

Climate Adaptation and Capturing Innovative and Best Practices of Sudan Funded Projects for Knowledge Management

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Abstract:- This paper mainly aims to capture and assess projects and initiatives that have led or are leading innovative actions or good practices that can be replicated or scaled up in Sudan. Methods used mainly desk review, interviews using convenient sampling method with a number of experts charged of different occupation in academia, research centres, line ministries and freelance experts. Assessment was covered selected projects of innovative actions and good ecological and/or socioeconomic practices implemented by development partners. Focusing was on four crosscutting accelerators: which is technology, innovation, data, and complements (governance, human capital and institutions). The secondary and primary data collected were subjected to screening, sorting out and thematic analysis.

Main findings of good practices adopted include; ecosystems-based adaptation (EbA) to reduce vulnerability and build resilience to climate change, adaptive technology like zero tillage, improve crop management practices etc., promotion of inclusive high-potential value chains, that allow resilient models for smallholder producers and other herewith described good practices. It is recommended that the local authorized and concerned partners to; support and scale up and replicate action needed to form consultative natural resource forum develops innovative tools for EbA, to alleviate vulnerability and build resilience to climate change; monitoring, reporting, and verification (MRV) system in sectors; establish Regional Observatory Centre; adoption of social protection system; land governance, support tenure rights and land ownership, The technologies judged as most appropriate by producers to be incorporated into on-farm demonstrations and strengthening the research and to be linked to development.

Keywords:- Innovative Actions, Good Practices, Accelerators, Scale Up, Replication.

I. INTRODUCTION

Best practices defined as “highlight knowledge or understanding gained by experience. The experience may be positive, as in a successful test or mission, or negative, as in a mishap or failure. However, the definition of what is good varies according to context and sector (UNEP ,2020). According to UNEP a “good” lesson must concisely capture the context from which it is derived, be applicable in a different context, have a clear application domain, have clear target users, and guide actions (<http://unfccc.int/6491.php>). Innovation is any new knowledge introduced into and utilized in an economic or social activity.

An innovation is a new product, process, service or management approach that is adopted on a significant scale because it is useful. Agricultural innovation has a number of dimensions social, technical, organizational and institutional. Innovation can take different shapes and forms. Scientific understanding, a new technology, an invention or a new idea is not innovation until it is put into use. Innovation approach offers a more holistic, multidisciplinary and comprehensive framework for analysing innovation processes for climate change adaptation and food security.

Enhanced sustainability performance requires adaptation and change in processes, products, management approaches, and policy orientations. Therefore, change is a fundamental element for organizations, supply chains, and communities as they evolve on their sustainability trajectory. Sustainable innovations that are continuously adopted improve specific organizations and the entire supply chain's sustainability trajectory, allowing them to achieve superior sustainability performance. (FAO,2021).

Accelerating and scaling up science, technology and innovation (STI), including institutional innovations, is key to meeting the aspiration of more efficient, inclusive, resilient and sustainable agri-food systems and leveraging emerging opportunities for achieving the SDGs. STI has huge potential of producing co-benefits of complementary sets of actions, (FAO,2021).

Knowledge management (KM) plays a vital role and can be a powerful tool in sustainability. KM, organizational learning and adaptive management are increasingly recognized in the international development community as important routes to more effective development assistance. Development agencies are investing in programmes that focus on building individual and organizational capacity to learn and adapt, and on measuring and demonstrating the links between learning, value for money and better development results.

The main objectives of this study reproduced by this paper are; identification of projects and initiatives in the Sudan that have led or are leading innovative actions and good practices that, can be replicated or scaled up; assess progress and opportunities of partners' initiatives on mobilizing youth and women as entrepreneurs in promoting innovations that transform livelihoods and enhance resilience at scale; describe the opportunities, innovative and good practices implemented or under implementation by projects and other initiatives in the Sudan or elsewhere that deserve to be replicated or scaled up ; Identify of monitoring and knowledge platforms relevant to the issue; assess barriers for implementation of good practices, innovative approaches and monitoring and knowledge Management platforms in the specified area.

II. METHODOLOGY

A. Study Area

Study Area, the projects identification process was started with gathering of available foreign funded projects and initiatives and lessons learned were determined and extracted from previous experiences mainly in land, water resources and agriculture. These projects aimed to support land, water resources, agricultural and rural development in Sudan: these grouped by Development Partners which are: IFAD funded projects; GEF and GCF Programmes that are implemented and administrated by their partners such as World bank, FAO, UNEP etc.; IGAD and AFDB Projects (Wasila et al ,2022).

