IFPRI SUDAN

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Prioritizing Development Policy Research in Sudan

An Innovative Approach to Guide IFPRI's Sudan Strategy Support Program

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EXECUTIVE SUMMARY

This paper presents an innovative approach to prioritizing development policy research in Sudan with the specific objective of informing the research agenda of the Sudan Strategy Support Program (Sudan SSP) of the International Food Policy Research Institute (IFPRI).[1] The key steps in this process were: [2]

A review of relevant priority setting methods and existing government strategies,

Pre-selection of research themes,

Selection of national and international experts,

Design and conduct priority setting workshop; and

Priority matrix construction and paper writing.

The paper suggests key research priorities for Sudan, which are both highly relevant to Sudan's current and future development policy agenda and consistent with IFPRI's own comparative advantage and strategy. It identifies research areas and topics under five main themes, namely:

1. Agricultural production,
2. Markets and trade,
3. Livelihoods and nutrition,
4. Development strategy and investment planning, and
5. Increasing resilience of farming under growing climate challenges.

Tackling the priority research tasks identified in this paper, for these five themes, is expected to help reduce poverty and improve food and nutrition security in Sudan. However, strengthening the links between policy research and decision-making will be crucial to ensure that evidence-based solutions are relevant and have a positive impact on people's lives.

[1] The paper and its findings may also be of interest for those looking for priority setting methods to apply in other countries or regions or for other policy research topics in Sudan. It is also important to note that the number and selection of topics that IFPRI will be working on in Sudan in the future will depend on the availability of funding.

[2] We note that the structure and approach used during the Sudan SSP co-creation workshop and as well as the outline and format of this paper follows closely to that used in the development of the Egypt's SSP – see Abdelaziz et al. (2016) for more details.

INTRODUCTION

Sudan is not only confronted with a complex set of macroeconomic, environmental, health, and humanitarian crises that threaten to worsen poverty and food insecurity and further undermine agricultural transformation but is also faced with limited resources to address these challenges. Scarcity of resources necessitates individuals, governments, and organizations to allocate them in such a way that benefits are maximized for a given cost. Decision makers in many countries face the tough question of how best to allocate limited public funds across diverse and competing research areas and geographies to achieve the largest impacts (Pemsl et al. 2022). Moreover, most international research programs and initiatives have limited funding. Thus, there is a need to identify and prioritize research and strategic support activities.

Research prioritization is expected to identify the areas or activities that have a high potential benefit in addressing the identified challenges and provide possible solutions which can be adopted while utilizing existing or new tools, methods, and skills (Ghodake 2001 cited in Abdelaziz et al. 2016). Priority setting has also been touted as an essential step in improving the management of agricultural research (Pemsl et al. 2022). A priority setting approach should be based on objective criteria – systematic, rational, and efficient. It should identify the relevant development objectives, analyze constraints, evaluate past research, define research objectives, identify projects, and choose the priorities among those projects, while identifying gaps and recommending conditions and measures needed for the success of these projects (Janssen and Kissi 1997 cited in Abdelaziz et al. 2016).

The priority setting exercise organized by IFPRI for the new Sudan Strategy Support Program (SSP) is informed by literature and follows closely on IFPRI's previous experiences in research priority setting in regional and country-specific contexts such as those in Central Asian countries (Babu and Tashmatov 2000), Malawi (Babu and Khaila 1996), and more recently in Egypt (Abdelaziz et al. 2016). In all these cases there was involvement of local stakeholders in identifying and understanding policy research needs, issues, and challenges; thorough review of existing information and identification of different stakeholders and potential collaborators; and identification of priority areas of research. The exercise includes conducting multi-stakeholder and expert workshops, organizing round-table discussions, and gathering information through questionnaires or personalized interviews (Viergever et al. 2010). A multiplicity of stakeholders is essential for research to have more relevance in policy making. Thus, a participatory approach was utilized to identify evidence-based research needs and gaps from a wide range of stakeholders. This also stresses the need for collaboration between policy makers and researchers in policy-making processes (WHO 2012).

Against this backdrop, the Sudan SSP team relied on multiple stakeholders with a deep understanding of the broad research needs of the country. The stakeholders helped to narrow down priorities to those that are policy relevant and provide solutions to some of the most pressing development challenges that the Sudanese people face. To achieve this, a limited number of key players and stakeholders from academia, civil society, the private sector, local non-governmental organizations, regional organizations, research centers, representatives from international development organizations based in Sudan, and other stakeholder groups were carefully selected and invited to the workshop.

The participatory focus-group discussions focused on key research themes and were aimed at exploring the short- and long-term development challenges and opportunities within the thematic areas. They were structured in recognition of the diversity of stakeholders. In addition to identifying key knowledge gaps, research demands, and key priorities, the discussions also marked the beginning of a community of practice that will be important for IFPRI's Sudan SSP. The workshop

format was also preferred because, unlike surveys and personal interviews, workshops allow for interaction between participants to allow for a cross-fertilization of ideas, which opens the chance for people to learn from each other, while taking advantage of their combined expertise. The workshop also employed innovative elements – such as, a Modified Carousel approach – which involved rotation of some members between groups to allow cross-pollination of ideas (Gelli et al. 2015). The approach is discussed in detail in the next sections.

The rest of this paper describes the research priority setting process with particular focus on the findings obtained from a research priority setting workshop held in Khartoum on February 9, 2022. The outcomes of this process provide the basis for IFPRI's research work under the Sudan SSP over the period 2021 to 2024. Moreover, the methodology used, and findings obtained from this priority setting process may prove to be useful for other policy researchers and research institutions as they seek to establish the priorities for their own work. The next section explains the workshop concept and methods. The third section presents the workshop findings, while the fourth summarizes the main findings and conclusions of the paper.

THEME PRE-SELECTION, WORKSHOP APPROACH, AND PROCEDURES

The goal of a research priority setting workshop is to identify strategic areas and topics that are highly relevant to a country's current and future development policy agenda and consistent with the institution's own comparative advantage and strategy. The discussions during the Sudan SSP priority setting workshop built upon IFPRI's experience and strategic research areas and the knowledge of national and international experts. All these were crystalized and prioritized into concrete areas and topics for actionable research.

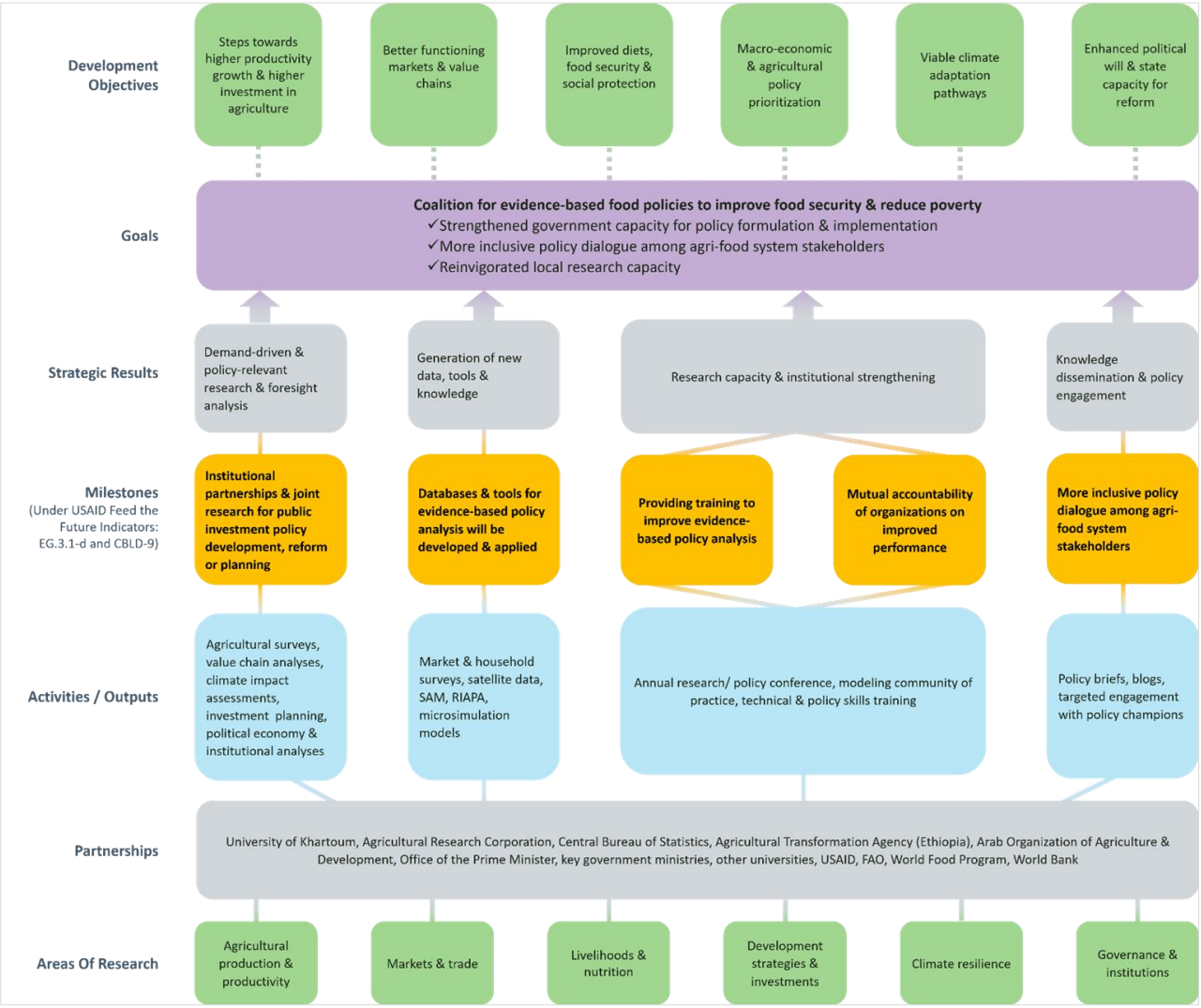
Theme Pre-Selection

Sudan's Development Strategy

As outlined in Figure 1, the overall goal of the Sudan SSP is to improve food security and reduce poverty. This will be achieved through evidence-based policy formulation, strengthening government capacity for policy implementation, encouraging more inclusive policy dialogue across a diverse range of agri-food system actors, and strengthening local capacities. Though Sudan has historically had an impressive number of researchers on agricultural development issues, international isolation has increasingly hindered their access to innovative methodologies, data, and training. The Sudan SSP seeks to increase the country's self-reliance to pursue its own development strategies and policies as well as build coalitions that involve national government and research partners as co-creators and co-authors of research outputs and co-convenors of major training events and conferences and advocates for change.

