Stakeholder workshop to support co-design of a Sudan decision dashboard

3- 4th November 2020, Online (Zoom)
Workshop report

Workshop report prepared by: Christine Magaju, Mieke Bourne, Tor Vagen

Introduction

The stakeholder workshop to support the co-design of a Sudan decision dashboard was held on 3rd and 4th November 2020 online via Zoom. The workshop brought together twenty seven participants from the Ministry of agriculture, Ministry of livestock, Sudan Meteorological authority, Higher council for environment and University of Khartoum (Annex 2). It was organized as part of the CTCN response plan on Developing Methodology and Capacity for Monitoring Climate Change and its Impacts on Agriculture in Sudan through Earth Observations.

Opening remarks

The workshop was officially opened by Dr Nabeel Ahmed Saad, Ministry of Agriculture and Natural Resource. In his opening remarks, Dr Nabeel emphasized on the need to address climate change as it affected food security areas in where majority of the population lived. He highlighted that issues of climate change were high on the agenda across the world including in Sudan where climate change is the main factor impacting agriculture. Dr Nabeel explained that Sudan was making progress in her effort to combat the effects of climate change and a Geographical Information System (GIS) unit had been established through the University of Khartoum, faculty of Geography to support climate change projects. He however acknowledged that data related to climate change was scarce and that the project offered an opportunity to not only add to the data but also increase the capacity of stakeholders to analyse the data and make climate projections.

Introduction to the project and to the NDC partnership

Nora Khojal, Ministry of Agriculture and Natural resources gave an introduction to the project. The project's aim is to enhance the resilience of the agricultural sector and to enhance the national monitoring system through the development of sustainable methods and tools based on the integral useof geospatial technology and capacity development. Nora highlighted that the project was being implemented through the following activities (i) development of implementation planning and communication documents; (ii) identification and mapping areas that are particularly vulnerable to changes in climate ; (iii) a baseline assessment and mapping of land health and (iv) an interactive decision dashboard integrating climate variables with soil and land health

Arig Bakhiet then gave an introduction to the Nationally Determined Contributions (NDC) partnership. The partnership supports countries update and implement the NDCs as a core element in the effort to combat climate change. She proposed the formation of a core group which could be used for information exchange even as the partnership seeks to collaborate with other countries.

Objectives of the workshop

Mieke Bourne, the facilitator, shared the workshop objectives, the principles of engagement and how to interact using Zoom. The objectives of the workshop were to:

- Learn about an ICRAF **application of Earth Observation (EO) based monitoring** systems for land health and climate to support decision making for agricultural resilience.

- **Identify relevant stakeholders** and other online systems in the country for climate and agriculture.
- Introduce **decision dashboards** and discuss possible dashboard **users and their needs**, visualization preferences and access capabilities.
- Identify the **data and information** on climate and land health that is collected and held by various partners in the country and evaluate the quality and accessibility of this data and any gaps.
- Form the **dashboard co-design team** and develop a roadmap for dashboard development.

Stakeholder Approach to Risk and Evidence based Decision making (SHARED)
The SHARED approach integrates a series of structured events geared to encourage stakeholders' interaction with data and evidence to inform decision. The SHARED approach (Figure 1) was used to design and facilitate the workshop process, more information is available at: http://www.worldagroforestry.org/shared.

Figure 1: The SHARED framework

Expectations from the workshop participants

Participants were asked "*What will make you leave feeling that this virtual workshop was a valuable experience?*'' The responses are listed below:

- Contributing and sharing information for the dashboard
- Learning more about earth observation
- Increased knowledge
- Diversity platform and networking with different experts and stakeholders
- A seed group for the dashboard
- provide the needed suppoert as a Remote Sensing (RS)/ expert.

- Lots of engagement around ideas for the decision dashboard, including data and types of analysis that can add value to the work on climate resilience and land health in Sudan.

Presentation of the pre-workshop survey results

A survey to understand the workshop participants' work in relation to the project was sent out prior to the workshop. The survey sought feedback on priorities for enhancing agricultural resilience in Sudan, stakeholders (organisations) that the the participants interacted with, preferred mode of interacting with data, participants' understanding of land degradation, the relationship between climate change and agricultural resilience among others. Below are some of the results presented during the workshop.

Figure 2: Wordclouds of the most common words in the response to the questions, what do you understand by land degradation and what is the relationship between climate and agricultural resilience

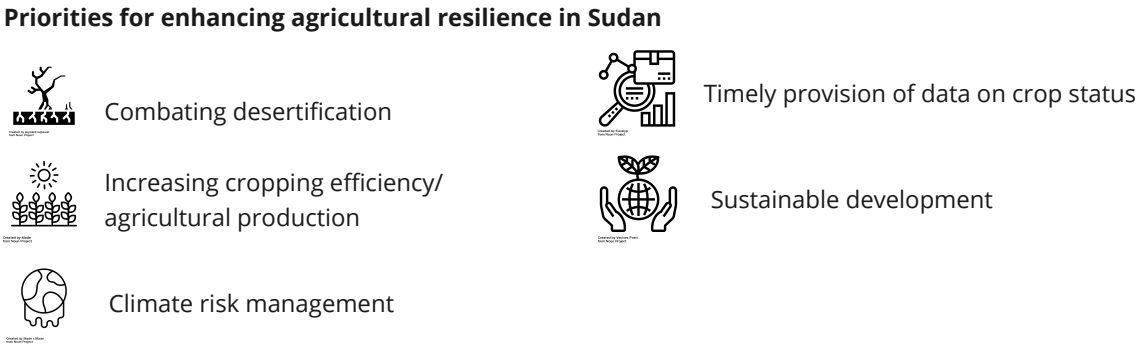

Figure 3: Priorities for ehnancing agricultural resilience in Sudan suggested in the pre-workshop survey

