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SDG Blueprint for Sustainable Agriculture: Expert Consultation

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SUMMARY NOTE

SDG 7 (Affordable and Clean Energy)

- Incorporating social factors into the adoption of technology in agriculture is essential, especially when addressing issues like land sharing and diversion, which directly affect farmers. Land diversion for power plants and renewables often leads to implications on farm-based livelihoods and income sources.
- Small farmers should be provided with technology suitable for their scale, as larger landowners often have access to advanced machinery. Barriers to adoption also include land diversity and geographical factors. Promoting quality research, providing continuous handholding, and support throughout the process are essential.
- Small farmers often face unique challenges compared to their larger counterparts. While big companies tend to work with large-scale farmers, there exists a trust deficit when it comes to engaging small farmers in government schemes. To bridge this gap, identifying local champions within the community who can work on innovative business models. Strengthening trust-building initiatives and fostering relationships with farmers should be prioritized. Additionally, leveraging existing mechanisms, such as involving organizations like SELCO, that have decentralized business models, can be beneficial. This decentralization approach fosters trust and community involvement.
- Many research organizations and civil societies advocate for agro-voltaic systems, but land-related challenges persist, particularly among small and marginal farmers. Introducing technologies like agro-voltaic systems can lead to increased land pressure on small and marginal farmers, as the same land is also used for other purposes. Crop diversification and subsistence farming may face challenges in such scenarios. These tradeoffs need to be considered.
- Innovative solutions, such as placing solar PV plants on canals, can save land and prevent evaporation loss from canals. Concepts like floatovoltaics or floating photovoltaics, utilizing hydropower reservoirs or multipurpose reservoirs to keep panels cold and increase efficiency while reducing evaporation loss, are gaining traction. Some farmers with solar pumps sell excess water to companies for panel maintenance and regulation, thereby earning extra income.
- While schemes like PM-KUSUM hold promise, implementation faces challenges like issues of trust due to long-term contracts, capital-related constraints, lack of awareness, and procedural hurdles. Procedural access to markets is another hurdle. Farmers often struggle with the application process, which includes understanding and filling out forms, particularly when they are in English. This underscores the need for information to be provided to farmers in vernacular and importance of

training, capacity building, and awareness campaigns to make the system more accessible.

- The National Smart Grid Mission (NSGM) presents both challenges and opportunities. Persistent grid failures and issues like grid choking require effective solutions such as grid management through systems like SKADA. Behavioral economics can play a significant role, and load dispatch centers can benefit from AI and machine learning for real-time data to create a more robust system that can efficiently collect, analyse, and present data. Integrating NSGM with the RESCO model can enhance the use of advanced technologies for data analysis and management. This includes the development of user-friendly dashboards that can be accessed easily, even by online searches. Additionally, integrating mechanization into the system can help bridge the gaps between RESCOs and communities, providing a pivotal solution to enhance the overall efficiency of these initiatives.
- From a Demand Side Management (DSM) perspective, it is vital to pinpoint where integration and value addition can occur. Understanding demand patterns, such as peak demand, subsistence demand, base demand, and surplus demand, is crucial to tailor-made solutions. Spatial analysis and the creation of institutional models can help address these demands effectively. Contextual issues and incentivization mechanisms for farmers to transition to more efficient systems should be addressed. Additionally, integrating gender-sensitive approaches into the system is crucial for fostering gender balance and inclusivity.
- Engaging civil society or grassroots organizations becomes essential to bridge the gap in community engagement and gain a deep understanding of ground dynamics. These organizations can act as intermediaries to connect with farmers on the ground. Identifying local champions can accelerate the adoption of innovation among farmers through continuous demonstrations and success stories. These champions can shed light on current realities and power dynamics within their respective areas.

In summary, while challenges exist within the PM-KUSUM, RESCO and ESCO models, there are ample opportunities to harness their potential for the betterment of India's energy landscape. By addressing trust deficits, value chain issues, procedural barriers, gender sensitivity, and technological advancements, these programs can play a pivotal role in fostering sustainable and inclusive energy solutions for the agricultural sector. Furthermore, integrating NSGM and DSM approaches can lead to more efficient and effective energy management in rural India.

SDG 13 (Climate Action)

The challenges and opportunities in addressing climate change in the agricultural sector in India were discussed on following subjects.