One of the main crosscutting themes, identified are IFAD Country Strategic Opportunities Programme (COSOP) which addresses women, with gender and youth mainstreaming action plans; FAO Strategic Framework 2022-2031 focusing on the four crosscutting accelerators: which is technology, innovation, data, and complements (governance, human capital and institutions) (IFAD,2021).

Initiatives were determined and extracted from previous experiences mainly in land, water resources and agriculture. Assessed projects proved to support land, water resources, agricultural and rural development in Sudan. Evaluated innovative and good practices clearly classified into 7 themes, which are (ecosystems-based adaptation; adaptive technologies; inclusive value chains, information technologies and resilience; water development; energy substitutes improvement; livestock improvement and livestock feeding system; and climate risk transfer).Gathering themes mainly depends on different

development partner's and on available opportunities, which, will allow Sudan and other countries come up with concepts for sound projects on appropriate technologies for land, water and agriculture development.

B. Secondary Data

Secondary data was used based upon reviewed literature of foreign funded projects, especially the documents and reports of the development partners to stand on what had been done in the context of scope, objectives, practices, implementation process, constraints, challenges etc. The primary data as a base for this study; the team conducted interviews, using convenient sampling method with a number of experts charged of different occupation in academia, research centers, line ministries and freelance experts. Some of the respondents were directly interviewed through face-to-face contact; others were interviewed through phone conversations.

Data analysis; the secondary data and the primary data were subjected to screening, sorting out and content analysis to make some inferences that may be useful to realize the objectives of the study.

III. KEY FINDINGS

A. Ecosystems-based Adaptation Approach (EbA)

EbA is a set of practices based on nature-based solutions that deploys biodiversity and ecosystem services to reduce vulnerability and build resilience to climate change. Recommended practices may include: rehabilitation of degraded land and sand dunes fixation using biological green windbreaks & shelterbelt, these integrated interventions had higher ecological resilience to extreme climate events, it will gain adaptation and co- benefits of smallholders to climate change in response to rangeland degradation and the drive towards increasing local-level management (governance) of resources. Mitigation co-benefit will include: reduction of CO₂ and NO₂ emissions and increase soil carbon stock. Scale up could be through:

- Establish Consultative Natural Resource Forums as multi sectoral -stakeholders
- Develop innovative adaptation tools for measuring carbon such as: FAO's EX-Ante Carbon- balance Tool (EX-ACT)¹.
- Improve monitoring measures to include: MRV system in sectors to include a data sharing agreement and a set of quality control procedures. FAO-Open Foris which are innovative, free and open tools help in measure, monitor and report on forests and land use, paving the way for improved climate change mitigation plans and more informed land-use policies
- Establish land degradation Observatory Centre.

EX-ACT ¹was used to develop estimates of the impact of forestry and rangeland mitigation measures. The tool is a land-based accounting system, measuring C stocks, stock changes per unit of land, and CH₄ and N₂O. emissions expressed in t CO₂e per hectare and year

Upscale EBA based by considering emergence partnerships and efforts in knowledge management and capacity development and capacity building to increase resilience to climate shocks and provides for knowledge management on successful EbA measures and develop communication and advocacy tools.

B. Adoption of Adaptive Technologies

Conservative Agriculture or zero tillage technology which, proved to improves the soil, increases production and decreases the cost of production. It consists of improved agricultural packages include: Crop residue from previous crop and crop rotation; Application of pre-post emergence herbicides;

Planting in rows and application of fertilizer in one operation by a special planter; and Agricultural operation started after the soil has received 110 mm of rain fall (HCNER ,2013). Zero tillage had climate mitigation co benefit through Zero tillage which reducing soil erosion, reduction of CO₂ and NO₂ emissions and increase soil stocks. Scale up of zero-tillage in require the following :

- Knowledge and skills and also necessitate those farmers be organized in groups or societies under the umbrella of agricultural service providers.
- Adoption of social protection system, tools or programs
- Mobilization & formation of association common interest groups and extension teams

C. Promotion of Inclusive Value Chains, Information Technologies and Resilience

Transformation of agricultural production through promotion of inclusive high-potential value chains; and promotion of information technologies for communication and provision of services to allow resilient models for smallholder producers in the rainfed areas of Sudan. This transformation increases environmental sustainability, enhances resilience at scale, and strengthens women and youth organizations and associations reducing inequities as it contributes to SDGs.

Scale-up requires revival of land governance, support of tenure rights, and land ownership; access to the production inputs market along the value chain; support for agriculture and natural resource management policies review, and networking dialogue and platforms at all levels.