Application of EO-based monitoring systems for climate and land health

Dr Tor Vagen, head of World Agroforestry's Spatial Learning and Applied Learning Lab, took the participants through an introduction to Earth Observation (EO) and its application in monitoring climate and land health.Applications of EO based monitoring described by Dr Vagen include: mapping of land cover and land cover change, mapping of soil properties,

tracking biodiversity, assessing the impact of natural disasters, precision farming among others. He also explored the concept of resilience pointing out a resilience referred to a system's ability to absorb, recover and adapt to adverse impacts.

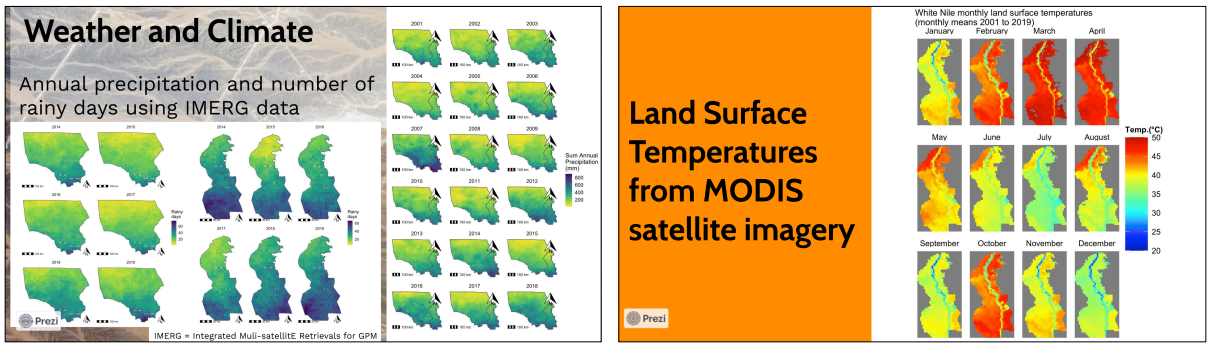

Figure 4: A slide off Dr Vagen's presentation showing how earth observation can be used to monitor climate and weather variables.

Dr Vagen also highlighted the linkage between ecosystem health and climate change. He explained that land and ecosystem health increased the adaptive capacity of a system to the effects of climate change and as such the project was focused on both land health and climate change . An healthy ecosystem is characterised by healthy soil, biodiversity, regulation of water, productivity and ecological balance. He also explained that the order to assess ecosystem health, project was building up on the Land Degradation Surveillance Framework (LDSF). The methodology measures indicators that reflect the state of the land to provide a biophysical baseline. Figure 5 below shows indicators measured using the LDSF methodology.

Figure 5: A presentation of the land and ecosystem health indicators measured using the Land Degradation Surveillance Framework (LDSF)

Discussion points and arising questions

- To which extent has the University of Khartoum, department of GIS been involved in the studies done in Sudan?
    - The department has been involved in building the capacity of students

- Where does the contribution of human agricultural practices to soil deteroriation fit in the presentation?
    - Connect the intervetions/mapping to human activities
    - The dashboard will give people an interactive too that they can use to make types of connections.
- Sudan is a fragile area with a lot of disasters and risks. What would be more efficient data for large scale monitoring of agricultural production in Sudan?
    - Need more advanced technologies in addition to satellites for an efficient and practical high resolution data for monitoring?
    - Actual field collection of field data is the most important aspect
    - Drone technology is better for more detailed small assessment
    - We need to focus on how to set up systems that can collect data on key indicators on the ground and build it from here.
- There is a strong relationship between climate change and land health. Is it easy to evaluate using LDSF? Is it costly and is it accessible to anybody to use?
- The Central Bureau of Statistics (CBS) is the responsible body for data generation and dissemination of all government information in Sudan. The information centre also offers technical backstopping.
- There are good efforts in different remose sensing and GIS activities. However, these activities are neither instistutionalised nor well coordinated. This forum can strengthen these areas, build up on them and bring all stakeholders together.
- To what extent do we need to consider the quality and variability of data?
    - The LDSF was developed to address the need for quality and consistent data.
- There is inadequate information on areas away from River Nile. If we are to use the presented monitoring systems, we need to monitor all areas.
- How do we integrate data from the different sectors in a central place to make communication easier?
- How do we increase the capacity to share information between different sectors?
    - This is a common bottleneck and needs to be addressed if we are to make any progress.
- Capacity development is key to operationalize
    - The LDSF involves building the capacity of stakeholders from data collection in the field through to analysis of the data.
- Climate change does not only affect agricultural areas but also rangelands. For example it might affect rangeland species production.
    - The dashboard will cover the states defined in the response plan i.e. White Nile, North Kordofan, South Kordofan, Gezira, Blue Nile and Sennar. If there are rangelands present in the states, and information on them available, they will be included.
- On national information centres, the Sudan Geoportal's mandate is to coordinate information at national and local levels. Where do they fit as they have the infrastrucuture to do so?

Decision cycles and information production and use in relation to climate and agricultural development

In this session, the particpants developed a joint decision cycle to understand how information was generated and used within organisations in sudan. To start, the participants identified the

main elements of the organisations' planning and reporting cycle and where in the cycle, monitoring took place in relation to climate and agricultural development.

