GGGI Insight Brief: Nepal

Planning and Implementation of Climate Smart Agriculture in the Terai Flood Plain in Nepal

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Photo Credit: Nepal, GGGI Country Office Nepal, 2023

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EXECUTIVE SUMMARY

Extreme heat waves, droughts, excessive and unpredictable rainfall, and high temperatures represent just a few of the weather and climate related events that negatively affect agriculture and farmers. With climate change becoming more pronounced in Nepal, it is imperative to help farmers prepare for and respond to these recurrent events.

To help address these issues, the KOICA-GGGI Climate Smart Agriculture (CSA) project in the Terai Flood Plain in the Madhesh Province is designed to alleviate the vulnerability of smallholder farmers and returned migrant workers, with a specific focus on enhancing food and livelihood security of the local population. The project recognizes the diverse nature of Nepal's farming systems and the high involvement of women in agriculture. Therefore, CSA interventions are tailored to specific locations and include considerations for Gender and Social inclusion (GESI). Climate risk analyses have been conducted to identify vulnerable regions and populations, ensuring that interventions address the unique challenges faced by different groups.

The identification and selection of CSA technologies suitable for the project area have been largely facilitated through collaboration with the Nepal Agricultural Research Council (NARC). The selected technologies will support overall agricultural resilience, lowering greenhouse gas emissions, and improving resource use efficiency. Similarly, consultations with related stakeholders, such as the Agriculture Ministry in the Madhesh Province, agriculture knowledge centers, local governments, and farming communities, were crucial for its success. Furthermore, the project seeks to mainstream CSA into municipal planning and implementations, setting the stage for scalability.

Image 1. Use of Yellow Sticky Trap, Climate Smart Agriculture Technology for the Management of Insect Pests in Vegetable Farm

Image 2. Use of Plastic Mulching, Climate Smart Agriculture Practice by Farmers at Mukhiyapatti Musharniya, Dhanusha

1. Impacts of Climate Change on Nepalese Agriculture

Climate change impacts in the agriculture sector can be directly observed as the sector is more dependent on natural resources than any other sector. Nepal, being exposed to diverse climatic hazards such as floods, droughts, heavy rainfall, and thunderbolts, experiences direct consequences on its agricultural activities. Floodings in rural areas damage crops and properties and cause inundation, soil erosion, siltation, and debris deposits on agricultural land that potentially make it unproductive. With drought, the impacts and losses on agriculture are intensified. An estimate of impacts between 2000-2010 shows that floods affected 2,097,434 people—or 14 percent—while droughts resulted in production loss of 1,725,416 tones, thereby affecting about 12,078,000 people[1]. Agriculture is the second biggest sector economically after the service sector and the largest source of employment in the country. Thus, the majority of the population is still dependent on highly climate-sensitive agriculture for their living. As climate change intensifies new risks in the agriculture sector, better adaptive capacity is needed to respond to climate challenges and achieve food security.

Agriculture has recently shown weak growth rates. Growth averaged 3.0 percent between the fiscal year 2011/12 and 2020/21 (versus 4.4 percent GDP growth) and only 2.4 percent through the fiscal year 2021/22. The Nepali agriculture sector's productivity and competitiveness are low compared to other countries in Southern Asia, and Nepal is a food importer with a large increasing agricultural trade deficit. The agriculture sector is dominated by smallholder farmers with an average farm size of about 0.68 ha.[2] Accordingly, farms experience higher production costs, lower crop yield, and lower profitability under the pronounced land fragmentation. In addition, poverty remains widespread in rural areas where people compete for a small set of economic opportunities and contend with the inherent vulnerability to climate change impacts, the practice of unsustainable land use, and a lack of investment opportunities. These issues contribute to the increasing outbound migration trend. In 2023, the net migration rate saw a 16.47% increase from 2022[3].

1 Country Report: Climate Risk Management for Agriculture in Nepal
2 Agriculture Census 2011/12, NS0 Nepal
3 United Nations – World Population Prospect

2. Responding to Climate Change in Agriculture: Climate Smart Agriculture

CSA is an evolving practice and science, perceived and understood by stakeholders in diverse ways. The Food and Agriculture Organization (FAO) of the United Nations defines CSA as "an approach aimed at developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change[4]." CSA should, first, help to improve farm productivity; second, increase resilience to weather extremes; and, third, decrease greenhouse gas emissions wherever possible.