Barriers around data

- One of the critical hurdles in tackling climate change in agriculture is the scarcity of data. Lack of access to relevant information among the farmers on the ground as there is a scant district-level data collection and management. Further, the creation or demarcation of new districts further complicates the planning efforts. While contingency plans have been developed at the district level, they often remain underutilized.
- There is a need to translate National Action Plan on Climate Change (NAPCC) into concrete actions at the district/block agriculture planning level. While there are state-level action plans for climate change, there is a notable absence of district-level plans. This lack of granularity limits our understanding of climate risks and hinders the effective implementation of climate policies and instruments. The diversity in agriculture in the country adds complexity to this challenge.
- Climate information systems needed to be context specific. Bridging the gap between climate data at the district level is a critical step in enhancing climate change adaptation efforts. To overcome this data gap, it is suggested that it is important to synthesize information from different agricultural systems, agro-economic zones, and ecological zones. This could involve mapping agriculture based on watershed variances or climatic zones, providing a more holistic way of collecting data beyond existing governance structures.
- Since achieving effective climate change adaptation in agriculture requires the active participation of district/mandal-level stakeholders, farmers' engagement and input are fundamental in formulating strategies that were both locally relevant and effective in building resilience against the impacts of climate change. To effectively manage climate change and its impacts, robust management information systems (MIS) and monitoring systems are essential. These systems play a crucial role in collecting data and predicting climate-related events, allowing for proactive measures to be taken.
- To strengthen climate resilience, sub-district climate risk analyses are essential. These analyses provide insights into localized vulnerabilities, enabling tailored adaptation strategies. National Mission for Sustainable Agriculture (NMSA) should provide clear guidelines that emphasize framing climate resilience strategies at the sub-national and local levels. This shift in focus from national to local action plans is crucial for tailoring strategies to the specific needs and conditions of different regions. Additionally, it may necessitate the development of different governance structures to ensure effective implementation.

Insurance related issues

- Insurance tools that exist to mitigate the impact of climate-related agricultural losses comes with its share of challenges, with a significant one being the lack of awareness

among farmers. Insurance schemes, such as the Pradhan Mantri Fasal Bima Yojana (PMFBY) in India, have been introduced to mitigate the impact of climate-related agricultural losses. However, the scheme faces several issues. Many states are opting out of such programs because the crops they produce are not covered by these schemes.

- Additionally, there is a lack of awareness among farmers regarding the availability of insurance options, with many perceiving it as an unnecessary financial burden. Even if insurance programs were offered for free or at highly subsidized rates, the awareness problem remains a formidable barrier. Often insurance providers, too, often perceive these insurance tools as loss-generating exercises rather than beneficial long-term investments.
- Issues related to creditworthiness among local farmers is a persistent challenge. Many farmers lack the financial history or collateral needed to access these funds, creating a barrier to their ability to invest in climate-resilient agricultural practices.
- Another critical issue linked to insurance programs is the occurrence of both underclaiming and overclaiming, which can lead to imbalances in dispersion of claims. To tackle this problem, leveraging technological advancements, including remote sensing, satellite data, and machine learning, can significantly enhance the accuracy of assessing agricultural losses. This would ensure that compensation is distributed fairly and aligns with the actual losses incurred by farmers.
- This also led to the discussion of parametric index-based insurance, which relies on predetermined meteorological benchmarks, could be a partial solution. However, implementing parametric insurance effectively would likely require a public-dominated model within a Public Private Partnership (PPP) framework. Motivating farmers through Krishi Vigyan Kendras (KVKs) and introducing remote sensing technology for accurate assessment can help revitalize and improve the effectiveness of PMFBY.

Climate-resilient agriculture

- Adaptation to climate change is a critical component of resilience-building, and it often involves responding to the impacts and losses that have already occurred due to climate-related events. This approach is based on addressing loss and damage, aiming to reduce vulnerability and enhance resilience to future challenges. Pro-resilience insurance can be instrumental in mitigating the impacts of these stressors.
- Drought-proofing strategies are regarded as one of the most reliable methods for mitigating the impacts of climate change on agriculture. NABARD's successful schemes offer valuable insights into promoting climate-resilient agriculture in India. Replicating and upscaling these initiatives, including capital subsidies, bank credit, CSR funding, and solar irrigation, can contribute to sustainable agricultural practices. Additionally, enhancing market linkages and addressing challenges in crop insurance schemes like PMFBY are vital steps toward building resilience in agriculture.
- In addressing climate change in agriculture, it is crucial to make the ‘invisibles of the agriculture visible’. There is a need to shift the focus on reporting solely on traditional metrics like yield per hectare, but examining the intangible benefits of agriculture,

such as resilience building, intercrop mixed agriculture methods, and circular economy integration, such as how bamboo agriculture can lead to more competitive market structures. Circular economy principles, like utilizing bamboo and converting waste into wealth through initiatives like Gobardhan, can make agriculture more cost-competitive and sustainable. Creating an economic case for various aspects of agriculture and making projections based on this data is a crucial step in observing the impacts of major schemes.