Participants also identified the type of information and evidence brought into the decision cycle and the type of information shared and reported. Figure 6 summarises a combined decision cycle developed by the workshop participants.

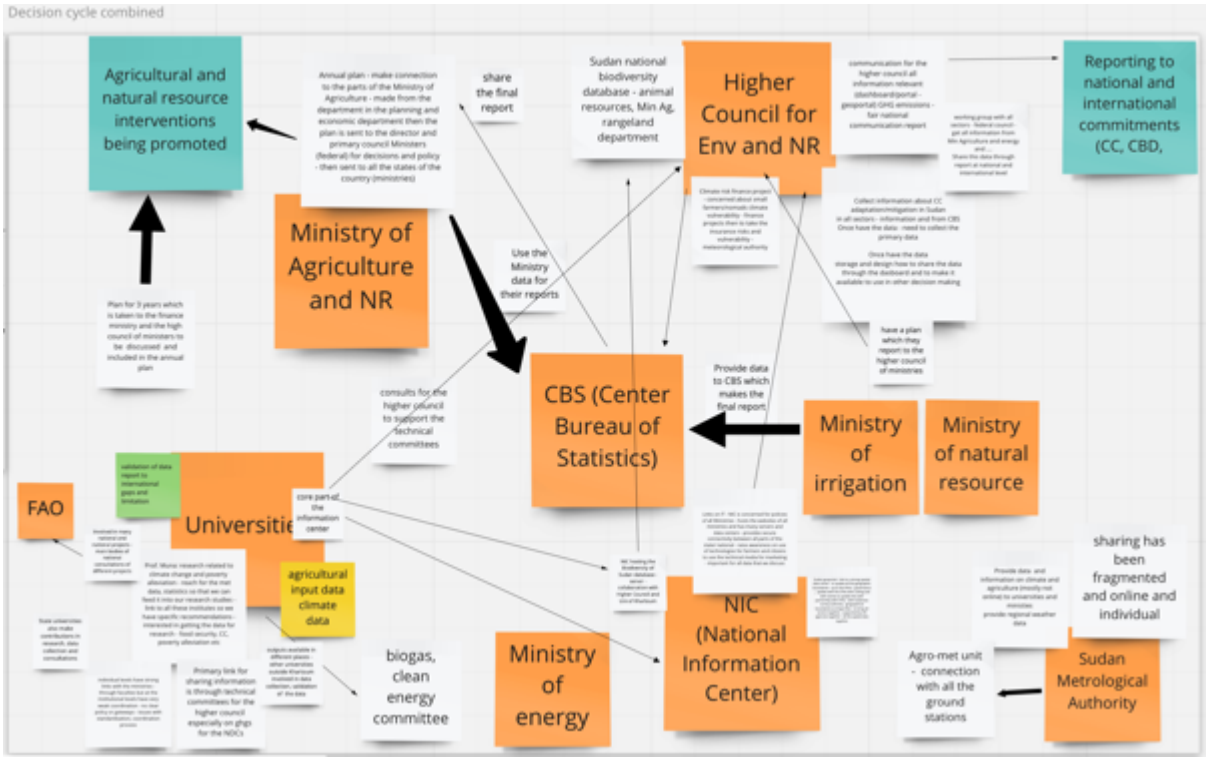

Figure 6: The decision cycle dwveloped by the workshop participants. The direction arrow shows the direction of information flow

Stakeholder transfer and use

Another aspect of the decision cycle is the stakeholders with whom information is generated and shared. The participants, in the pre-workshop survey and during the workshop, identified organisations that either produce or use land health, climate or agriculture resilience information. This informed a stakeholder network map for Sudan (Fig 7). However, during the workshop, participants highlighted that the network map only represented organisations at the federal level and suggested expanding the survey to reach organisations and stakeholders at the state level.

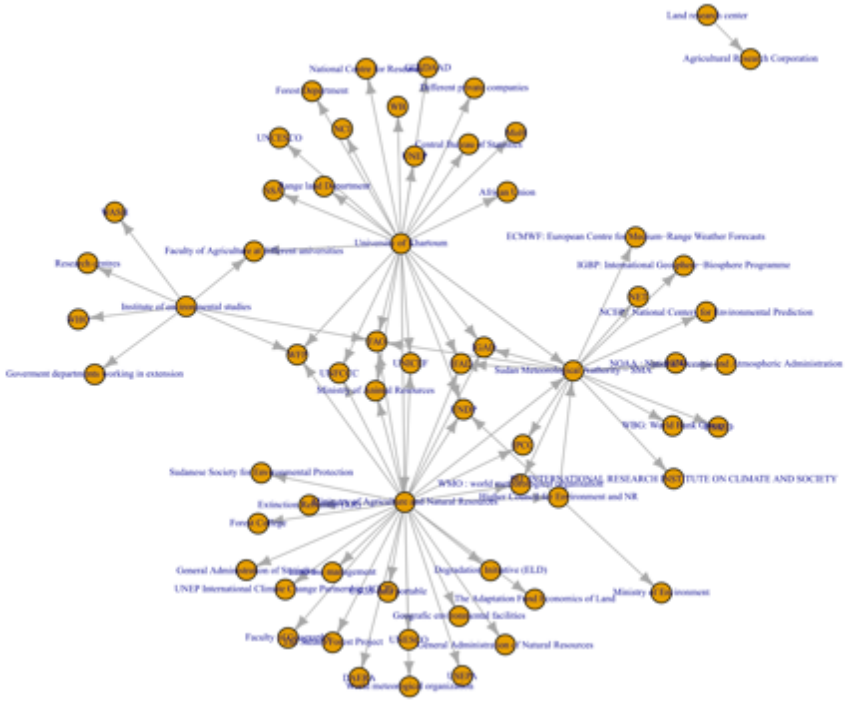

Figure 7: Stakeholder network in Sudan. The direction of the arrow shows the flow of information.

