobi, 31st May 2017)

TOPICS	WORKING GROUP THEME		
	Land use change implications on food security	**GHG observations, carbon stocks and climate change mitigation**	**Climate-smart agriculture**
Data needs and gaps	Low data availability and/or accessibility.		
	Data are often spread, no real network connecting those data, so no sustainability of the observation systems		
	Need for data repositories and data management skills. Data Format: Information are need in a format that can be understood and used.		
	Visibility: often information is not visible, like illegal activities (charcoal)	Need to develop baselines: for GHG emissions, mitigation, adaptation. Need for suitable indicators.	High resolution vs low resolution: example: farmers need local scale data but most of the info they receive is at higher scales.
			Need for short term data: from almost real time (early warning) to seasonal forecast and few years, for food security and adaptation.
			Lower need for historical data or long term future predictions.
	Increasing need and use of remote sensing data and GIS applications		
Capacities			Farmers responsive research - In response to farming needs. This link to the resolution issues
			Indigenous knowledge (traditional forecaster): need to bridge with scientific knowledge.

			Traditional knowledge can be used for innovative solution! Farmers are a source of data and info but the information products, services, etc. have to go back to them
	Not full exploitation of the (human) capacity potential		
Infrastructures	Many efforts in place, but mostly fragmented, no coordination, not connected institutions, with low sharing of information and low accessibility of data.		
	Citizens science could emerge as a new kind of low cost monitoring infrastructure		
Adaptation vs mitigation	Adaptation is a priority for Africa, while mitigation not. Although, mitigation can be seen also as an opportunity: mitigation practices are often also adaptation practices; sustainable productions (soil health, nutrient and carbon conservation, etc.); market opportunity for new technologies.		
Urbanization	New needs for new data and new science.		From farming to urban areas.
Market			Market mechanisms: for export of food products, you may need to certify low carbon emissions.
			Market can influence farmer decisions.

3.2 Outcomes of the 2nd SEACRIFOG Stakeholder Consultation Workshop

Table 2: Summary of world café thematic discussions - 2nd SEACRIFOG Stakeholder Consultation Workshop (Sunyani, 16 June 2017)

TOPICS	WORKING GROUP THEME		
	Land use change implications on food security	**GHG observations, carbon stocks and climate change mitigation**	**Climate-smart agriculture**
Data needs and gaps	Need of synchronization between farmers needs, weather conditions and governmental helps (seeds and fertilizer)	Presence of lots of data but low availability and/or accessibility	
	Maps are a fundamental tool for development and for establishment of land use policy (that is lacking in Ghana).	Data are often spread, no real network connecting those data, so no sustainability of the observation systems	
	Satellite images are very useful for information sharing and communication with stakeholders about the state of the art of the environment.	Need for data repositories	
		Data Format: Information are needed in a format that can be understood and used. Interoperability of data from different sources. Quality of metadata.	
		Inaccurate emission factors	
		Data quality also means data up-to-date: some data are not collected frequently enough for reporting	
		Spatial resolution: High resolution vs low resolution: example: farmers need local scale data but most of the info they receive is at higher scales. Inaccurate previsions	
		Spatial resolution: High resolution data are available but too expensive	
Knowledge needs and gaps	Inadequate combination of technology and local knowledge		
			Enterprise selection, selecting types and quantity of crops
	No information about water resources, the use of water resources is inadequate for absence of communication with		Inadequate awareness about climate change

	local farmers (ground water mostly not used in Ghana).		impacts in the agricultural sector
Infrastructures	Many efforts in place, but mostly fragmented, no coordination, not connected institutions, with low sharing of information and low accessibility of data		
	Investments needed, e.g. into technologies and equipment, role of government subsidies		
Capacities	Need of more cooperation among the farmers category (e.g. cooperatives for accessing to rural bank loans)	Need for data management skills	Combination of technology and local knowledge
	Not full exploitation of the (human) capacity potential		
	Lack of interest for agricultural sector	<u>Guidelines for reporting</u>: necessity for capacity-building of officials to understand and implement the guide lines	
Obstacles	Inadequate resources		
	Complicated land tenure systems		
	Land suitability		
	Land affordability		
	Land fragmentation		
	Inadequate infrastructures able to guarantee the access to the market (storage and processing facilities)		
	<u>Urbanization:</u> - Land conversion from farming to urban areas. Urbanization is rather rapid and vastly horizontal (low-floor buildings)		
	Pressure on farming lands for illegal mining, land sold for real estate development		
	<u>Prices:</u> -Price insecurity of agricultural products - need to reform the price system, no more price per bags of product but price per kg of product - Not adequate and fair price for products		
Solutions	Mobile technology is used to provide advice farmers about weather forecast (SMS info), information sharing and communication with the local farmers (Kenya)		Promotion of elements of climate smart agricultural practices, such as multicropping, agroforestry, shifting crops or organic agriculture
	Farmers responsive research - In response to farming needs		Climate Smart Agri-business: maximize production along value chain, adding value to production
	Improve the assistance to farmers e.g. through the extension offices		Education, communication and awareness: education and assistance for farmers, e.g. with