Following other country SSPs implemented by IFPRI, the program would also support capacity strengthening activities of local stakeholders within the identified research themes. Additionally, given that Sudan is an extremely data-scarce environment, the Sudan SSP will work with partners to conduct nationally representative, regionally based, and/or thematic surveys throughout the life of the project, thereby providing the stakeholders and policy makers with data to make informed policy decisions while simultaneously building local capacities to conduct survey collection and analysis. Learning from other SSPs in Ethiopia and Egypt, the Sudan SSP will also complement and support ongoing Sudanese policy efforts such as the potential establishment of the Sudan Agricultural and Livestock Transformation Agency.

Figure 1: Theory of Change for Sudan Strategy Support Program



Source: Sudan SSP Monitoring, Evaluation and Learning Plan 2021-2024

IFPRI's Strategy

IFPRI is CGIAR's center of excellence for agricultural, food security and nutrition policy with a wealth of experience in managing several SSPs in different countries, including Bangladesh, China, Egypt, Ethiopia, Ghana, Malawi, Myanmar, Nigeria, Pakistan, and Rwanda. These country SSPs provide holistic, customized support for country-led development by building evidence, tools, and capacity for agricultural and economic transformation. Sudan SSP will follow in the footsteps of these country programs. The pre-selected research themes of the Sudan SSP are in line with IFPRI's five strategic research areas which includes a cross-cutting theme focused on gender (IFPRI 2018) (Figure 2):

1. Fostering Climate-Resilient and Sustainable Food Supply

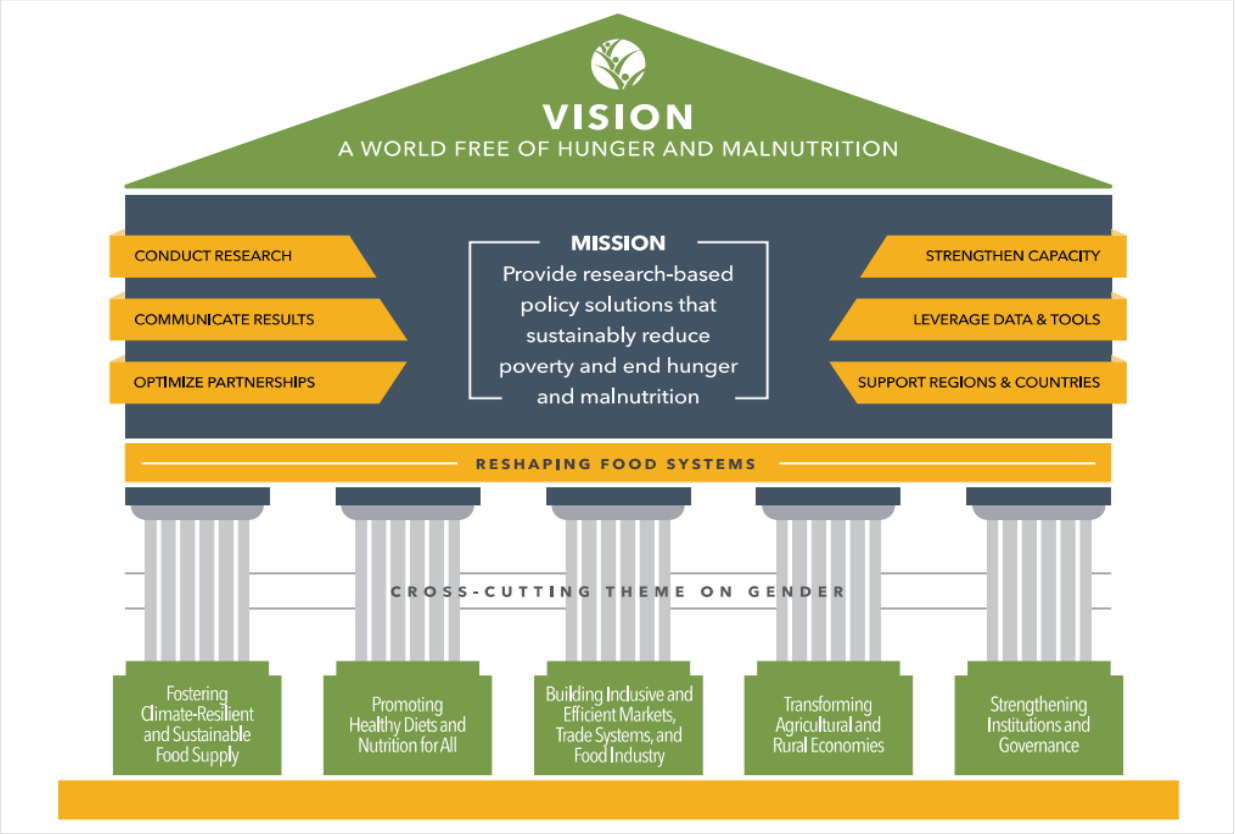
Promoting Healthy Diets and Nutrition For All

Building Inclusive and Efficient Markets, Trade Systems and Food Industry

Transforming Agricultural and Rural Economies

Strengthening Institutions and Governance

Figure 2: Strategic Framework of the International Food Policy Research Institute



Source: Adapted from IFPRI (2018)

Workshop Themes

Five major themes were identified for the Sudan SSP:

1. Agricultural production,
2. Markets and trade,
3. Livelihoods and nutrition,
4. Development strategy and investment planning, and
5. Increasing resilience of farming under growing climate challenges.

We provide detailed descriptions of the approaches and procedures used during the workshop to identify specific knowledge gaps and research demands within each of the five themes.

Workshop Methodology and Organization

Guiding Questions

After the broad priority policy research themes had been selected, three guiding questions underlying the conceptualization of the priority setting workshop were also formulated and provided to each of the five groups:

1. What are the main development challenges in Sudan within *this theme* (in the short-term and long-term)?
2. What are (a) the main knowledge gaps within *this theme* and (b) the specific research questions within the top-three knowledge gaps?
3. What are the main (a) governmental; (b) non-governmental organizations; and (c) research institutions working in areas of *this theme* in Sudan?

To answer these questions accurately, breaking them up into parts with sub-questions was expedient. Hence, discussions at the Sudan SSP priority setting workshop were structured around three subjects with three specific questions for each of the five themes. The three subjects and specific questions were formulated identically to achieve comparability and consistency in the workshop's findings across the five themes.

1. Development Challenges and Opportunities

a) What are Sudan's main development challenges within [this theme] in (a) the short-term and (b) the long-term?

b) Rank the short-term and the long-term development challenges according to their relative importance, providing reasons for your rankings.

c) What are Sudan's main development opportunities and possible solutions to address Sudan's development challenges?

2. Knowledge Gaps and Research Demands

a) What are (a) the *main knowledge gaps* within [this theme] in Sudan, and (b) the *specific research questions* within the top-three knowledge gaps?

b) Rank the knowledge gaps and research questions according to their relative importance and provide reasons for your rankings.

c) Which *data* are needed to address these research questions, and *from where* are they available?

3. Relevant Organizations and Areas of Work

a) What are the main (a) *governmental*; (b) *non-governmental organizations*; and (c) *research institutions* working in areas of [this theme] in Sudan?

b) Which of these organizations or institutions are most important as *potential collaboration partners* for IFPRI, considering IFPRI's mission and the aims of the Sudan SSP? Provide reasons for your recommendations.

c) Who are the *focal points* in these organizations or institutions (contact details), and what is their area(s) of expertise or interest?

Each set of questions was allocated about 30 minutes of discussion time and were structured to serve multiple purposes: to (a) learn about Sudan's main development challenges and opportunities directly from national experts participating in the workshop, (b) identify existing knowledge gaps and IFPRI's potential contributions across the four themes, and (c) understand which organizations and research institutions engage in which themes and are concerned with which issues.

Selection of Participants: Blending of Different Types of Stakeholders

Preceding the workshop, the organizing team for the Sudan SSP priority setting workshop identified and participants with relevant expertise along the themes from non-government organizations, academia, private sector, and international development agencies, and a few representatives from the USAID office in Sudan (Appendix Table A1). The team followed a systematic approach to identify and invite these key stakeholders. Senior researchers from IFPRI with international experience and expertise in the selected themes of the workshop were also present in the workshop (Appendix Table A2). The team also aimed at a gender balance, thus the invitation to workshop was sent to both qualified men and women. In the end, 23 attendees were Women (representing 37%) and the rest 40 (63%) were men (Appendix Table A1).