Discussion points and arising questions

- We need an assessment of the contribution of other national organisations and other universities
    - The stakeholder map are is not final or complete but help us understand the gaps and bottlenecks in sharing information
- Can the centre of the map be the Central Bureau of Statistics?
    - The network map shows the relationships and connections between different organisations and as such has no centre.
- Government ministries here in Sudan including the ones working on environment, agriculture, animal resources and irrigation send their plans to the office of the prime minister where they are discussed and decided on.
- The current stakeholder map is only at the federal level and there are other levels for which stakeholder maps can be developed by going further to explore the connection between organizations at the state level

Introduction to decision dashboards and the co-design process

A decision dashboard co-design process is used to increase ownership by the stakeholders and partners by the end of the development and to ensure data that is available respoins to user needs. Figure 8 shows the process of developing a decision dashaboard. Mieke explained that the design process was developed with the end users, the people who wil use the data, in mind. This is to make sure that the way the dashboard is designed represents the wat information is used and is applicable to the use cases existing in the country. Mieke also explained the importance of the co-design workshop as part of the design process. The workshop helps identify the team to take the desing process forward. The workshop also allows for conversation around the connections between information, where there might be gaps, what information is available and how people prefer to visualize information.

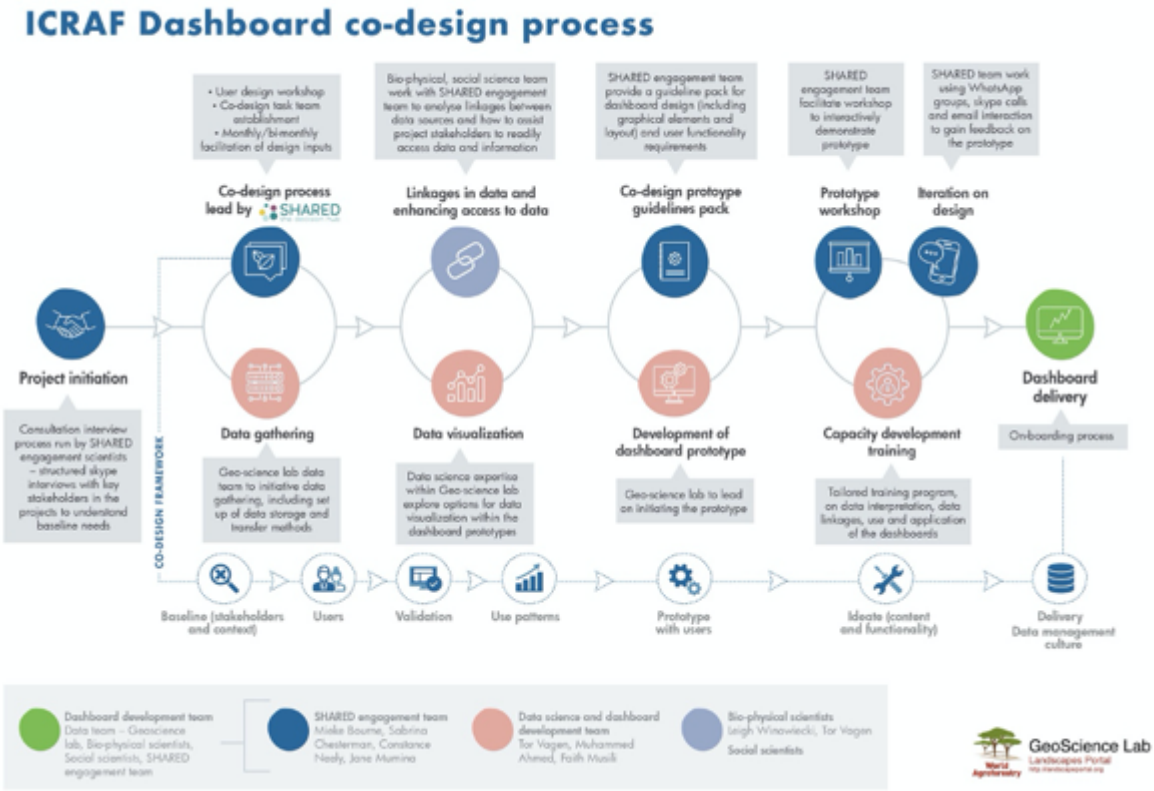

Figure 8: The dashboard design process

Afterwards, Tor took the participants through an example of a dashboard to give them an idea of how a dashboard looks like and functionalities available. ICRAF has developed different dashboards for different types of audiences and users. These are available here

Arising questions

- Is it possible for dashboard users to upload shapefiles and analyse data?
    - Yes, the dashboard is open access, users can upload data.

Dashboard users and their needs, visualization preferences and access capabilities.

Participants were asked: beyond your planning and reporting aspect, who are the **target audiences for your work, what are their interests** and what **types of information** would you like to share with them?. They identified the following target audiences: extension services including field officers and farmer groups, national information centres, researchers, pastoralists, decision makers, pastoralists, private sector including investors, foresters and ministries related to agricultural sector. Interests and visualization preference of each target audience are summarized in table 1 below.