			regard to technologies or fertilizer application
	Provide assistance with market analyses to cope unpredictable prices		Combine the efforts to maximize the production in mixed production systems
	Know-how sharing concerning innovative technologies, technology transfer, introduce farmers to business thinking.		Know-how sharing concerning innovative technologies, technology transfer, introduce farmers to business thinking.
	Implementation of good storage systems for agricultural products and processing systems		
	Improvement of irrigation systems		
	Promotion of post processed products so that in case of good yield, the price of products will be not decrease, the excess of production not spoiled for inadequate storage systems and for diversifying the source of incomes		
	Land classification and assessment of land productivity (for avoiding building on fertile land useful for farming)		
	Promotion of good agricultural practices with pilot farming systems and local networking for sharing knowledge		
	Demystify science: role of scientists, traditional leaders, agriculture extension officials (mediation)		
	Participatory approach		
Adaptation Vs Mitigation	Adaptation is a priority for Africa, while mitigation not		
	This is an apparent conflict, sometimes due to problems of common understanding (communication issue), because mitigation can be seen also as an opportunity: mitigation practices are often linked to adaptation practices; sustainable productions (soil health, nutrient and carbon conservation, etc.); market opportunity for new technologies		

3.3 Outcomes of the 3rd SEACRIFOG Stakeholder Consultation Workshop

Table 3: Summary of world café thematic discussions – 3rd SEACRIFOG Stakeholder Consultation Workshop (Lusaka, 18 April 2018)

TOPICS	WORKING GROUP THEME		
	Land use change implications on food security	**GHG observations, carbon stocks and climate change mitigation**	**Capacity development**
Data needs and gaps	Data needs: - Soil data - Meteorological data (Zambia: accurate weather forecast missing, only 33 meteo station in the country.)	Data to compile GHG emission inventories are very coarse and lacking accuracy. Since countries are non-Annex I parties to UNFCCC, most GHG emission inventories are calculated based on Tier I indicators and coefficients.	Data needs for land use mapping - missing detailed mapping concerning land use changes, information and data are often fragmented, coming from various sources
	Most important is communication of data!	Data sharing needs to be improved – often hard to access data as ministries and other owners do not share data readily	Data used for GHGs reporting do not usually originate from the reporting country and are taken from elsewhere.
	Better access to data is needed in Zambia. Very centralized structure that needs to be decentralized. Example of good data policy: Integrated Land Use Assessment (ILUA) project.	Data is needed to improve the close of the carbon budgets and improve the regional balance of carbon fluxes (not only atmospheric, or remote sensing, but also in situ data needed).	
	Transboundary information share is needed.		
	Botswana: Data might be available, but link between research and extension officers is weak.		
	Zambia: National Remote Sensing Centre monitors LUC using earth observation.		
	Angola: lack of observational system for natural hazards, risk mapping in preparation.		

Knowledge needs and gaps	Zambia: diversification of crops is governmental issue, but not applied by farmers.	Data gaps in national, regional and continental GHGs observations in Africa.	Missing ArcGIS capacities, availability of software (open source often not available)
	Zambia: Agricultural National Plan exists, but people do not know about it, limited capacity of extension officers.		Capacities in GHG observations and measurements often lacking
	Inadequate equipment in terms of computer software (GIS, remote sensing)		Inaccurate data use - missing experience in data analysis (e.g. if data are used by students the processes of data validation and sensitivity analysis is in some cases omitted, which leads to inaccurate results).
	Zimbabwe: lack of training, land reform led to farming without agricultural knowledge.		
Infrastructures	Missing decentralization and capacity building.	GHG observation infrastructure in Zambia, Botswana, Angola, Namibia: Hardly anything. And if there is anything, it is unclear what happens to the data and how the data can be accessed	Missing research infrastructure on GHG observations.
	There is a need for information platforms/centers like SASSCAL		
	Lack of information for farmers about processing infrastructures.		
	Angola: Food waste due to lack of transport infrastructure.		
Obstacles	LUC drivers identified: - Economy - Agriculture (including beef production) - Mining - Infrastructure development - Illegal logging - Land grabbing - Urban/residential development- urban migration - Water management - Energy demand- e.g. charcoal production leading to deforestation - Population growth	Financial resources	Gap between educational programs and demand of future employers (gap between industrial and governmental demand for skills of the graduates and the actual focus of university programs. Educational programs at universities often do not respond to the demand of the labour market).