The workshop was organized in five breakout groups representing each of the pre-selected themes. This was done to ensure efficient and effective communication and discussion among the workshop participants. The organization of breakout group discussions are discussed in the next section. It should be noted that, a moderated panel discussion preceded the breakout group discussions (see Workshop Agenda). This session provided an introduction to the key issues in each of the five thematic areas and it also aided the discussion of potential cross-thematic issues. The discussion of cross-cutting issues was guided by the following questions which were expounded during plenary sessions:

1. What are Sudan's main development challenges in (a) the short-term and (b) the long-term, which are at the intersection of [this theme] and [that theme]?
2. What are (a) the main knowledge gaps at the intersection of [this theme] and [that theme] in Sudan and (b) the specific research questions within the top-three knowledge gaps?
3. Which other issues—not belonging to one of the five themes—should be considered as research priorities for Sudan SSP?

The "Modified Carousel Approach" to Strategic Planning

To allow effective discussions in a time-efficient manner, the organizing team adopted and adapted an approach that would allow for comprehensive and in-depth discussions, fully drawing upon the different expertise and interests of the participants. The focused discussions were held in five parallel break-out group sessions for about 90 minutes. Experiences from previous workshops suggest that parallel breakout group discussions of closely related topics often yield nearly similar findings and duplications. To improve the quality of the workshop group findings and in recognizing the limited amount of time available for the workshop, the team opted for an innovative structured approach that involved rotation of members among groups – a Modified Carousel Approach.

A priori, all workshop participants were allocated a specific group according to their expertise (and preference). Additionally, the guiding principle for the formation of the breakout groups was heterogeneity –people from the same organization or institution were split into different groups. The rationale was to bring together experts from different backgrounds working on the same theme so as to enrich the discussions.

The group then proceeded to transect the group discussions covering the three sub-questions. To implement this Modified Carousel Approach, each group moved from one table to the another at the end of 90 minutes (for example, Table 4's members moved to Table 5, Table 5's to Table 1, etc.) to consider the discussions that the first group already had. The facilitator and the notetaker remained in their original groups. During this 30 minute of crosspollination of ideas, the notetaker and the group discussion leader presented a summary of the deliberations that transpired for each set of questions. The "new" group had a chance to provide additional input to add to the thoughts of the first group. The discussions among the subgroups were facilitated by an expert from Sudan (who had the option to note main discussion points on a flip chart) and the detailed notes of the discussions were done by IFPRI staff. During the workshop, the facilitators were responsible for keeping the discussions focused on the theme's questions. Later, the facilitators and notetakers summarized the findings for inclusion in this workshop paper. For consistency across themes and subgroup discussions and to minimize potential moderator effects, all facilitators and notetakers received the questions and the logistical guidelines for how to conduct the discussions as part of a preparatory briefing before the workshop.

WORKSHOP FINDINGS: TOP RESEARCH PRIORITIES

The structure of this section follows the structure of the workshop sessions whereby each sub-section summarizes the theme's background, followed by a review of the content of the breakout group discussions.

Theme 1: Agricultural Production

Background and Setting the Stage

Agriculture offers a strong basis for post-COVID-19 recovery and transformation of the Sudanese economy and assumed a central role in the recently assembled "growth, rebuilding, and resilience" agenda of the Transitional Government of Sudan. However, the sector faces important challenges and impediments, including lack of necessary infrastructural investments, a constrained business environment, limited access to modern technologies and inputs, underdeveloped and fragmented value chains, erratic rainfall and climatic conditions, poor agricultural extension services, limited R&D investments, and limited access to markets (e.g., Sassi and Cardaci (2013); IFAD (2017); World Bank (2020)). The low allocation of government spending on agriculture, which falls far below the 10 percent of total expenditures that Sudan has committed under the CADDP framework, coupled with economic isolation caused by the international sanctions, has significantly hindered agricultural investments. Weak and fragmented land markets and land-use rights are also important factors that discourage agricultural investments in Sudan (World Bank, 2020). About 70 percent of staple foods and 85 percent of the livestock population are produced by resource-constrained smallholder farmers who mostly use traditional farming techniques and inputs (World Bank, 2020). The usage of improved agricultural inputs, including fertilizer and improved seeds, remains below the sub-Saharan African average. Despite these impediments, there exists significant potential to improve agricultural yield and expand agri-food value chains and agro-processing industries. For instance, cultivated land covers only a quarter of Sudanese arable land, implying high potential for productivity growth and expansion. The role of the agricultural sector will likely increase with the recent removal of U.S. sanctions as the sector is expected to attract significant international finance and FDI. Moreover, the recent invasion of Ukraine by Russia is likely to have significant influence on the food security situation in Sudan and other countries in the MENA region that import grains (especially wheat) from these warring countries.

Summary of Breakout Group Discussions

This sub-section summarizes the findings of the breakout group discussions related to the development challenges and opportunities within the theme of agricultural production, the governmental and non-governmental organizations and research institutions working on issues related to this theme, and the existing knowledge gaps and research demands within the theme.

Development Challenges and Opportunities

Challenge 1: Agricultural productivity improvement. Despite the significant role of agriculture in Sudan's economy there is large room for further developing the sector– especially on productivity improvement for both crop and livestock subsectors. Available information on production technology adoption is limited such as which technologies/innovations are preferred, reasons for adoption (or dis-adoption), and the impact of these technologies on productivity and welfare of farmers. The use of productive inputs such as fertilizers and improved seeds, as well as irrigation and mechanization are also low. Climate change and variability also continue to affect agricultural production, yet the expected impacts remain unclear. The growth in value addition along agricultural value chains are also dependent on growth in production and productivity.

Challenge 2: Data challenges and knowledge transfer. Substantial data gaps exist in Sudan on agricultural production. There is a lack of information about and access to available data, and there are questions about the quality of existing datasets on agricultural production. The data challenges span production (area and yields) for major crops and livestock products and information about markets and trade (demand, prices, transport costs, etc.). There is a growing demand in Sudan and beyond to digitize data for easy processing and sharing to inform policy. To improve the quality of data, there is also a strong need for capacity development in data collection, data analysis, impact evaluation methods, among other topics. In addition, there is also a need for capacity building in science-based and data-driven policy formulation.

Years of work and output from national research centers often do not reach farmers due to a lack of adequately trained extension agents. Substantial knowledge gaps exist in how research and extension can be better linked and benefit from each other, especially at the local levels. These include gaps in understanding the capacity of the extension service providers, and the potential to reach farmers through other forms of communication (like e-extension).

Challenge 3: Natural resource management challenges: Sudan is in the Sudano-Sahel region – the band of drylands on the southern edge of the Sahara Desert. This region faces multiple and interrelated challenges: land degradation, extreme climate variability, poor land management, and conflicts. Scant and unreliable rainfall and poor soils make the land difficult to farm. Substantial production stress and a lack of soil fertility enhancement strategies has led to soil "mining". There are knowledge gaps related to soil fertility improvement and the options available for sustainable intensification in different farming systems/agroecological zones. There is also limited information on what climate change mitigation and adaptation strategies could work for different production systems and regions.

Challenge 4: Policy and institutions. Sudan's agricultural sector policies are often incoherent and not in line with the latest evidence. Agricultural development strategies suffer from a lack of prioritization and lack clear implementation guidance. Key decisions on how investments in agriculture should be allocated are often not transparent.

Knowledge Gaps and Research Demands

The expert participants identified several critical knowledge gaps impeding the growth of agricultural production in Sudan. Policy lessons from other countries with comparable agro-ecological and development characteristics, such as Egypt, were also deemed useful to provide impetus to the Sudan SSP research and capacity building agenda. The gaps identified and key priorities can be summarized as follows:

Priority 1: Investing in data infrastructure and analytical rigor. The lack of empirical data to guide policy decisions remains a priority due to the substantial data gaps in Sudan's agricultural sector. Efforts should be directed toward data collection through surveys, with a focus on undertaking an agricultural census and value chain studies. Data collection activities will be most effective if closely coordinated among development partners (FAO, IFAD, WFP etc.). For example, the World Bank's is planning to support a nationally representative household survey conducted by the Central Bureau of Statistics (CBS). Working closely with national agencies and institutions (such as CBS, Agricultural Research Corporation, Khartoum University and others) will be key to improve the coverage and quality of data and the institutional architecture that manages data systems.

Priority 2: New evidence and technologies. It remains unclear what constrains productivity enhancement and value chain development. To prioritize investment strategies to support farmers there is a need to generate new evidence through micro-level studies on fertilizer usage, access to agricultural extension services and the viability of digital extension tools, and a better understanding of rural markets. Understanding the potential for new technologies such as solar energy to spur production may also offer new opportunities.

Priority 3: Investment prioritization. Given limited public resources, the Sudanese government will need to prioritize its investments to impact agricultural productivity growth. To do so, new tools will be needed that build the capacity of local institutions and identify the types of investment and policies that make sense for Sudan by examining the role of agriculture and the linkages between agriculture and the rural and urban nonfarm economy. There also needs to be a strong focus on sub-national development considering national and regional market opportunities. Efforts should also be undertaken to identify which types of public investments are most likely to benefit the rural poor, and what features of the policy and governance environment can best stimulate such investments.