Table 1: target audience for the dashboard, their interests and visualisations.

Target audience	**What are their interests/ what questions would they want to answer with data**	**What visualisations would they understand and use**	**Other comments or thoughts**
Ministries related to Agriculture (Agriculture, animal resources, irrigation, interior, trade)	Fertilisation; rice cultivation data; agricultural economics (analysis of studies) - main crops like cereals, market prices, market access; to make policy; early warning unit; forecasting for food security in the country; interventions for food security and targeting interventions in rural areas (enhance food security)	Numbers; tables; figures - comparative (time series at least 10 years); Use maps to know in which place this agricultural crops are growing	Internet is weak and in some cases not available in the rural areas; Internet and smart phones are issues to be considered
Remote Sensing a Authority	High resolution imagery for the different agricultural zones; land cover data and the situation in the different agricultural sectors; specific climate change situation	Remote sensing data maps; satellite images	Is there is any way to produce real or near real time data with frequent updates?
Researchers	Data iand the associated meta data files including the source, accuracy, means of verifications, e if there any discrepancy; the methods used in generating the information; seeds; type of crops; climate to enhance seeds; forecasts: rainfall humidity	Interactive maps; charts; time series comparisons	
Farmers	Information about agriculture; information on rainfall and drought; focal point through agricultural association in areas with well organised farmers need awareness and campaign to reach; extension services; ministry of		Many farmers don't have smart phones and good internet connectivity. Phone network is also difficult; one suggestion is to assign a particular day to send information from the federal ministries to the ministries in the states; use radio to

	production content of agriculture animal resources		connect; UNICEF has worked with farmers using SMS; in major cities, farmers can be supported by smartphones and internet connections while in the very remote areas, it could be via SMS or through the centralized hubs; in each village there is what we call the community based network, usually with a leader or a coordinator, this person could play an important role in remote areas.
Project development/ climate institutions /international organisations	Reliable information on climate and agriculture; climate mitigation or adaptation		
extension services/farmer groups/field officers	Information on agriculture such as crop information; seasonal forecast and long climate forecast as it affects agriculture and farmers; information related to disasters and risks associated with crops; suitable crops in Sudan; rainfall and temperature; information on severe weather/early warning - link to the Sudan Meteorological Authority	climate maps, vegetation cover maps;satellite images/ spatial data; tables; graphs on rainfall, temperature trends, humidity and wind; soil classification maps; crop density,production, varieties and distribution of varieties; time series on planting, harvesting	Develop an agroclimate model that can be updated. The meteorological department already has a similar model and would be important to link to it; ministry of agriculture will be providing a call center - a useful tool of communication - The call center was run by FAO for 2 years but stopped when FAO funding ended; we will need a suitable crops model to identify the best crops for each area given human activities, soil, rainfall etc. Internet is limited in the rural areas but almost everyone has a mobile phone. we will need to build their capacity to access and use the dashboard; we can use SMS or facebook or whatsApp for extension

Students/ academics	Information related to biophysical characteristics of the crops; AEZs of sudan; rainfall and climate data; link between climate and other natural resources; crop monitoring; socioeconomic data; best tools, technologies and practices for climate smart agriculture; crop zonation; potential production of different crops in Sudan; soil health including holding capacity, earthworms and degradation; types of crops and their relationship to soil health;real agricultural practices	Graphs; maps; time series combined with maps for climate and rainfall data; high resolution satellite-images from recent satellites; shapefiles of all agricultura crops and soil types; maps of crop zonation in Sudan (spatial distribution)	Internet connection is available for students; students will need capacity building to access and use the dashboard; capacity to use the dashboard is available within the university faculties especially. geography faculties; it will be useful for further research development and recommendation; ministries might need additional capacity to use and access the dashboard
Agricultural companies	Distribution of land in the rural areas; information on soil properties; crop information: type, productivity, price; most suitable areas for agriculture; water resources; socioeconomic data i.e.e human activities/behaviour; spatial information related to distribution of farm areas and road networks; microfinance; agricultural insurance information	Maps and tables of land distribution in the area; general soil maps; graphs of seasonal variability of crop production; network maps of water resources/irrigation; table of socioeconomic data; road networks	
Pastoralists	Information rainfall, temperature and floods; assessments of rangeland officers; information fire incidence maps; species types in the rangelands (flora and fauna); hazard and risk maps	Tables; figures; maps; satellite images	
Rangeland officers	Need crops productivity; animal feed balance; water resource in animal routes		

Available data

Participants reflected on existing data and identified additional data including where the data is held, its quality and any gaps in terms of data or broader research questions.

Table 2:Available data and the source of the data

Data category	Dataset	Source
Climate and Weather data	Ground station data - rainfall, temperature and humidity, sunshine duration, all the parameter, weather data, weather forecast (daily-10 days), seasonal, monitoring of rainy season, monthly and seasonal bulletin.	Sudan Metrological Authority
	Satellite images with high resolution, maps, research	Sudan Remote Sensing Authority
	Open source and cost administrative data can be accessed and the Ministry can access. Particularly for climate and land use data	
Agriculture and land health data	Planted area and harvest area 1970-now	Ministry of Aagriculture
	Number of animals census 2020	Ministry of Animal Resources
	Cost of production for the main crops for 20 years and the prices of the crops; Market prices for the 8 main crops	Ministry of Agriculture
	IBBC risk classification reports	
	Sudan map FAPAR 2002-2020	Ministry of Agriculture
	Feed balance gap for fodder 2014-2020	Ministry of Animal Resources
	Annual agricultural policy report	Ministry of Agriculture