	- Governmental policy's- especially in case when subsidies for seeds, fertilizer, etc. increase the expansion of agricultural land - Inadequate information and integration of indigenous knowledge on mitigation of insect/pests infestation - Lack of secure land tenure among rural people (land tenure inequality) - Land tenure- depends where people are from, even in one country the land tenure system may vary. Differences appear when land is private land, traditional administrated or public administrated		
	Zambia: Agriculture is intensified, often monocultures established.	Short-term economic interests usually prevail over long-term environmental interests.	Duplication of efforts (too much of duplications between different efforts that do not know about each other).
	Botswana: Mining for diamonds in the game reserves (Kalahari Reserve) is a problem. Beef export and tourism important economic factors affecting LUC.		Financial constraints (e.g. Zambia: the country has National Biodiversity Strategy and Action Plan (NBSAP), but no financial mechanisms to support the goals of this Strategy. When donors offer funding, in some cases it covers goals of the strategy only partially, or in a fragmented way. The external funding is also unstable, can be halted or interrupted at any time.)
	Angola: Slash and burn practices for agricultural land. Charcoal and timber logging drivers for LUC.		Unstable political environment
	Namibia: Bush clearing for feed stock, biomass for biofuel and charcoal.		
Solutions	Better infrastructure for farming (irrigation and other farming facilities)	Need for GHG data, established research infrastructure network across African continent.	Need for practical "hands-on" experience during the university education (e.g. in form

Solutions			of internship, traineeship programs) that would enrich training of students and support them to provide knowledge and capacities for start of their professional carrier. The imbalance in training was mentioned in case of Angola and Zambia.
	Encouraging crop diversification, promotion of traditional farming and sustainable practices	When properly measured, the GHG data should be consolidated, verified/scrutinized in order to ensure their quality.	Coordination of activities across SADC countries (e.g. establishing a land use change platform that would provide monitoring and evaluation).
	Need for encouraging people for more efficient production	Need for a long time series which implies a certain level of sustainability that is usually not achieved with the research projects carried out in Africa.	Initiatives coming from the countries - The driving force for the capacity development should preferably come from the countries themselves. It should be rather self-driven process, which would increase the ownership concerning capacity development.
	Employment opportunities (in agriculture people are normally not employed)	Focus on regional and continental information (compared to one species or narrow area focus).	Educational programs reflecting labour market demand.
		Newly acquired data would feed into the national reporting processes (where calculations often use emission factors that are not suited for Africa) and the modelling activities.	Educational programs on GHG observations - need for particular training when establishing the network.
	Namibia: Biochar project, to produce biochar from bushes and combine it with manure leading to reduced fertilizer use.	Need for educating, informing, training the local communities for sustainable practices.	Appropriate use and monitoring of NDCs - Nationally determined contributions that were established by Paris Agreement in order to achieve long-term goals and can be used for CC mitigation and capacity development, also in the area of GHG monitoring.
			Capacity building across various levels and stakeholders

			- needs to be done at different levels – students, researchers, government officials, public society as well as institutional capacity building (not only capacity building of the individuals).
			Linking research with applications - outcomes not only for use of researchers, but also to be applicable for end-users (e.g. governmental, private sector).
			Science-policy interface and communication of science and research results - need to share and communicate the research results with end-users, such as private and governmental stakeholders to support decision-making based on research outcomes.

3.4 Main common results and next steps

„The engagement of key stakeholders was crucial in order to tailor the development and implementation of the SEACRIFOG project to the identified fundamental issues of interest to these parties. The most prominent issues raised, concerned data and metadata: availability, accessibility, usability, interoperability, resolution, format and quality. Additionally, the importance of sharing data and knowledge (i.e. methodological guidance and research results) was repeatedly raised by respondents, emphasising the need to develop not only technologies and RIs, but also strong, collaborative and proactive networking at different levels. Adaptation more than mitigation was confirmed to be a priority for Africa. Beside the scientific and technical aspects, the solution to most of the constraints could be a comprehensive approach able to consider not only scientific and ecological issues but also socio-economic dynamics (land tenure, urbanisation, jobs opportunities, market, prices, investments, etc.), which may influence the success and the long-term sustainability of a RI network. Science alone is not always enough, thus mediation among scientists, traditional leaders and agriculture“ (López-Ballesteros *et al.*, 2018).

On the basis of the workshops held, a further event would be recommended in order to address some missing aspects such as the involvement of private sector among the stakeholders and more contextualized solution on the ground.

Literature

Brown, J. and Isaacs, D. (2005) 'The world café: Shaping our future through conversations that matter', p. 300.