D. Water Development

Water development of different forms for different purposes represent good opportunity for water security and build social integrity among diverse groups of users in addition, provision water reduced of resources-based management especially pastoralists and farmers. It includes: Pump irrigation and Improved water harvesting practices and water catchment.

Water development supports It increases resilience of vulnerable main crop production systems to climate change, to improve socio-economic conditions, reduce poverty and contribute to achieving SDGs.

Scale up need to introduce climate monitoring and early warning systems; introduce weather-indexed crop insurance; Rainwater harvesting through water storage and spreading techniques to be utilized during dry spell and to avoid rain variability in rain-fed agriculture and pasture improvement sites.

➤ *Energy Substitutes Improvement:*

Include: Distribution of gas cylinders and stove units to vulnerable household communities reduced, consumption per household of charcoal. Scale up a provision of LPG cylinders -refilling center and invest in solar energy (Solar energy pumps).

E. Livestock Improvement Activities and Improve Livestock Feeding System

Good practices in increasing adaptive capacities of vulnerable population population. Scale up and replication need strengthening the research to guarantee complete package delivery in crop and livestock activities; manure management studies; feed inventories studies by ecological zones at various seasons for different animal type; development of forecast-based finance instruments to minimize potential losses to productive systems; and design of combinations of appropriate risk finance tools and instruments appropriate to local contexts.

F. Climate Risk Finance

This includes vegetation index insurance facilitated by microfinance and micro insurance. Climate risk finance for sustainable and climate resilient rain-fed farming and pastoral systems is to increase climate resilience of rain-fed farmer and pastoral communities in regions of high rainfall variability through climate risk financing. Scale up and replication should be enhancing governance; and Support tenure rights, and replicate African Development Fund to implement the Africa Disaster Risk Financing Programme (ADRFi).

➤ *Knowledge Management and Platforms*

Knowledge management (KM) plays a vital role and can be a powerful tool. Its organizational learning and adaptive management are increasingly recognized in the international development community as important routes to more effective development assistance. Development agencies are investing in programmes that focus on building individual and organizational capacity to learn and adapt, and on measuring and demonstrating the links between learning, value for money and better development results (IFAD,2019). Major assets in Knowledge Management in the Sudan were evidenced by knowledge systematization and cross learning between the projects, particularly around natural resource management and governance, and women empowerment.

Collaboration with international and/or national entities, e.g. Consultative Group on International Agricultural Research (CGIAR), Agricultural Research Centre (ARC), Universities or similar research and academia. The Platforms which are established act as a liaison and/ or coordinating body to foster communication between the groups, information-sharing, coordination and mutual learning, however related platform include: WASH (Water, Sanitation and Hygiene); Pastoral forum, Natural Resources Network and NGOs platforms (Dafalla et al., 2017).

➤ *Innovative and Best Practices from Development Partners on Climate Resilient Actions and Resource Mobilization*

Implementation modalities of all mentioned development partners comprising youth and women as entrepreneurs as community-based actors who, fully engaged in the implementation process in different forms such as local village development committees (VDCs) at community levels and producers' associations, which governed by the producers' associations Act (2011) and supervised by the MoAF, under the umbrella of the General Attorney office. Those local non-state actors are gender based selected or elected often, there are specialized women committees, developed as income generating activities groups to support livelihoods transformation and enhance the resilience.

One of the main crosscutting themes, the IFAD COSOP addresses are: Women and youth mainstreaming action plans during the programme design phase; Nutrition will be mainstreamed by selecting nutrition-sensitive crops for value chain development and home gardens. Expected result in this regard is that by the end of COSOP a 20%

reduction in unemployment of women, men and youth.

FAO Strategic Framework 2022-2031 was focused on the four crosscutting accelerators: technology, innovation, data, and complements (governance, human capital and institutions) focus efforts in all of FAO's programmatic interventions, is to fast-track progress and maximize prospects for contributing to the SDGs, while minimizing trade-offs. The crosscutting themes of gender, youth and inclusion are embedded across all of FAO's work to operationalize the principle of leaving no one behind (FAO, 2022).

Core function of FAO strategy include Capacity development; and improve capacities of institutions and organizations for gender-responsive action (FAO, 2021).