	Agricultural and livestock - national agriculture and livestock sector report; national climate change communications report (a report with data inside)	Higher Council for Environment and Natural Resources
	National adaptation plan - adaptation measures - 18 sectors - in the field of agriculture and livestock report (inside the report there are identified measures)	Higher Council for Environment and Natural Resources
	State of environment 2020 report	Higher Council for Environment and Natural Resources
	PhD and thesis and updated data from students - we can search and see the most related, environmental assessment reports	Universities, institute of environmental studies
	Crops, technical package - field, hoticultural, medicinal crops - all information about producer organisations, agriculture extensionists distribution and in the locality	Ministry of Agriculture, extension department
	Sudan range resource survey report 2018	Ministry of Animal Resource and Rangeland
	Crop markets - prices of crops and animal products and border trade	FuseNet - FAO
	Annual plans for the Ministry of Agriculture for all state	
	Marketing cost and margins and crops prices and livestock product	
	Statistic administration in the ministry of agriculture have ceral production for all the country states from 1971 till now; Rangeland area boundry in spatial area in sudan	Rangeland adiministration

Furthermore, the participants identified existing databases in Sudan. These included the Sudan geoportal and the ICloud for climate risk finance project.

Discussion points/arising questions

- How do we verify the quality of the available data?
    - Data for the dashboard needs to be of good quality and validated. You should have a good level of confidence in how the data was collected and stored.
- The more spatially explicit data is the better

Sudan Dashboard brainstorm

Functionalities and comments from the participants regarding how the dashboard should be:

Landing page

The landing page should include:the two niles satellite image, boundaries, photos of different landscapes, zones and crops, summary informationincluding the country profile, aims of the dashboard, land use types and biodiversity, logos of all partners that have shared data, animated flag of Sudan

Climate module

Is there any function about the operational monitoring such as flood forecast?

- This is beyond the current technical response plan. Furthermore, it would be challenging to do as it involveds a large area thus requiring a broad analysis.
- The government body responsible for the flood risk information is the irrigation ministry

Seasonal forecast can take place in this module because is very important for the Users. Moreover the strategic plan of the state is dependent on the seasonal forecast of rains and temperatures in confronting disasters and setting early precautions for the agriculture plan. It also plays an important role in determining the type of crops that could be planted.

The dashboard is developed using open source tools and therefore can be expanded in another project to include additional aspects that are beyond the scope of the current CTCN output

Dashboard co-design team

Mieke shared the proposed the roles of the dashboard co-design team which would be made up of 5 to 10 stakeholders. The roles include: providing input and working closely with the ICRAF programmers to suggest functionalities, visualization preferences and feedback on prototypes, support data collection from identified sources, providing a link back to key stakeholders, supporting colleagues to use the dashboard and if needed use their authority to contact others for data. Participants then suggested members of the co-design team (table 3). They also identified WhatsApp and email as the best mode communication between the co-desing team and the dashboard developers.

Table 3: Members of the dashboard co-design team

Sudan dashboard co-design team

Organization / Department	Nominated person	Email address	WhatsApp number
University of Khartoum	Dr. Manal AwadKheiry	manalawadk@gmail.com	+249912648585
Sudan Remote Sense authority	Hatim	hatimoo22@yahoo.com	+249904366226
Ministry of Agriculture and Natural Resources	Gawahir Siddig Salim	gawhi731@gmail.com	+249129180493
Ministry of agriculture (marketing)	Sumai Abash	sumiaabash@yahoo.com	+249904233545
-Ministry of Livestock and rangeland	Nafisa Bakrawi	nafisa.a.b3@gmail.com	+249912723578
Institute of environmental studies, University of Khartoum	Prof Muna Mahjoub	munamm789@yahoo.com	+249912149607
HCENR-Environment	Huyam Ahmed	hoyamahmed66@gmail.com	+249908273803
Central Statistical Organization	Ms. Abeer Fadlelmula Adam	abeerrose68@gmail.com	+249964077353
Sudan Meteorological Authority			
Sudan survey authority			

Road map for dashboard development

Workshop participants agreed on a timeline for developing the dashboard. The process is envisioned reach complete in March 2021 (figure 9).