Relevant Organizations and Areas of Work

Table 1 lists the governmental and non-governmental organizations and research institutions that participants saw as key actors in the promotion of agricultural production and related activities in Sudan. These organizations and institutions are listed in descending order of relevance as indicated by the discussion participants. Yet, this ordering is subjective and should be interpreted cautiously.

Table 1: Organizations and institutions concerned with agricultural production

Governmental organizations	Private or non-governmental associations and organizations	Research Institutions
Ministries: ► Minister of Agriculture and Natural Resources ► Minister of Irrigation and Water Resources ► Minister of Livestock and Fisheries	**Farmers, processors, and exporters associations:** ► Farmers Organizations and Cooperatives ► Consumer Associations ► Agricultural Banks	**Research centers and institutes:** ► Agricultural Research Corporation ► National Centre for Research ► Central Bureau of Statistics
National centers and institutes: ► Agricultural Research Corporation ► National Centre for Research ► Central Bureau of Statistics	**Domestic NGOs:**	**Universities:** ► University of Khartoum ► Afhad University for Women
	International NGOs: ► UN Agencies ► AOAD ► International Research Organizations [ICARDA, IITA, etc.]	

Source: Own representation.

Theme 2: Markets and Trade

Background and Setting the Stage

Rural and urban markets in Sudan are fragmented and linkages across value chains involve several formal and informal actors. A weak business environment, frequent conflicts, lack of market infrastructure, and unavailability of market information are likely to contribute to the poor functioning of rural markets and value chains (IFAD, 2017; World Bank 2020). Furthermore, unorganized trade flows and inefficient trading systems limit smallholders' participation, bargaining power, and access to markets and finance (IFAD 2017; World Bank 2020). The lack of linkages within value chains, including the absence of a well-functioning agro-processing sector, is also an important factor that limits smallholders' production potential and market opportunities. These bottlenecks are apparent even within those high-potential agricultural value chains, including gum Arabic, sesame seeds, livestock (meat), horticulture, and dairy (World Bank 2020). These value chains have received substantial traction and policy attention by the Transitional Government of Sudan. However, the poor functioning of local agricultural markets and value chains are likely to generate significant distortions and volatility in market prices while also limiting marketing opportunities even for these high potential value chains. Some of these challenges are reflected in high transaction costs, inequities in profit margins across value chain actors, and poor spatial integration of markets, which collectively are limiting the competitiveness of smallholders and value chains, domestically as well as regionally (World Bank 2020). These bottlenecks coupled with the significant spatial variation in production potential and seasonality in farming systems imply that improving the functioning of markets and value chains is critical for ensuring food security in Sudan. Furthermore, competitive value chains and strong linkages among value chain actors are crucial not only for domestically traded goods and services but also for globally traded products. Improving the competitiveness and backward and forward linkages among value chains is one of the major priorities of the "growth, rebuilding, and resilience" agenda of the Transitional Government of Sudan.

Breakout Group Discussions

This sub-section summarizes the findings of the breakout group discussions related to the development challenges and opportunities within the theme of markets and trade, the governmental

and non-governmental organizations and research institutions working on issues related to this theme, and the existing knowledge gaps and research demands within the theme.

Development Challenges and Opportunities

Challenge 1: The lack of infrastructure (including markets and roads). The value of commodities and products could be improved by creating, upgrading and maintaining markets and road infrastructure, including special commodity centers[3] and grading centers. There are also many intermediaries and traders along the value chains, which contributes to relatively high trade margins and low producer prices. Participants also consistently mentioned very high spatial disparities in terms of infrastructural access – where some regions (such as Darfur and Bahr-el-Ghazal) are very poorly connected to markets and lack road networks.

Challenge 2: Financing–especially micro-financing. Many farmers must rely on local informal networks or traders for pre-financing inputs etc. Traders especially seem to take advantage of farmers' reliance on prefinancing and often extract very high interest rates to provide them with financing packages. At the moment, financial markets do not seem to provide adequate products for farmers and associated services such as financial education (literacy) at a larger scale. Also, alternative models such as contract farming arrangements don't seem to be widely available.

Challenge 3: International market dynamics. The international market dynamics influencing some crops such as wheat and sunflower are often unpredictable. As the country is a net importer of these two important commodities and domestic competitiveness is limited, a sound trade strategy is critical. Poor linkages and communication between different ministries and the private sector make it difficult to coordinate imports and to develop local processing industries.

Knowledge Gaps and Research Demands

Implementation of policies to promote markets and trade requires filling several significant knowledge gaps in Sudan. This section describes some of the key knowledge gaps and priority research relating to markets and trade highlighted by the workshop participants.

Priority 1: Conducting market and value chain studies. Priority should be given to market and value chain studies of rural and urban markets to identify important constraints and bottlenecks (for commodities such as wheat, gum Arabic, sorghum, sesame, livestock and dairy) by employing primary and secondary sources of data (including satellite-based sources). Based on these assessments, policy recommendations on how to improve the functioning of markets and value chains should be developed.

Priority 2: Improve market-related data infrastructure. While working with both local and international partners, the program should also prioritize development of data infrastructure and hence improve evidence-based policy making in Sudan. Examples could include the development of (online) market price data for the main commodities across the primary markets in Sudan and the development of a mobile app that helps farmers to access and share producer and input price data.

Priority 3: Digitizing service delivery. The participants highlighted the importance of developing and implementing innovative approaches to revitalize the agricultural extension system and market information systems. The potential of digital tools and ICT innovations should be given priority as a cost-effective way to support farmers. Digital tools such as video extension and price information apps are shown to be effective in improving the functioning of markets and rural extension systems in Africa (e.g., Van Campenhout et al., 2018; Abate et al. 2019). Learning from these experiences,

[3] These are specialized organized markets where members buy and sell commodities or contract for future delivery under established rules and regulations.

taking stock of ongoing digital service delivery initiatives in Sudan and developing Sudan specific systems and tools are seen as important elements of improving markets and trade.

Relevant Organizations and Areas of Work

Table 2 presents a list of governmental and non-governmental organizations and research institutions that now contribute to promoting markets and trade in Sudan. These organizations and institutions are loosely listed in descending order of relevance as indicated by the discussion participants. Yet, this ordering is subjective and should be interpreted cautiously.

Table 2: Organizations and institutions concerned with markets and trade

Governmental organizations	Private or non-governmental associations and organizations	Research Institutions
Ministries: ► Ministry of Trade ► Ministry of Industry ► Ministry of Animal Resources	**Farmers, processors, and exporters associations:** ► Farmers Organizations and Cooperatives ► Consumer Associations ► Agricultural Banks	**Research centers and institutes:** ► Chambers of Commerce
National centers and institutes: ► Sudan Standards Association ► National Centre for Research ► Central Bureau of Statistics ► Agricultural Research Corporation	**Domestic NGOs:** ► Councils of trade (private sector and government are represented)	**Universities:** ► University of Khartoum ► Afhad University for Women
	International NGOs: ► UN Agencies/Organizations ► AOAD	

Source: Own representation.

Theme 3: Livelihoods and Nutrition

Background and Setting the Stage

Poverty, food insecurity, and malnutrition have been highly prevalent in Sudan, and COVID-19 has further exacerbated the already fragile food security and nutrition situation in the country. According to FAO projections, nearly half of the population were moderately or severely food insecure in 2017–2019 (FAO 2020). Acute and chronic child malnutrition is widespread, especially in rural areas where an estimated 65% of the population lives (UNDP 2021). The latest Multiple Indicator Cluster Survey from 2014 shows that an estimated 17% of all children younger than five years were wasted in rural areas (compared to 13% in urban areas), and 43% were stunted in rural areas (compared to 27% in urban areas) (CBS & UNICEF 2016). More recent child nutrition estimates and survey-based data on household food security and diet quality as well as other forms of malnutrition are unavailable.

Agriculture—including farming, pastoralism, and agro-pastoralism—provides the main livelihood of Sudan's rural population, but its contribution to rural incomes is unknown due to the lack of recent household income and consumption survey data. There are likely strong linkages between agricultural production, household income, food prices, household diets, and nutrition outcomes, but there are no studies that have systematically analyzed and quantified these linkages in Sudan. It can be expected that the linkages considerably differ between sedentary and pastoralist/semi-pastoralist lifestyles of agricultural households. Understanding these linkages is essential for designing and implementing effective policies to improve food security and nutrition, as these

linkages form the pathways through which most public policies act, and synergies between a set of interventions can be utilized. Sudan's poor and fragile food security and nutrition situation especially among agricultural households calls for urgent and decisive policy actions that increase household resilience to seasonal variations of food and income availability, shocks (such as COVID-19 or pests), and the impact of climate change. However, knowledge about the effectiveness of existing food and social protection policies (such as the wheat subsidy program) or alternative/complementary policies (such as cash transfer payments) in Sudan is scarce.

Breakout Group Discussions

This sub-section summarizes the findings of the breakout group discussions related to the development challenges and opportunities within the theme of livelihoods and nutrition, the governmental and non-governmental organizations and research institutions working on issues related to this theme, and the existing knowledge gaps and research demands within the theme.