The KOICA-GGGI CSA project in the Terai Flood Plain aims to address vulnerability of smallholder farmers and returned migrant workers, particularly in food plains of Terai (Madhesh Province) by promoting widespread adoption of climate smart agriculture practices. The project is being implemented with the following objectives:

- Improving emergency management in the agriculture sector to protect lives and livelihoods,
- Strengthening resilient agriculture planning and implementation, and
- Building and financing climate smart agriculture businesses for job creation and long-term resilient green growth.

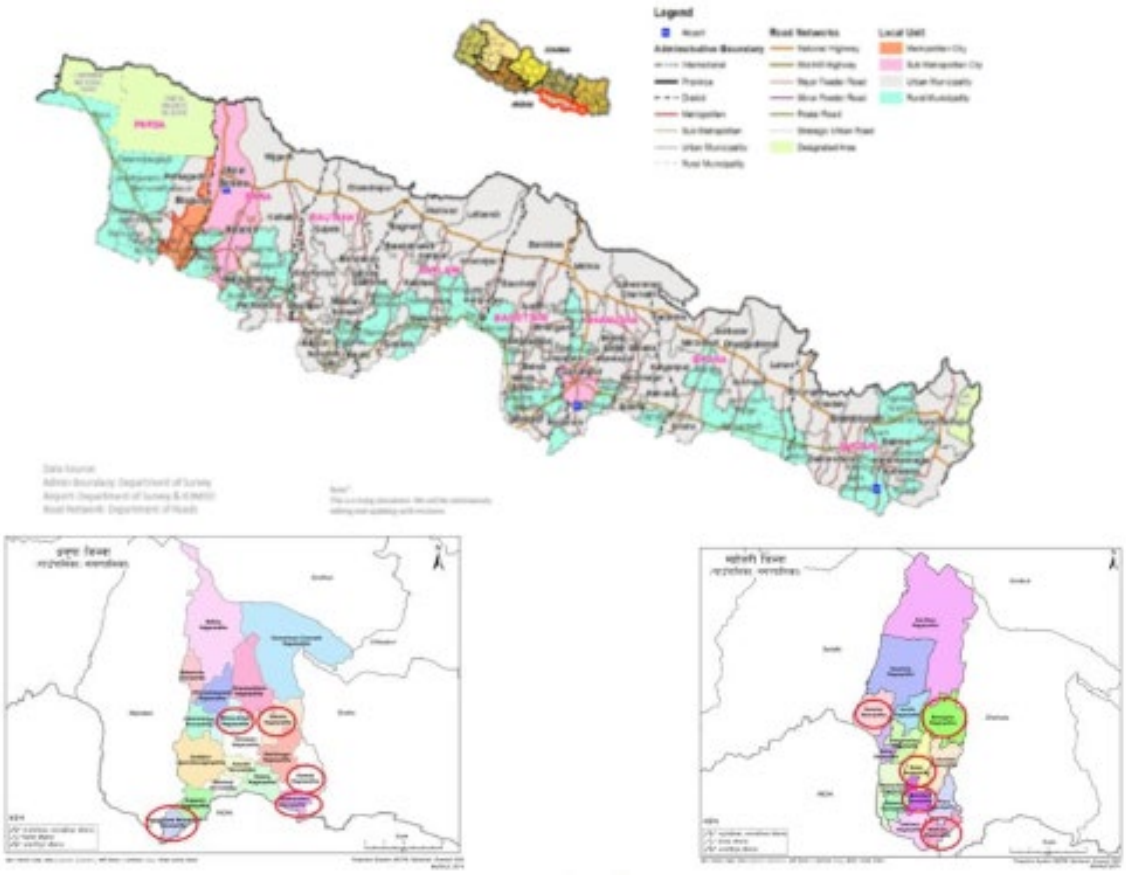

Figure 1. Project Area

4 Food and Agriculture Organization of United Nations

Key facts

Terai accounts for about 56% of Nepal's arable land.[5]

Agriculture suffered a loss of Rs. 2.36 billion (USD 17 million) due to floods, landslides, and drought in 2015. The loss was more than 10% of the total budget of the Ministry of Agriculture and Livestock Development in that year.[6]

Nine districts in Nepal fall into very high-risk climate change categories, six of which are in the Madesh Province.[7]

Extreme climate events can erode about 1.5%-2% of GDP per year in the water management and agricultural sectors, and higher (about 5%) in extreme years.[8]