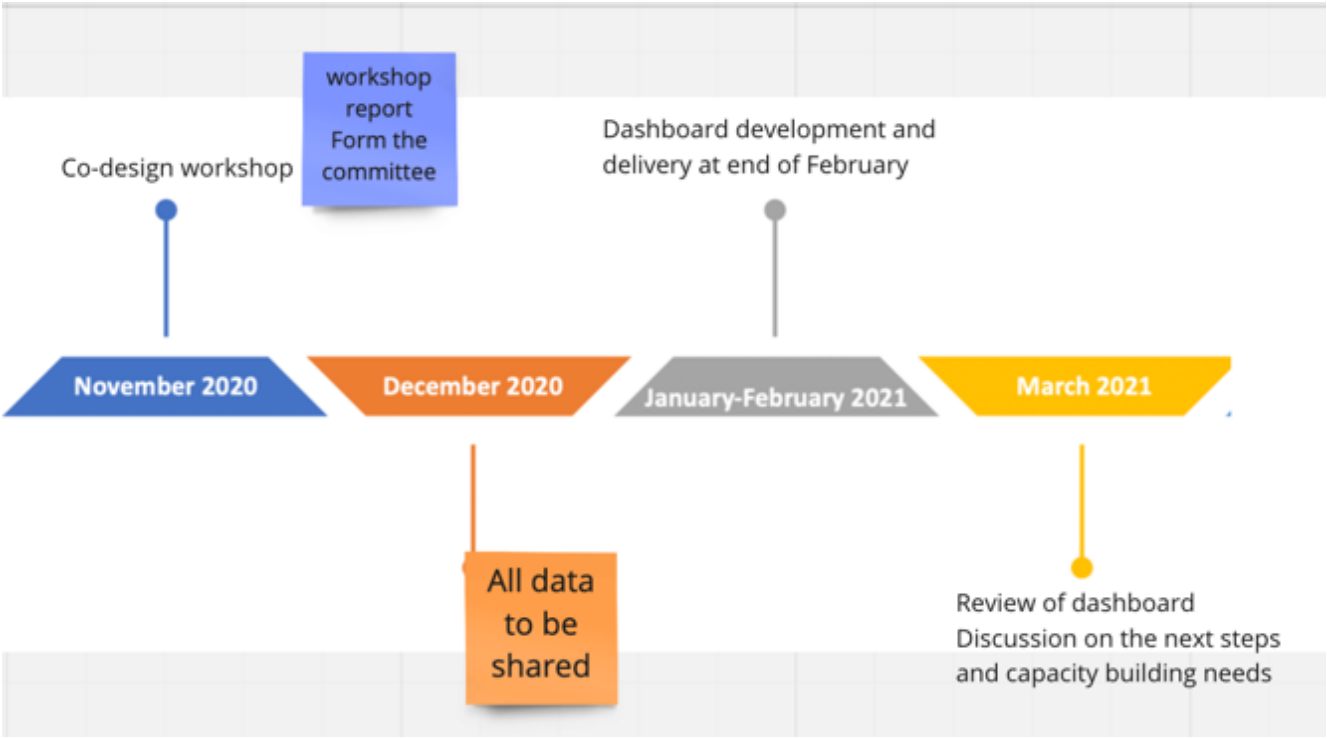

Figure 9: Timeline for developing the dashboard

Closing remarks and next steps

Nora Khojali closed the workshop by calling all stakeholders to participate fully in the dashboard development process as sustainability was very important to Sudan.The participants also agreed on the following next steps:

I. Continue the inventory of available data by filling in the excel file developed from table 1.
II. Share the stakeholders assessment survey with other partners at both federal and state level.

Workshop evaluation

Participants evaluated the workshop by scoring from 1 (lowest) to 5 (highest) for the following categories.

- Content
- Meeting Objectives
- Facilitation
- Time Management
- Representation and participation
- Logistics

The results of the evaluation are presented in figure 10 below.

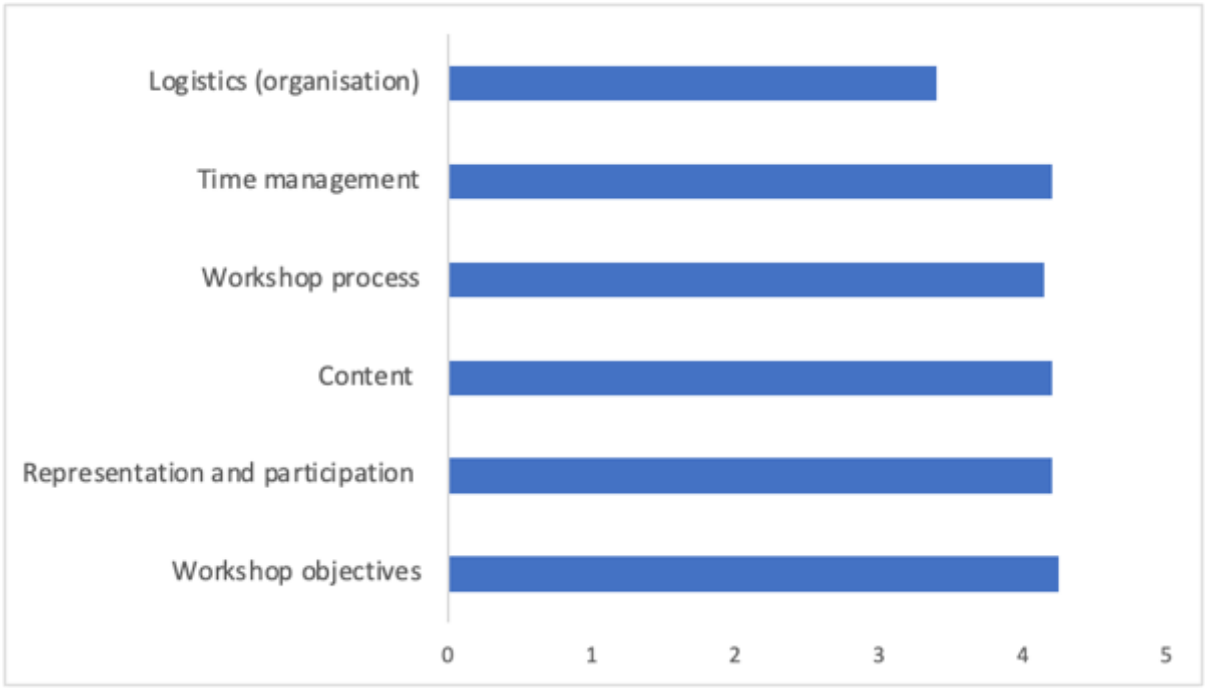

Figure 10:Results of the workshop evaluation

Annexes

Annex 1. Workshop agenda

Stakeholder workshop to support co-design of a Sudan decision dashboard for climate resilience
3trd and 4th of November, Online (Zoom)

Workshop objectives:

- Learn about an ICRAF application of **Earth Observation (EO) based monitoring systems** for land health and climate to support decision making for agricultural resilience.
- Map **decision cycles** for agricultural and climate related work, involving planning, monitoring, reporting and decision making.
- **Identify process for exchange of information** related to climate and agriculture amongst **stakeholders**.
- Introduce **decision dashboards** and discuss possible dashboard **users and their needs**, visualization preferences and access capabilities.
- Identify the **data and information** on climate and land health that is collected and held by various partners in the country and evaluate the quality and accessibility of this data and any gaps.
- Form the **dashboard co-design team** and develop a roadmap for dashboard development.