Development Challenges and Opportunities: Nutrition

Nutritional Challenge 1: Lack of knowledge about nutrition and little research and data on nutrition. Mothers often lack basic information about feeding nutritious foods and the importance of breastfeeding. Knowledge about the nutritional value of traditional food and cooking is lessoning among parts of the population, especially younger people in urban areas. The potential exists for overweight and obesity problems in the future as experienced in other countries like Egypt.

Government data is scarce and is often difficult to obtain. The latest available household survey is from 2009 and there is an urgent need to collect detailed consumption data for households given the changes that have taken place since 2009. As such, under- and overnutrition trends, data on diets and dietary diversity and the health status of people remain unclear. In addition, the main drivers of malnutrition are also not well known and need to be identified in order to design adequate programs and policies.

Nutritional Challenge 2: Inadequate availability of food throughout the year and changing food culture. Sudan's agricultural production is mainly rain-fed and the production patterns for many crops and regions are largely seasonal. Moreover, there are a series of post-harvest challenges such as transport and storage problems which impede food availability and stability. As a consequence, many people face food shortage throughout the year and rely on international organizations such as the World Food Program for basic food items. With economic development, growing incomes, and urbanization Sudan is undergoing a nutrition transition. This growing consumer market offers opportunities for producers but also poses challenges. People in urban areas are increasingly shifting to wheat-based products (bread, pizza, pasta etc.), which will likely increase wheat demand in the future. However, overconsumption of nutrient dense and processed foods can increase overweight and obesity unless better nutrition information is available.

Nutritional Challenge 3: Suitable policies for healthy agricultural production and awareness. Agricultural policies should evolve to support traditional crops that are also often more resilient to disruptions (e.g., conflict) because such crops are less input intensive. Support and subsidies should be geared more to healthier foods rather than input intensive systems to grow wheat. Innovative approaches are needed to improve consumers' nutritional awareness.

Development Challenges and Opportunities: Livelihoods

Livelihood Challenge 1: Livelihoods are eroding. In rural areas there is often a lack of diversity in income sources / livelihoods. Many households are dependent on agriculture only and become

vulnerable when harvests fail or are less than expected. Additionally, some livelihoods are compromised by climate change and growing population density like herding animals. In some parts of the country youth migration out of agriculture means that the average age of farmers is likely to increase.

Livelihood Challenge 2: Fluctuations in weather and droughts cause high variability in livelihoods. Shocks such as droughts and floods and stressors such as the volatile political environment and security situation all impact the livelihood base of communities. These challenges are likely to increase with climate change and continued high population growth, likely further accelerating the migration to urban areas. Though some poor households receive humanitarian assistance, their livelihood is not supported to increase incomes and build resilience. Intensive cropping systems that rely on improved seeds and fertilizers may not be the appropriate farming system for many areas in Sudan as uncertainties and conflict can easily disrupt supply chains for input and output markets. Less input intensive and more traditional farming systems with crop rotations may be better suited.

Livelihood Challenge 3: Lack of appropriate technology. In areas with high potential and more stable/safe market access, access to modern technology and inputs is a common challenge for crops (seeds, fertilizer) and livestock (improved breeds), which leads to low levels of output. Moreover, technology is required for improved / sustainable production and preservation of productive resources. Forests are being cut down instead of thinking about agro-forestry systems. By increasing productivity through technologies, household incomes can be raised, especially when accompanied by marketing and trade reforms.

Some of the cross-cutting investments to address these challenges would include increasing the allocation and effectiveness of agricultural and rural investments, fostering stability and human security and a commitment by policy makers to prioritize agriculture and rural areas.

Knowledge Gaps and Research Demands

Some of the immediate priorities for research and associated tools and methods to improve livelihoods and nutrition may include the following:

Priority 1: Stocktaking exercise to assess the current food and nutrition security and existing nutrition programs. Understanding of existing programs and gaining insights on best policy practices from other relevant countries can help inform Sudan's nutrition programming. This should be complemented with a review of existing questionnaires for the national household consumption survey and the inclusion of a nutrition module in the forthcoming surveys conducted by the CSO. In addition, a collaboration with WFP and access to its regular Integrated Phase Classification (IPC) surveys could yield important insights plus collaboration with national institutes such as the Food Research Center.

Priority 2: Agriculture and Nutrition linkages research. Analysis is needed to understand the linkages between agricultural production, household income, food prices, household diets, and nutrition outcomes in farming and agro-pastoral systems. Given the importance of growing poverty and food insecurity, such programs are likely to focus on combatting calorie deficiencies and child malnutrition, but also focus on awareness raising and issues related to dietary diversity.

Priority 3: Create awareness by making information available and accessible. Livelihoods and nutrition research needs to be made widely accessible to support policy and program formulation. Ongoing dialogue with the transitional government is needed to broaden awareness of current issues and their causes. New thinking is needed to improve large scale nutrition campaigns that raise nutrition knowledge on issues such as the importance of breastfeeding and dietary diversity in combatting chronic malnutrition.

Relevant Organizations and Areas of Work

The governmental and non-governmental organizations and research institutions that are dealing with issues of livelihoods and nutrition in Sudan are listed in Table 3. The organizations and institutions are loosely listed in descending order of relevance as indicated by the discussion participants. Yet, this ordering is subjective and should be interpreted cautiously.

Table 3: Organizations and institutions concerned with livelihoods and nutrition

Governmental organizations	Private or non-governmental associations and organizations	Research Institutions
Ministries: ► Ministry of Trade ► Ministry of Industry ► Ministry of Animal Resources	**Farmers, processors, and exporters associations:** ► Farmers Organizations and Cooperatives ► Consumer Associations ► Agricultural Banks	**Research centers and institutes:** ► Chambers of Commerce
National centers and institutes: ► Sudan Standards Association ► National Centre for Research ► Central Bureau of Statistics ► Agricultural Research Corporation	**Domestic NGOs:** ► Councils of Trade (private sector and government are represented)	**Universities:** ► University of Khartoum ► Afhad University for Women
	International NGOs: ► UN Agencies/Organizations ► AOAD	

Source: Own representation.

Theme 4: Development Strategy and Investment Planning

Background and Setting the Stage

Development strategy and investment planning for the coming three years will likely be dominated by recovery from COVID-19 and the 2020 floods and locust swarms, in addition to macroeconomic stabilization (EIU 2020). The IMF estimated a slow recovery in 2021 of 0.8 percent growth in economic output (IMF 2021). IFPRI research suggests that COVID-19 had few direct impacts on agricultural production and that the negative impact on agriculture was mainly indirectly through reductions in food demand and migrant labor shortages. Swarms of desert locust plus the floods had a much greater negative impact on agriculture. It remains to be seen what the impacts of the Ukraine war will be. Given the rising world market prices for wheat combined with the import dependence of Sudan and the subsidization of bread, the costs of imports, the budget deficit, and poverty are all likely to increase. Policies and investments to tackle socio-economic recovery from the multiple shocks and crises will ideally lay the groundwork for longer-term sustainable transformation with the food system as one of the key driving sectors. Evidence suggests a large potential for productivity-driven agricultural growth as well as an expansion of agro-processing and agro-services for both domestic and international markets (Nin Pratt et. al. 2018). Due to the labor intensity of most agri-food system sectors, this growth is likely to create jobs and increase the (real) incomes of the rural and urban poor. Such agri-food system transformation also provides an opportunity to build a food system that delivers healthy foods at reasonable prices.

Breakout Group Discussions

This sub-section summarizes the findings of the breakout group discussions related to the development challenges and opportunities within the theme of development strategy and

investment planning, the governmental and non-governmental organizations and research institutions working on issues related to this theme, and the existing knowledge gaps and research demands within the theme.

Development Challenges and Opportunities

Challenge 1: Strategy formulation and implementation challenges. There is a perceived lack of capacity to develop and implement agricultural/food security/rural development strategies. The Ministry of Agriculture would be the obvious national stakeholder and should develop a food security strategy. Such a strategy would serve as a master plan for development and investment and should provide guidelines for all the sectors related to food security. Important questions to be addressed within such a strategy would be: what should be the priority value chains? Which crops are suited to specific zones? How should the budget allocation look like to achieve certain development goals? Furthermore, given the federal system in Sudan, sub-national level development strategies for each state are needed to reflect on the agro-climatic, socio-economic and cultural differences across states. With each state having budget power to allocate funds, the priorities would likely be different. Also, capacity building activities should be tailored to the needs at the state level. Additionally, the strategy would also focus on the challenges, causes, outlook and implications of climate change. The impacts of conflicts, risks, and migration on development should be anchored in the strategy so as to anticipate and prepare mitigation strategies beforehand. What is Sudan's development pathway? There are important lessons from traditional methods; is high input agriculture the right path? What lessons can be borrowed from international experience and comparable countries such as other African countries, India, Europe?

Challenge 2: Coherence of laws and regulations and institutions. The contradiction between federal and state law concerning the terms of investment law inhibit investments due to uncertainties that are created. Institutions such as the equivalent of Ethiopia's Agricultural Transformation Agency (ATA) would be useful to farmers. The agency, together with research and other partners, could guide and help draft and streamline investment laws and regulations. Additionally, state institutions are often weak. State failures in this regard further compounds the challenges experienced by the farmers. There might be need to further assess and review the federal system in terms of service delivery.