Adaptation fund climate innovation accelerator (AFCIA) which is the operational arm of the United Nations Framework Convention on Climate Change (UNFCCC) Technology Mechanism. This Innovation Facility of the Adaptation Fund is offering vulnerable countries, new tools and grants to foster scale up and accelerate innovative adaptation practices and technologies on the ground to help meet the urgency of climate change. Climate technology center and network (CTCN); UNDP and UNEP provide different services to support innovation in adaptation to developing countries through Adaptation Fund AFCIA. The AFCIA UNDP Grant Funding programme is designed to develop and diffuse innovative adaptation practices, tools, and technologies that will result in improved climate resilience livelihood

➤ *Priority Areas Linked with Innovative and Good Practices*

Table 1 Priority Areas were Identified in the Initial Screening Sudan was Summarized

Portfolio	Priority areas	Good Practices for replication or upscale
1. Sustainable Land and water management and biodiversity	Restoration and management of land and other ecosystems	Land management
		Carbon sequestered
		Protected area management
2. Climate actions and Green Economy	Mobilization and integrated management of water resources	Water structures
	Adaptation and resilience to climate change through green growth	Resilient actions
		Energy substitute infrastructure
	Strengthening of energy infrastructure	Improved stoves and bio digesters
3. Resilient Economic Development and Security	Vulnerability management to climate risks	Climate smart villages (CSV)
	Promotion and Development of productive green jobs	green jobs and interactive structures
	Improvement of access to d basic social services	Enabling environment for value chain activities
4. Technical and logistic capacity building	Knowledge management	knowledge management platforms
	Research and development of local knowledge	Selection and seed processing units
	Support to research, training and development	Studies/research and capacities
5. Information Communication	Centres for the support of the Resilient Development	Establish Operational Centres of Support for Resilient Land Development and training
		Setting up a network; Land degradation Observatory

Portfolio	Priority areas	Good Practices for replication or upscale
Advocacy	Communication, Marketing and Advocacy	Publication and dissemination Coalitions and platforms / Communication Plan
Financial support	Provision of financial services and access to funding lender institutions	Involvement of private sector to support and Establishment of joint ventures

➤ *Barriers For Implementation of Good Practices, Approaches and Monitoring and Knowledge*

Institutional barriers: contradicting sectoral policies and regulatory framework to support sustainable land and natural resources adaptation and mitigation measures; Physical barriers: Incomplete land use map, poor equipped and low working environment; Technical barriers: Inadequate capacities and knowledge gaps; Financial barriers: Financial constraints Ineffective coordination between governmental organizations and lack of synergies; Environmental barriers: Weak drought contingency planning and Gender and social barriers:

IV. CONCLUSION & RECOMMENDATION

Assessment was covered selected projects of innovative actions and good ecological and /or socioeconomic practices implemented by development partners. One of the main crosscutting themes, identified are IFAD -COSOP, which addresses women, with gender and youth mainstreaming action plans; FAO Strategic Framework 2022-2031 focusing on the four crosscutting accelerators: which are technology, innovation, data, and complements (governance, human capital and institutions). Assessed innovative and good practices clearly classified into 7 themes depend on the analysis of effectiveness of projects and initiatives, gathering themes mainly depends on different development partner's and an available opportunities mentioned above, which, will allow Sudan and come up with concepts for sound projects on appropriate technologies for land, water and agriculture development. These innovative practices include: Ecosystems-based adaptation; Adoption of adaptive technologies; Promotion of inclusive value chains, information technologies and resilience Water development; Energy substitutes improvement; Livestock improvement activities and improve livestock feeding system; Climate risk finance. Key Scale up and replication action needed are: need to formation of consultative natural resource forum develops innovative adaptation tools for measuring carbon; MRV system in sectors; establishment land degradation Observatory Centre; adoption of social protection system; land governance, support tenure rights, and land ownership and strengthening the research and to be linked to development.

➤ *Main Recommendations*

- Ministries and departments authorized for planning and implementation of projects should involve indigenous knowledge and making the process up streaming

- Considerable fund should be devoted from the donors to climate resilient infrastructures and access to renewable energy, and provision of energy saving technologies.
- Encouragement and sponsoring the promotion of information technologies for communication and provision of services
- Innovation demonstrations can be as a platform for the engagement of the stakeholders to demonstrate new technology or practices.
- The technologies judged as most appropriate by producers will be incorporated into the on-farm demonstrations in the following season.
- Networking among the relevant stakeholders and knowledge sharing models or platforms should be developed to make use of scientific institutions competencies (research, universities, institutions in environment protection etc) to promote and scale up the innovative technologies and good practices
- The partners should seek and implement effective approaches for coordination, exchange and flow of information at regional and national levels.
- Establishment of networking among established community-based organizations at village and locality and State levels, which would play a central role in the empowerment of local people and provide greater incentives to manage and utilize these natural resources in a sustainable way.
- Increased focus should be given to the inclusion of youth in FOCI activities.
- Digital marketing data base it is essential to disseminate markets information

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