Agenda

Time	Activity	Lead
	Day 1	
8.45-9.00	Coming online	
9.00-9.30	Introductions, Principles of engagement and Workshop objectives	Facilitator
9.30-9.40	Opening remarks	Dr.Nabeel Ahmed Saad
9.40-10.00	Welcoming remarks and introduction to the project	Nora Khojali
10.00-10.30	Application of EO-based monitoring systems for climate and land health	Tor-G Vagen
10.30-10.55	Questions and discussion	Facilitated discussion
10.55-11.00	Short break	
11.00-11.45	Decision cycles and information production and use in relation to climate and agricultural development	Facilitated break out groups
11.45-12.15	Break for prayer	
12.15-13.15	Process of information exchange amongst stakeholders	Facilitators
13.15-13.45	Introduction to decision dashboards and the co-design process	Tor-G Vagen and Mieke Bourne
13.45-14.00	End of day closing remarks	Nora Khojali

Time	Activity	Lead
	Day 2	
8.45-9.00	Coming online	
9.00-9.15	Brief recap of previous day	Facilitators
9.15-10.30	Dashboard users and their needs, visualization preferences and access capabilities.	Facilitated break out groups
10.30-11.45	Reflecting on existing data, additional data - where it is held, its quality and any gaps in terms of data or broader research questions.	Facilitated break out groups
11.45-12.15	Break for prayer	
12.15-13.45	Discuss dashboard elements, agree on the dashboard co-design team and develop a road map for dashboard development.	Facilitated discussion
13.45-14.00	Next steps and closing remarks.	

Annex 2. List of participants

	Name of Participant	Institution	Email
1	Hisham Osman	Ministry of Agriculture and Natural Resource-Food Security	hishammo2008@hotmail.com
2	Esraa Abas Jacksa	Ministry of Agriculture and Natural Resource-Early Warning	esraa.jacksa@gmail.com
3	Gawahr Elsdig	Ministry of Agriculture and Natural Resource- Disaster Management and Insurance	gawhi731@gmail.com
4	Donia KhalfAllah	Ministry of Agriculture and Natural Resource-Statsicic Department	doniaashraf057@gmail.com
5	Dr.Sawsn Fouad	Ministry of Agriculture and Natural Resource-Researcher	sawsanfouad.606@gmail.com
6	Amani Sanhori	Sudan Metrological Authority –agro-met unit	amanisan2008@gmail.com
8	Mohamed Awa Allah ElBadwi	Sudan Metrological Authority	Alsheake1980@gmail.com
9	Prof.Muna Ahmed	Researcher	munamm789@yahoo.com
10	Nafisa Bakrawi	Livestock and Range land Ministry	nafisa.a.b3@gmail.com
11	Hatim Elobeid Ibrahim- RS. Research	Sudan Remote Sense Authority	hatimoo22@yahoo.com
12	Omnia Omer Sudan	Sudan Remote Sense Authority	omniaomer4@gmail.com
13	Ayman Mohmed Abdein	Ministry of Agriculture and Natural Resource- Drought Desertification Department	Aymanmohammed30@yahoo.com
14	Hana Hashim	Ministry of Agriculture and Natural Resource-Extension Administration	bithashimsalih@gmail.com
15	Huyam Ahmed Abdalla	Higher Council for Environment and Natural Resources	hoyamahmed66@gmail.com
16	Halima Abdalla Elbadri	Higher Council for Environment and Natural Resources	halom2008@yahoo.com

17	Abdel Rahman Ibrahim Idriss	Higher Council for Environment and Natural Resources	abodoibrahim11@hotmail.com
18	Hana Hamadalla	Higher Council for Environment and Natural Resources	hanahamadalla2@yahoo.com
19	Tarig Elkheir Suliman	Higher Council for Environment and Natural Resources	tarigelkheir@live.com
20	Sumai Abash	Ministry of Agriculture and Natural Resource-Marketing Administration	sumiaabash@yahoo.com
21	Ms. Abeer Fadlelmula Adam	Center Bureau of Statistics	abeerrose68@gmail.com
22	Abdel Majid Ali	Land Research Center	Melmobarak2012@gmail.com
23	Dr. Anwar ElTayeb	Researcher	anwareltayeb@gmail.com
24	Dr.Eltaib Saeed ganawa	University of Khartoum	ganawagis@gmail.com
25	Dr.Manal Awad Kheiry	University of Khartoum	manalawadk@gmail.com
26	Arig Bakhiet	NDC	arigplus@gmail.com
27	Dr.Nabeel Ahmed Saad	Ministry of Agriculture and Natural Resource	nabeelahmedsaad@yahoo.com
28	Nora Abdelraheim Khojali	Ministry of Agriculture and Natural Resource	Norakhan_2000@yahoo.com