Challenge 3: Investments challenges and business climate. With the Foreign Direct Investments arrangement, there was a view that the government gives foreigners preference over domestic investors. For instance, sometimes there seem to be forced relocations whereby the local people are moved from their land to make way for large-scale farming operation by foreigners. Beyond such reported large-scale investments, insecurity together with the unfavorable investment climate seems to limit the number of agri-food system investments (agriculture, processing etc.) in the country. There is also a lack of key infrastructures such as roads, water and electricity.

Challenge 4: Gender and inclusion. Like many other developing economies, women in agriculture are a disadvantaged group and their role is underestimated. Women have limited access to credit, land, and other productive assets. Women empowerment strategies are urgently needed. It was also noted that that policies in Sudan are often top to down and not tailored to the needs of the women farmers. Another systemic challenge is that the government often prefers farmers in the irrigated systems to the neglect of other smallholders. Also, it is perceived that youth are leaving agriculture and there is a lack of strategy to keep them in rural areas. Farming can be a very attractive venture, but the startup costs are high, and the business risks are also often higher than in other sectors. The influence of cartels as middlemen within the commodity markets who exclude certain farmers (such as women) must be addressed to improve farmers' earnings.

Challenge 5: Value chains and farming systems. Sudan has a large diversity of farmers with big difference in farm size (large, mechanized farms versus smallholders), farm ownership (owners versus farm laborers), and types of farming system (irrigated vs non-irrigated). A comprehensive approach that addresses these diversities is important, and policies and investments should be formulated accordingly. Acknowledging these differences, a comprehensive analysis of the competitiveness of agriculture and the different value chains in Sudan in view of the ongoing macroeconomic challenges (exchange rate, rising prices, subsidies etc.) should be conducted. Such assessments should also include identifying appropriate technologies on the farm and along the value chain depending on local contexts.

Challenge 6: Capacity and data. As shown earlier, there are apparent data and capacity challenges that hinder strategy and policy formulation and implementation. There is an urgent need to reassess the organization and capacity of local research institutes. Many of them are perceived to need reform and new approaches to capacity building. Capacity building may need to include to collection, organization and interpretation of data as well as the development, application and interpretation of scientific tools. At the farm level, farmers have a lack information and there is a lack of communication from the research and extension services to farmers. Therefore, there is need to bridge the science – policy gap. How can data be translated into research and practical solutions to address the pressing needs of farmers. The exchange of knowledge between research, farmers, and international institutions and partners is key in this process. To attract and keep young professionals in the sector would require raising the profile of agricultural colleges. Lessons from other countries like Egypt (such as giving graduates a piece of land to farm) could be considered.

Challenge 7: Markets access and agricultural/food processing. The road infrastructure connecting states and states and the capital city are often inadequate and need improvements so that farmers and traders can access markets. Due to bad roads, drying facilities, cold storage, packaging facilities lots of produce cannot be sold and is lost. There is also a need to improve access to international markets. That could lead to more diversified production and export structure, for example the potential for organic export farming (certified by private sector companies) was mentioned as an opportunity. The bottlenecks bedeviling local processing, which could become a key driver of local growth and job creation including lack of infrastructure, reliable and affordable electricity, access to markets, and access to capital should also be addressed.

Knowledge Gaps and Research Demands

As highlighted in the preceding subsection, development strategy and investment planning in Sudan faces myriad of challenges. We summarize the knowledge gaps as well as some of the main research activities that could support the design and implementation of policies and investments to drive agri-food system transformation in Sudan in this subsection.

Priority 1: Addressing strategy development difficulties (lack of development strategy): In order to enable local partners to develop strategies, investment plans and programs, there is a need to develop country-specific databases and tools. For example, tools that help prioritizing value chains and ranking different kinds of investments according to their expected developmental outcomes (like economy-wide models such as RIAPA/AIDA), impact assessment and geo-spatial analyses. There is a strong sense that in order to enable local partners such as the Central Bureau of Statistics, Ministry of Finance and Economic Planning and other relevant stakeholders to use such tools, the development and application of the tools will need to be implemented in close collaboration with Sudan SSP and accompanied by capacity building.

Priority 2: Consolidate evidence on the effectiveness of policies, investments and programs. There is a need to develop a vision, mission, and specific objectives within the agricultural strategy. For

that, a baseline development path should be developed in order to assess alternative and viable pathways and their trade-offs (e.g. export-led growth vs. domestic led growth; agricultural-led vs service-led growth etc.) Once such broad development pathways have been analyzed and discussed, appropriate policies and investments should be co-designed and their impact should be assessed, including their economy-wide costs and benefits to guide policies and investments prioritization.

Priority 3: Stocktaking of sectoral laws, regulations and institutions Existing sectoral policy would require harmonization to address incoherence and inconsistencies. Better institutions are needed to promote economic development. A good starting point is documenting existing policies and the institutional capacities for both policy formulation, policy implementation, and policy analysis.

Priority 4: Value chains and farming systems assessments. One of the priority areas that is also important for development strategy and investment planning is targeted target value chain/farming systems analyses. Such analyses would provide recommendations for the value chains that a program like Sudan SSP and other initiatives should focus their investments in order to best achieve the desired objectives of food security and poverty reduction.

Priority 5: Addressing the lack of capacity and data for strategy development. The group discussions (and experience from elsewhere in the country SSPs), identified that the establishment of a policy research community of practice is needed to bridge the science-policy gap. A starting point could be capacity building in economy-wide database construction, modeling capacity, micro-econometric analyses and related policy communication activities.

Relevant Organizations and Areas of Work

Table 4 shows the governmental and non-governmental organizations and research institutions that are concerned with development strategy and investment planning. Organizations and institutions are loosely listed in descending order of relevance as indicated by the discussion participants. Yet, this ordering is subjective and should be interpreted cautiously.

Table 4: Organizations and institutions concerned with development strategy and investment planning

Governmental organizations	Private or non-governmental associations and organizations	Research Institutions
Ministries: ▶ Ministry of Finance ▶ Ministry of Agriculture ▶ Ministry of Animal Resources	**Farmers, processors, and exporters associations:** ▶ Unions (Farmers, Producers) ▶ Microfinance Institutions	**Research centers and institutes:** ▶ Parliament
National centers and institutes: ▶ Central Bank ▶ National Centre for Research ▶ Central Bureau of Statistics ▶ Agricultural Research Corporation	**Domestic NGOs:** ▶ Private Sector Financing Farmers (CTC, DAL)	**Universities:** ▶ University of Khartoum ▶ Afhad University for Women
	International NGOs: ▶ UN Agencies/Organizations ▶ AOAD	

Source: Own representation.

Theme 5: Increasing Resilience of Farming Under Growing Climate Challenges

Background and Setting the Stage

An important reason for the slow progress in agricultural productivity in Sudan is the lack of water and the inefficient use of available water and energy resources. Food production levels are dramatically below potential, amid population growth, growing food demands, changing climate conditions, weak policies, including poor coordination among key government agencies, and costly or unavailable agricultural inputs. Below-potential production is common in the various agricultural production systems, not just traditional rainfed agriculture. Roughly 43 percent of the Nile River Basin, which is shared among 11 countries, lies within Sudan but Sudan has only used around 14-16 billion cubic meters of Nile water resources to date due to its low water storage capacity and other infrastructure development (Babiker, Siddig and Ringler 2019). The country has three types of agricultural production systems: the largest equipped irrigation system in Sub-Saharan Africa, at about 1.7 million hectares, including the 1-million-hectare Gezira scheme; a larger-scale, semi-mechanized rainfed system of about 6 million hectares in the higher rainfall areas focused on sorghum; and a low-input small-scale rainfed system of about 9 million hectares where most of the poorer rural population is engaged growing a series of subsistence and export crops (FAO 2020). Agriculture uses about 97% of the country's extracted River Nile waters, but about 95% of the total area under crop production depends on rainfall. The limited, internal renewable water resources as well as the erratic nature of rainfall in Sudan – and its concentration in a short season – place the country in a vulnerable situation, especially in rainfed areas. Livestock production, which accounts for a much larger share of agricultural GDP, at around 60 percent, also suffers from low productivity and continued reductions in accessible land and water resources. Climate change has already increased temperatures in Sudan, and precipitation has become more variable, which puts rainfed production systems at risk with frequent re-plantings to generate output. Other impacts include increased incidence of pests and diseases, as well as seasonal droughts and floods. Some of the climate variability can be mitigated through harnessing the increased water availability for irrigation from more predicable flows when the upstream GERD dam is fully operational, but this requires that Sudan implements massive, planned investments in nine new irrigation systems, as well as increased storage capacity.

Breakout Group Discussions

This sub-section summarizes the findings of the breakout group discussions related to the development challenges and opportunities within the theme of increasing resilience of farming under growing climate challenges, the governmental and non-governmental organizations and research institutions working on issues related to this theme, and the existing knowledge gaps and research demands within the theme.

Development Challenges and Opportunities

Challenge 1: Data challenges – insufficient data and inaccessibility of available data. The are several challenges associated with data in Sudan. Data is often missing or uncollected, is not accessible, and data is fragmented across various institutions/sources. Participants pointed to several areas under this theme where data and analyses are needed. This includes climate forecasts, livelihoods resilience strategies (such climate insurance for weather risks), watershed data, and land use change data and analysis.

Challenge 2: Lack of awareness and lack of political will by policymakers on climate change issues. Addressing the challenges and the effects of climate change requires political will from the policy makers. Participants suggested that policy makers have not completely understood the devastating effects of the increasing climate challenges, nor the time sensitivity associated with addressing them. The impacts of climate change are wide and far reaching with potential for ensuing insecurity and conflict over resources due to shortages. Participatory research with a wider spectrum of stakeholders may help create a mutual understanding of the potential challenges associated with climate change and its impact on agriculture, thus generating increased political will.