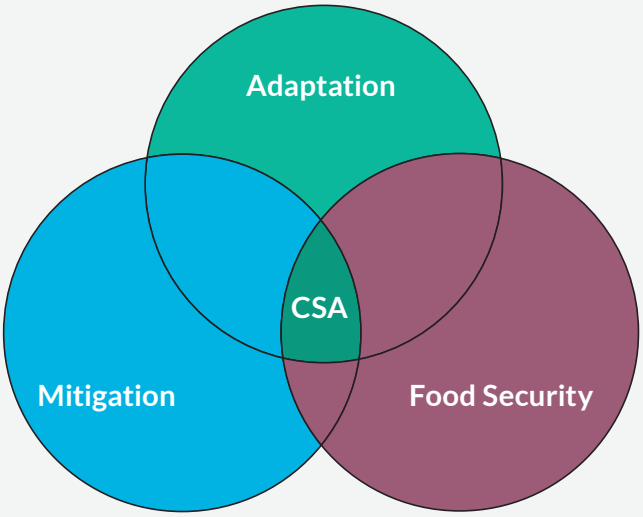

Image 3. Climate Smart Agriculture (CSA) technology orientation to leader farmers

5 Central Bureau of Statistics, 2013.
6 Status of Crops and Weather Report, Agriculture Extension Directorates, Lalitpur, 2015.
7 Vulnerability and Risk Assessment Report, Ministry of Environment and Forest, 2021.
8 Global Climate Adaptation Partnership, 2014.

3. Identification and Selection of CSA technologies for Terai Flood Plain, Nepal

CSA interventions are context specific, and there is no pre-set, fixed package of CSA interventions. Interventions need to be location-specific and reflect climate risks, agriculture production systems, and other bio-physical/socioeconomic conditions. In Nepal, where farming systems and farm typology are diverse, and involvement of women in agriculture is high, location-specific climate smart interventions including gender and social inclusion (GESI) are essential.

i. Collaboration and Consultation

The implementation of the CSA project started with collaboration with NARC, a prominent institute dedicated to agricultural research and development which operates under the Ministry of Agriculture and Livestock Development. GGGI and NARC entered into a Memorandum of Understanding (MoU) to support CSA technologies and approaches, including dissemination of weather information, promoting climate resilient varieties, and providing an agricultural extension service for climate smart agriculture production in the project area. NARC suggested a comprehensive array of technologies for enhancing vegetable, cereal, and legume production, which encompassed a total of 52 CSA technologies. Following further consultations with the provincial agriculture ministry and agriculture knowledge centers, the list was narrowed down to 21 CSA technologies (Annex 1), which were considered suitable for the Madhesh province.