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Annex

Annex 1: List of participant organizations in the three stakeholders' workshops organized by the SEACRIFOG consortium

Organization	Type of organization	Number of participants	Geographical coverage
1st Workshop (Kenya, Nairobi, 31st May 2017) - Needs and knowledge gaps in the area of LUC, food security, GHGs, and clime-smart agriculture			
Panafrican Climate Justice Alliance	NGO	2	Regional
Climate Change Department - MEWNR	Governmental institution	2	Kenya
IGAD Climate Prediction and Applications Centre	Research	1	Regional
Kenya Agricultural and Livestock Research Organization	Research	1	Kenya
System for Land-Based Emission Estimation in Kenya	Research	1	Kenya
Low Emission and Climate Resilient Development Project (UNDP)	UN	2	Global
Ministry of Agriculture, Livestock and Fisheries	Governmental institution	1	Kenya
International Development Research Centre	International organization	1	Global

Food and Agriculture Organization of UN - FAO	UN	1	Global
International Livestock Research Institute (ILRI)	SEACRIFOG Project partner	1	Kenya
Euro-Mediterranean Center on Climate Change (CMCC Foundation)	SEACRIFOG Project partner	2	Italy
Univ. Witwatersrand	SEACRIFOG Project partner	1	South Africa
Lund University	SEACRIFOG Project partner	1	Sweden
Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL)	SEACRIFOG Project partner	1	Namibia / Regional
UniResearch	SEACRIFOG Project partner	1	Norway
GEOMAR Kiel	SEACRIFOG Project partner	1	Germany
Univ. Bergen & uniResearch	SEACRIFOG Project partner	1	Norway
University of Nairobi	SEACRIFOG Project partner	1	Kenya
Climate Change, Agriculture and Food Security (CCAFS)/ International Livestock Research Institute (ILRI)	SEACRIFOG Project partner	1	Kenya / Regional
Wondogenet College of Forestry and Natural Resources (WGCF-NR)	SEACRIFOG Project partner	1	Ethiopia
Integrated Carbon Observation System, European Research Infrastructure Consortium (ICOS ERIC)	SEACRIFOG Project partner	2	Finland / Regional

2nd Workshop (Sunyani, Ghana, 16th June 2017) - "Needs and knowledge gaps in the area of land use, land use change, food security, GHGs, and clime-smart agriculture"			
University of Energy and Natural Resources (UENR)	Academia	16	Ghana
Ministry of Food and Agriculture (MOFA)	Governmental Institution	1	Ghana
Department of Agriculture, Sunyani, Ghana	Governmental Institution	3	Ghana
Ghana Space Science and Technology Institute (GSSTI)	Academia	3	Ghana
Regional Centre for Mapping of Resources for Development (RCMRD)	International Organization	2	Kenya / Regional
Office of the Prime minister (OPM)	Governmental Institution	1	Uganda
Local farmers	Farmers	5	Ghana
Survey and Mapping Division of Lands Commission (SMD-LC)	Governmental Institution	1	Ghana
Global Change Research Center of the Czech Academy of Sciences (CzechGlobe)	SEACRIFOG Project partner	2	Czech Republic
Euro-Mediterranean Center on Climate Change (CMCC Foundation)	SEACRIFOG Project partner	1	Italy
Integrated Carbon Observation System, European Research Infrastructure Consortium (ICOS ERIC)	SEACRIFOG Project partner	1	Finland / Regional
West African Science Service Center on Climate Change and Adapted Land Use (WASCAL)	SEACRIFOG Project partner	1	Ghana

3rd Workshop (Lusaka, Zambia, 18th April 2018) – "Needs and knowledge gaps in the area of land use, land use change, food security, GHGs, and capacity development"			
University of Zambia	Academia	13	Zambia
University of Botswana	Academia	1	Botswana
Council for Scientific and Industrial Research	Research	1	South Africa
Zambia Youth Water Network	NGO	1	Zambia
Instituto Superior de Ciências da Educação	Academia	1	Angola
University of Namibia	Academia	1	Namibia
Botswana University of Agriculture and Natural Resources	Academia	2	Botswana
Department of National Parks and Wildlife	Governmental Institution	1	Zambia
Climate Service Center Germany (GERICS)	Research	1	Germany
WWF	NGO	1	Zambia
Namibia University of Science and Technology	Academia	1	Namibia
Agostinho Neto University	Academia	1	Angola

National Commission on Research Science and Technology	Governmental Institution	1	Namibia
National Remote Sensing Centre (NRSC)	Governmental Institution	1	Zambia
Copperbelt University	Academia	1	Zambia
University of Jena	Academia	1	Germany
Global Change Research Center of the Czech Academy of Sciences (CzechGlobe)	SEACRIFOG Project partner	2	Czech Republic
Euro-Mediterranean Center on Climate Change (CMCC Foundation)	SEACRIFOG Project partner	1	Italy
Thunen Institute	SEACRIFOG Project partner	1	Germany
Integrated Carbon Observation System, European Research Infrastructure Consortium (ICOS ERIC)	SEACRIFOG Project partner	1	Finland / Regional
Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL)	SEACRIFOG Project partner	2	Namibia / Regional