Challenge 3: Water access and its effect on women. Like in the other thematic discussions, gender dimensions also featured in this group. With growing water shortages, there may be an impact on women's time-use by changing the process of obtaining water for domestic use. A few large farms also may compound the problem by overdrawing water for irrigation against domestic needs.

Challenge 4: Inadequate strategies to address climate related challenges. Policies on adaptation and mitigation strategies are necessary to effectively combat growing climate challenges. Institutional coordination is needed to better organize collaboration between various ministries and state and federal government structures. Currently, Sudan lacks both policies/strategies as well as institutions to coordinate a response to the growing climate challenges.

Knowledge Gaps and Research Demands

Several knowledge gaps were identified limiting increased resilience of farming under growing climate challenges. This subsection enumerates and categorizes these gaps and priority research for each category.

Priority 1: Climate adaptation research. A climate-water-irrigation assessment is needed to provide more detailed climate variability and climate change impact assessments for Sudan's three agricultural systems (irrigated, mechanized rainfed and traditional rainfed) by crop. It will need to examine and propose alternative adaptation options, in consultation with various Sudanese partners including the national agricultural research systems. A household survey covering all three types of agricultural production systems would also help better understand key constraints experienced by farmers in these agricultural production systems, such as access to agricultural input and credit, as well as to examine existing climate adaptation approaches.

Priority 2: Development of a coherent national action plan. The action plan would outline several avenues to address resilience and climate challenges while assessing existing (in-progress) strategies and initiatives. This would include mitigation measures, mainstreaming of environment and climate change policies, reviewing Sudan's ratification of international conventions or agreements. This would also include a better outline of the roles and responsibilities of Sudan's various ministries in implementing a climate-resilience strategy including the creation of coordination committee.

Relevant Organizations and Areas of Work

Table 5 shows the governmental and non-governmental organizations and research institutions that are concerned with resilience under growing climate challenges. Organizations and institutions are loosely listed in descending order of relevance as indicated by the discussion participants. Yet, this ordering is subjective and should be interpreted cautiously.

Table 5: Organizations and institutions concerned with resilience of farming under growing climate challenges

Governmental organizations	Private or non-governmental associations and organizations	Research Institutions
Ministries: ► Strategic Studies Center ► Agricultural Resource Corporations	**Farmers, processors, and exporters associations:** ► Unions (farmers, producers)	**Research centers and institutes:** ► Parliament
National centers and institutes: ► Higher Council for Environment and Natural Resources ► Agricultural extension departments ► National Center for Research	**Domestic NGOs:** ► Haggar Group	**Universities:** ► University of Khartoum ► Afhad University for Women
	International NGOs: ► Catholic Relief Services ► World Vision ► Mercy Corps ► WHH ► UNEP ► UN Agencies/organizations ► AOAD	

Source: Own representation.

SUMMARY AND CONCLUSIONS

This paper presents an innovative approach to prioritizing development policy research in Sudan with the specific objective of informing the research agenda of IFPRI's Sudan Strategy Support Program. It provides concrete, policy relevant research priorities for Sudan, including associated development challenges and opportunities, key organizations involved in the topic, and knowledge gaps and research demands. The identified priorities are ranked on their level of importance as identified by the workshop participants and the workshop organizing team (IFPRI staff).

The *Research Priority Matrix* (Table 5) summarizes the proposed research areas for IFPRI's Sudan SSP over the period 2021-2024. Our findings from the priority setting workshop suggest that IFPRI and its partners should focus on the following priorities:

Agricultural Production

- Investing in data infrastructure and analytical rigor and strengthen the capacity of local agricultural researchers and policy makers.
- Generate new evidence (and technologies) to guide improvements in agricultural practices, policies and investments based on existing and new data, such as surveys, satellite data etc.
- Conduct investment prioritization analysis to identify activities with high impact on agricultural productivity growth.

Markets and Trade

- Conduct market and value chain studies of rural and urban markets to identify constraints, bottlenecks and opportunities to improve the functioning of markets and trade systems.
- Improve market and trade related data infrastructure.
- Introduce and evaluate the potential of digital tools and ICT innovations to revitalize agricultural extension and market information systems.

Livelihoods and Nutrition

- Assess the current food security and nutrition situation based on existing data and to review existing food and nutrition security, and social protection policies.
- Analyzing the linkages between agricultural production, household income, food prices, household diets, and nutrition outcomes in farming and agro-pastoral systems.
- Create awareness by making information available and accessible.

Development Strategy and Investment Planning

- Stocktaking of sectoral laws, regulations and institutions.
- Consolidate evidence on the effectiveness of policies, investments and programs
- Update and expand the current economy-wide database and model and build microsimulation modules for poverty and nutrition.
    - Designing a baseline scenario to establish a development path for Sudanese economy over the next 10 years.
    - Designing alternative scenarios and estimating their economy-wide costs and benefits to help the Government of Sudan and international partners to prioritize policies and investments.
- Conduct value chains and farming systems assessments.
- Establishing a modeling community of practice (conduct capacity building in economy-wide database construction and modeling and policy communication activities).

Increasing Resilience of Farming Under Growing Climate Challenges

- Building climate change awareness and education among actors
- Understanding the various adaptation strategies
- Develop a coherent national action plan

Tackling these priority research tasks is expected to help in reducing poverty and improving food and nutrition security in Sudan. However, what will be crucial is the strengthening of links between policy research and decision making to ensure that evidence-based solutions are relevant and have a positive impact on people’s lives.

Table 6: Research Priority Matrix

Subject / Theme:	Agricultural production	Markets and trade	Livelihoods and nutrition	Development strategy and investment planning	Resilience of farming under growing climate challenges	Cross-theme
Development challenges and opportunities	*Challenge 1:* Agricultural productivity improvement *Challenge 2:* Data challenges and Knowledge transfer *Challenge 3:* Natural resource Management challenges *Challenge 4:* Policy and institutions	*Challenge 1:* The lack of infrastructure (including markets and roads) *Challenge 2:* Financing– especially micro-financing *Challenge 3:* International market dynamics	*Nutritional Challenge 1:* Lack of knowledge about nutrition and little research and data on nutrition *Nutritional Challenge 2:* Inadequate availability of food throughout the year and changing food culture *Nutritional Challenge 3:* Suitable policies for healthy agricultural production and awareness *Livelihood Challenge 1:* Livelihoods are eroding *Livelihood Challenge 2:* Livelihoods' fluctuations due to weather and droughts *Livelihood Challenge 3:* Lack of appropriate technology	*Challenge 1:* Strategy formulation and implementation challenges *Challenge 2:* Coherence of laws and regulations and institutions *Challenge 3:* Investments challenges and business environment *Challenge 4:* Gender and inclusion *Challenge 5:* Value chains and farming systems *Challenge 6:* capacity and data *Challenge 7:* Markets access, processing.	*Challenge 1:* Data challenges – insufficient data and inaccessibility of available data *Challenge 2:* Lack of awareness and lack political will by policymakers on climate change issues *Challenge 3:* Water and its effect on women *Challenge 4:* Inadequate strategies to address climate related challenges	*Challenge 1:* Data challenges *Challenge 2:* Laws, Policy & institutions *Challenge 3:* Infrastructural challenges (road, markets) *Challenge 4:* Lack of finances
Knowledge gaps and research demands	*Priority 1:* Investing in data infrastructure & analytical rigor *Priority 2:* New evidence and technologies *Priority 3:* Investing prioritization	*Priority 1:* Conducting market and value chain studies *Priority 2:* Improve market-related data infrastructure *Priority 3:* Digitizing service delivery	*Priority 1:* Stocktaking exercise to assess the current food security and nutrition situation nutrition programs *Priority 2:* Agriculture and Nutrition linkages research *Priority 3:* Create awareness by making information available and accessible	*Priority 1:* Addressing strategy difficulties (lack of development strategy) *Priority 2:* Consolidate evidence on effectiveness of policies, investments and programs *Priority 3:* Stocktaking of sectoral laws, regulations and institutions *Priority 4:* Value chains and farming systems assessments *Priority 5:* Addressing the lack of capacity and data for strategy development	*Priority 1:* Climate adaptation research *Priority 2:* Development of a national coherent action plan	*Priority 1:* Improve data infrastructure *Priority 2:* Improvement of analytical skills and capacity *Priority 3:* Market and value chain studies