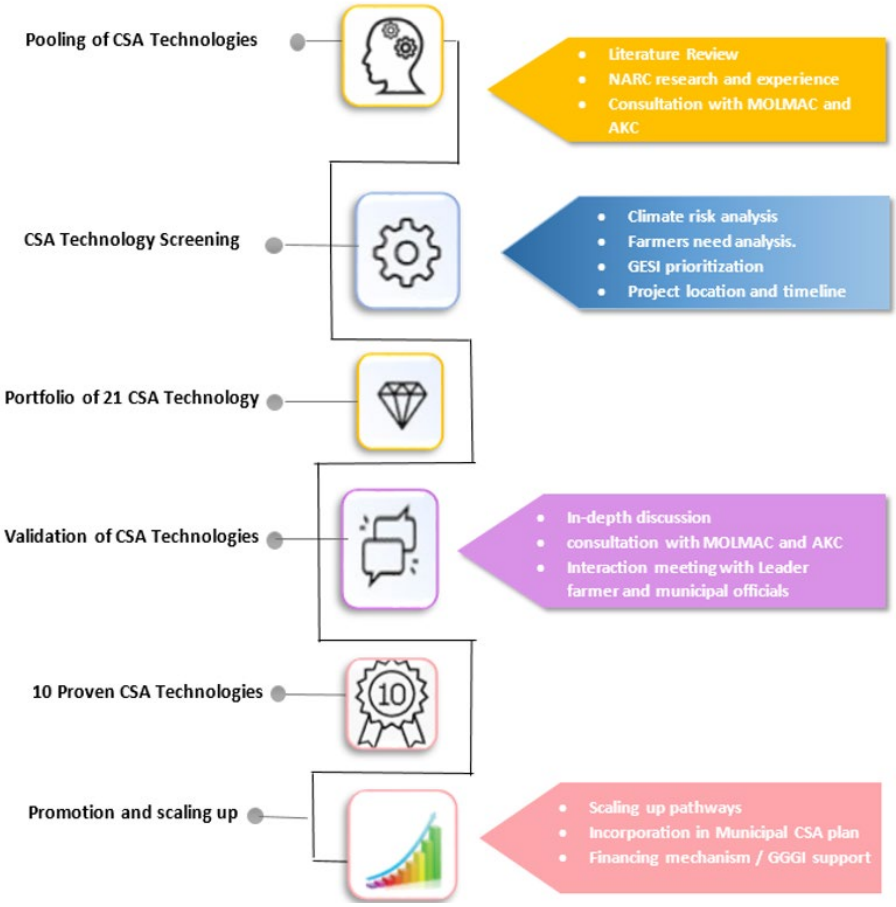

Figure 2: Climate Smart Agriculture (CSA) Technologies Screening Process

ii. Climate Risk Analysis and GESI Prioritization

The incidence of climate change and its impact are dissimilar across different geographies. Thus, analysis was conducted across the project area to identify which regions, sectors or system components are particularly affected by climate change, and identify where there is an urgent need to adapt. For instance, agricultural land near a river is more susceptible to damage from floods than land far from the river. Agricultural land in relatively higher altitude is more inclined to droughts while lowlands are more susceptible to floods.

Similarly, climate change has diverse effects on different groups of people in the same geography. Women who perform more manual work than men are more susceptible to heat waves and other climate vagaries than males who mostly outmigrant for employment. The Dalit communities that mostly reside near the river and in lowlands are susceptible to floods. Likewise, land tenants are more susceptible to the hazards than the landowners whose land they rent and cultivate. Hence, the assessment and selection of CSA technologies incorporated the principles of GESI to make sure that everyone, regardless of gender, background, or circumstances, has an equal chance to benefit from the project activities.

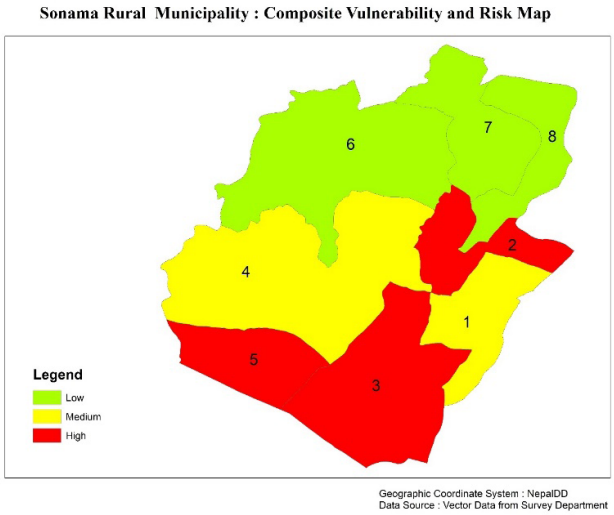

Figure 3. Vulnerability and Risk Map of one of the project municipalities

iii. Mainstreaming CSA in Municipal Planning and Implementation: Scaling-up Opportunities

GGGI engaged in rigorous dialogues and consultations with municipal officials and farming communities about the selected 21 CSA technologies and the results of the climate risk analysis, leading to the agreement to promote these technologies in the project area. Furthermore, GGGI facilitated discussions and capacity building training to local farmers and governmental officials to enhance their understanding of CSA. After thorough assessment, consultation, and coordination, the local governments, with technical support from GGGI, were able to develop a 5-year climate smart agriculture plan, incorporating 10 CSA technologies relevant to the local context. These plans are endorsed and incorporated in the municipal plan as well as in their budgets, which provides opportunities for scale up in the coming years. Prompting the municipality towards the implementation of the CSA plan, some financial support is arranged by GGGI for procurement of the CSA technologies.

4. Challenges and the Way Forward

The adoption and implementation of the CSA technologies in the project area demonstrates some challenges and GGGI is well positioned to provide the needed support. The foremost limitation identified by GGGI is the lack of knowledge and awareness about the concept and approach of CSA among the farming communities. To address this issue, GGGI leverages its technical expertise by conducting capacity-building training for relevant stakeholders. In addition, fostering collaboration among government agencies, the private sector, and non-governmental organizations in research, development and dissemination of CSA technologies can further accelerate the process. By partnering with NARC and working closely with Agriculture Knowledge Centers (AKCs) as well as local government, GGGI can successfully bridge the gap between the region's research and farming communities.

The region has inadequate infrastructure including poor transportation, limited access to electricity, and unreliable internet connection, which pose considerable hinderances. Local and provincial governments should take initiatives in this regard to provide infrastructure that would create opportunities for agriculture and other sectors. The biggest challenge of all, particularly for farmers, is the lack of financial resources necessary to invest in new and often costly CSA technologies. In addition, farmers often face regulatory hurdles and lack incentives for adopting CSA technologies, which deter them from making investments. Implementing financial incentives, such as subsidies or tax breaks, can significantly reduce the initial financial burden to farmers embracing CSA technologies. In this regard, GGGI strongly advocates prioritization of GESI considerations to ensure that marginalized groups, particularly women, have equal access to and benefit from these initiatives.

Above all, tailoring CSA strategies to the unique agro-ecological conditions and socio-economic contexts of different regions in Nepal is crucial. Special attention must be given to the specific needs and preferences of diverse groups, including women and marginalized communities, during the design and implementation of CSA interventions. Furthermore, investing in research is paramount to develop context-specific, cost-effective, and sustainable CSA technologies aligned with the diverse agricultural landscapes of Nepal. As observed by GGGI, establishing knowledge-sharing platforms and fostering peer learning among farmers can facilitate the exchange of experiences and best practices related to CSA technology adoption. These platforms must be accessible and welcoming to all, with a special emphasis on inclusivity for women and marginalized groups, ensuring that a wide range of voices and perspectives are represented and heard.

Image 4. Adoption of Climate Smart Agriculture (CSA) Technologies by Farmers

Image 5. Farmers Level Training about Climate Smart Agriculture (CSA) Technologies

ANNEXES

Annex 1. Selected CSA Technologies for CSA Project Implementation

SN	CSA Technologies	Why is it Climate Smart Technology?
A	Water Smart	
1	Alternate wetting and drying irrigation system for Paddy	Increase water use efficiency - 30% water savings
2	Drip/sprinkler/furrow irrigation for vegetable production	Increase water use efficiency
3	Mulching for vegetables- plastic/bio mulching	Conserve moisture, decrease weed and pest incidence, soil fertility management
B	Nutrient Smart	
4	Lentil - relay cropping with paddy	Soil fertility management, increase production
5	Riverbed farming: Musk/watermelon, pointed gourd, ground nut, pigeon pea	Use of barren land, soil conservation, prevents riverbed cutting, increased production and income
6	FYM/Compost management/vermi-compost promotion	Use of locally available manure and organic waste, decrease dependency on chemical fertilizer, increase soil fertility
7	Intercropping in mango/litchi orchard: turmeric, ginger. Colocasia	Use of barren land under orchard, soil conservation, increased production, and additional income
C	Carbon Smart	
8	Use of Nano-Urea; green manure; bio-fertilizer application in paddy	Decrease the use and dependency on chemical fertilizers, decrease emission
9	Zero tillage- garlic production	Soil conservation, increased production
10	Zero tillage technology for wheat	Seed cum fertilizer, time saving, soil conservation
11	Pheromone traps/lures, physical traps for insect pest control	Non-chemical disease pest control, no biohazards
12	Bio/ botanical pesticide (Jholmal) for disease pest control	Non-chemical disease pest control, no biohazards
D	Energy Smart	
13	Jab planter (maize and vegetable seeds)	Labor smart, time Saving, GESI friendly
14	Corn sheller - manual / electric	Labor smart, time Saving, GESI friendly
E	Knowledge Smart	
15	Improved seed of vegetables	Heat tolerant, Increased production, disease pest resistant
16	Nursery raising technologies: Semi-structured protected nursery with poly house, raised / sunken / hot bed nursery, plastic tray with coco peat	Can grow seedlings in harsh climatic condition (rainy, cold), healthy seedlings, increased production
17	Staking in vegetables (Cucurbits and tomato): pole/string	Increased production, less infection of disease pest

18	3-G cutting in cucurbits	Increased production, less infection of disease pest
19	Seed multiplication (wheat/rice/maize)	Increase availability of improved seed at local market
E	**Weather Smart**	
20	Heat tolerant wheat variety: Gautam, Vijay, NL-971	Increased production in hot weather as in Madhesh
21	Heat tolerant maize variety: Rampur Hybrid-10	Increased production in hot weather as in Madhesh

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