Key organizations and research institutions	**Ministries:** ▶ Minister of Agriculture and Natural Resources ▶ Minister of Irrigation and Water Resources ▶ Minister of Livestock and Fisheries **National centers and institutes:** ▶ Agricultural Research Corporation ▶ National Centre for Research ▶ Central Bureau of Statistics **Farmers, processors, and exporters associations:** ▶ Farmers Organizations and Cooperatives ▶ Consumer Associations ▶ Agricultural Banks **International NGOs:** ▶ UN Agencies ▶ AOAD ▶ International Research Organizations [ICARDA, IITA etc. **Research centers and institutes:** ▶ Agricultural Research Corporation ▶ National Centre for Research ▶ Central Bureau of Statistics **Universities:** ▶ University of Khartoum ▶ Afhad University for Women	**Ministries:** ▶ Ministry of trade ▶ Ministry of industry ▶ Ministry of animal resources **National centers and institutes:** ▶ Sudan Standards Association ▶ National Centre for Research ▶ Central Bureau of Statistics ▶ Agricultural Research Corporation **Farmers, processors, and exporters associations:** ▶ Farmers Organizations and Cooperatives ▶ Consumer Associations ▶ Agricultural Banks **Domestic NGOs:** ▶ Councils of trade (private sector and government are represented) **International NGOs:** ▶ UN Agencies/ organizations ▶ AOAD **Research centers and institutes:** ▶ Chambers of Commerce **Universities:** ▶ University of Khartoum ▶ Afhad University for Women	**Ministries:** ▶ Ministry of trade ▶ Ministry of industry ▶ Ministry of animal resources **National centers and institutes:** ▶ Sudan Standards Association ▶ National Centre for Research ▶ Central Bureau of Statistics ▶ Agricultural Research Corporation **Farmers, processors, and exporters associations:** ▶ Farmers Organizations and Cooperatives ▶ Consumer Associations ▶ Agricultural Banks **Domestic NGOs:** ▶ Councils of trade **International NGOs:** ▶ UN Agencies/ Organizations ▶ AOAD **Research centers and institutes:** Chambers of Commerce **Universities:** ▶ University of Khartoum ▶ Afhad University for Women	**Ministries:** ▶ Ministry of Finance ▶ Ministry of Agriculture ▶ Ministry of animal resources **National centers and institutes:** ▶ Central Bank ▶ National Centre for Research ▶ Central Bureau of Statistics ▶ Agricultural Research Corporation **Farmers, processors, and exporters associations:** ▶ Unions (farmers, producers) ▶ Microfinance institutions **Domestic NGOs:** ▶ Private sector financing farmers (CTC, DAL) **International NGOs:** ▶ UN Agencies/organizations ▶ AOAD **Research centers and institutes:** Parliament **Universities:** ▶ University of Khartoum ▶ Afhad University for Women	**Ministries:** ▶ Strategic Studies Center ▶ Agricultural Resource Corporations **National centers and institutes:** ▶ Higher Council for Environment and Natural Resources ▶ Agricultural extension departments ▶ National Center for Research **Farmers, processors, and exporters associations:** ▶ Unions (farmers, producers) **Domestic NGOs:** ▶ Haggar Group **International NGOs:** ▶ Catholic Relief Services ▶ World Vision ▶ Mercy Corps ▶ WHH ▶ UNEP ▶ UN Agencies/ organizations ▶ AOAD **Research centers and institutes:** ▶ Parliament **Universities:** ▶ University of Khartoum ▶ Afhad University for Women	**Ministries:** ▶ Ministry of trade ▶ Ministry of industry ▶ Ministry of animal resources **National centers and institutes:** ▶ Agricultural Research Corporation ▶ National Centre for Research ▶ Central Bureau of Statistics **Farmers, processors, and exporters associations:** ▶ Farmers Organizations and Cooperatives ▶ Consumer Associations ▶ Agricultural Banks **Domestic NGOs:** ▶ Councils of trade **International NGOs:** ▶ UN Agencies/ organizations ▶ AOAD **Research centers and institutes:** ▶ Chambers of Commerce **Universities:** ▶ University of Khartoum ▶ Afhad University for Women

Source: Own representation.

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APPENDIX: WORKSHOP PARTICIPANTS

Table A1: Participating national experts

	First Name	Last Name	Gender	Organization	Position
1	Abdallah	Mohamed	M	Toward Enduring Peace in Sudan (TEPS)	Chief of Party
2	Abdelatief	Ibrahim	M	University of Khartoum & Rida Group LTD	Ass. Prof. & Senior Manager Agribusiness
3	Abdulrahman	Eissa	M	Tenzeen for Agric. and Animal Services	Operation Manager
4	Abubakr	Albukhary	M	UNICEF	Food Security & Livelihoods Program Manager
5	Abubekr	Hussein	M	Ahfad University for Women	Assistant Professor
6	Ahmed	Subahi	M	IFAD	Country Programme Officer
7	Ahmed	Altahir	M	USAID Sudan	Monitoring and Evaluation Specialist
8	Ahmed	Elnefeidi	M	Elnefeidi Group	CEO
9	Ala'addin	Humid	M	Africorp	
10	Aldisougie	Elwagie	M	White Nile Sugar Company	General Manager
11	Amani	Osman	F	Independent	Homemaker
12	Amel	Mahgoub	F	Mahgoub Group	Executive Manager
13	Amir	Eltayeb	M	USAID Sudan	Development Assistance Specialist
14	Amjad	Babiker	M	University of Khartoum	Student
15	Amr	Tayfour	M	CTC Group	Business Dev. & Sustainability Manager
16	Anwar	Yagoub	M	Salih Abdelrahman Yagoub Group	General Manager
17	Awadallah	Abdelmawla	M	University of Khartoum	Dean of Faculty of Agriculture
18	Babagana	Ahmadu	M	FAO	Representative to Sudan
19	Dana	Fuentes	F	Voluntas	Senior Associate
20	Felicia	Genet	F	USAID Sudan	Humanitarian Officer
21	Hala	ElAmin	F	World Bank	Digital Development Consultant
22	Hanadi	Eldessougi	F	University of Khartoum	Head of Agronomy Department
23	Haruna	Sekabira	M	WFP Sudan	Value Chains and Food Systems Expert
24	Hassan	ElAwad	M	ICARDA Sudan	Country Manager
25	Hatim	Elamin	M	Orgamed Farms Company Ltd.	General Manager
26	Ibrahim	Hamid	M	USAID Sudan	Project Manager
27	Jawhara	Kanu	F	Sudanese Women Economists Association	Founding Member
28	Kabbashi	Suliman	M	University of Khartoum	Ass. Professor, Department of economics

29	Kamilia	Kora	F	NUWEDA	Executive Director
30	Karrar	Abbadi	M	Arab Organization for Agri. Development	Head of the Food Security Department
31	Khatab	Abdallah	M	National Center for Research	Assistant Professor
32	Magdi	Mukhtar	M	Innovative Relief & Development Solutions	CEO
33	Mai	Izeldeen	F	Ahfad University for Women	Ass. Professor of Gender and Development
34	Mamoun	Dawelbeit	M	CTC Group	Director of Agrotechnology Transfer
35	Mervyn	Farroe	M	USAID Sudan	Mission Director
36	Michael	Gabriel	M	Welthungerhilfe (WHH)	Country Director
37	Mohamed	Adam	M	USAID Sudan	Monitoring and Evaluation Specialist/Gender
38	Muawia	Shaddad	M	University of Khartoum	Professor
39	Muhtadi	Yousif	M	USAID Sudan	
40	Mumin	Mukhayer	M	Elnefeidi Group	Board Secretary
41	Mustapha	ElHamzaoui	M	USAID Sudan	Director - Agriculture & Environment Office
42	Nada	Saleh	F	Salih Abdelrahman Yagoub Group	
43	Nimat	Nurein	F	USAID Sudan	Communications Specialist
44	Nuha	Ahmed	F	Independent	Senior Agricultural Statistician
45	Osama	Salih Alawad	M	Ahfad University for Women	
46	Rashid	Hassan	M	Centre for Env. Economics & Policy in Africa	Director
47	Rihab	Abdalla	F	Save the Children	Head of Technical- Acting CD Deputy on PQD
48	Rusha	Hussien	F	Sudan Polling and Statistics Center	Consultant
49	Safa	Eltayeb	F	Bank of Khartoum	Head of Corporate Products and Services
50	Safaa	Eltigani	F	Ahfad University for Women	Assistant professor
51	Salah	Abdelmagid	M	Arab Organization for Agri. Development	Agricultural Economist
52	Salah	Salih Alawad	M	University of Khartoum / AOAD	Associate professor
53	Salma	Rashid	F	USAID Sudan-Bureau of Humanitarian Assist.	Food Security Specialist
54	Sarrah	Kheir	F	Impact Hub Khartoum	Business Development & Programs Manager
55	Sawsan	Elshowaya	F	Confederation of Sudanese Civil Society Org.	Secretary General
56	Solara	ElSheikh	F	IITA	Project management specialist
57	Somiya	Mohamed	F	Ahfad University for Women	Professor of Nutrition & Health

58	Suad	Ramram	F	ENABLE Youth Sudan Program	Director of Gender Mainstreaming
60	Tarig	Khair	M	Haggar Group	Chief Operating Officer
61	Umnia	Mahgoub	F	Mahgoub Group	Head of Strategy & Development
62	Wolde	Abbute	M	FAO	International Technical Advisor
63	Yousif	Hamid	M	Darfur Development & Reconstruction Agency	Executive Director

Source: Own representation.

Table A2: Participating IFPRI staff and collaborators

	Name	First Name	Gender	Organization	Position	Role in workshop
1	Breisinger	Clemens	M	IFPRI	Interim Chief of Party	Curator, Presenter, Notetaker
2	Kassim	Yumna	F	IFPRI	Senior Research Associate	Convenor, Curator and Notetaker
3	Dorosh	Paul	M	IFPRI	DSG Division Director	Presenter and Notetaker
4	Kirui	Oliver	M	IFPRI	Research Fellow	Presenter and Notetaker
5	Siddig	Khalid	M	Humboldt University	Assistant Professor	Presenter and Notetaker

Source: Own representation.

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