- Crop diversification can be an approach to shift the focus food security to nutrition security. However, it's essential not only to consider the supply side but also to consider the demand side, as well as water usage and land use.
- Crop sustainability analysis is a vital tool that needs to be employed more widely to inform agricultural practices. It helps identify suitable crops and practices based on local conditions and climate considerations. Farmers require support and guidance to transition effectively into diversified cropping systems. This includes vulnerability assessments to determine suitable crop choices for specific regions. Agro-climate mapping using GIS technology, as exemplified in Punjab through the Integrated Mission for Sustainable Agriculture (IMRM), is a valuable tool for informed decision-making.
- Additionally, schemes related to organic farming and horticulture need to address market linkage challenges to ensure profitability for farmers. Agroforestry presents an opportunity to address land degradation and promote mixed cropping systems in India. However, this requires the allocation of resources and the establishment of governance structures for skill development and capacity building. The issue of land degradation requires financial support. Combining agroforestry with efforts to combat land degradation can make projects more appealing to financiers looking for sustainability.
- Implementing climate-resilient agricultural programs requires a clear understanding of roles and responsibilities, as well as effective coordination between the central and state governments. While programs are in place, the key question often revolves around who will execute them and how. In this context, the central government is seen as a facilitator, working to ensure that states are ready and willing to implement climate-resilient agriculture initiatives. The willingness of states to collaborate and actively participate is crucial for the success of such programs.
- Corporate Social Responsibility (CSR) funding is another avenue that can be tapped to support agricultural initiatives. Private companies can contribute significantly to climate-resilient agriculture.
- There is a need for a clear and practical definition of climate-smart agriculture (CSA) that goes beyond academic and research spaces. This definition should reach farmers in the field and inform policymakers, focusing on how CSA can generate green credit and be seen as a profitable measure.

Climate Finance

- In terms of climate finance, there is a growing recognition of the need for blended finance, which combines public and private resources to fund both mitigation and adaptation efforts. While mitigation programs often come with well-defined business plans, adaptation projects often lack such business models and lesser funds are allocated towards adaptation. Additionally, mobilizing finance for climate-smart

agriculture (CSA) or climate resilience is challenging, as it is difficult to attract private finance without clear, tangible benefits for the private sector.

- Climate finance should be closely linked to co-benefits, ensuring that investments in resilience also contribute to broader development objectives and sustainability. Furthermore, there is a need to leverage co-benefits from mitigation efforts, which often receive a larger share of finance. Adaptation schemes should incorporate mitigation co-benefits, or vice versa, to create a more balanced approach to climate financing.
- India's Climate Change Development Report (CDDR) underscores the importance of integrating development and climate initiatives. A collaborative approach involving solution providers and financiers is essential to scale up climate financing. Result-based financing and pre-financing for farmers' databases can facilitate effective implementation.
- Governance challenges in climate-smart agriculture persist, as many states find policies and schemes confusing. A decentralized approach is essential to address the variability of climate impacts. There should be more efforts to streamline and merge schemes. There is a potential for cross-sectoral collaboration to overcome information gaps and establish robust governance structures. Increasing private sector involvement in adaptation is crucial since the expanding demand for funding in this area cannot be adequately met through public funding alone.
- Private enterprises play a pivotal role in funding, constructing, and sustaining essential infrastructure, supply chains, and markets. Therefore, it is imperative that they incorporate climate resilience considerations into their investment choices and explore creative financial tools to enhance partnerships with the public sector in crucial domains.
- Climate finance is inherently linked to the political sector, and it is imperative that states disburse funds effectively for climate resilience projects. Ensuring that financial resources reach the grassroots level and are used efficiently is a complex challenge that requires political will, commitment and coordination.
- Stabilizing elementary financing through mechanisms like green credit and establishing a minimum carbon price can provide stability and incentives for climate-resilient agricultural practices. Addressing market linkage is a challenge, especially when consumer demand is not consistently strong. Many farmers still rely on government procurement systems and minimum support prices (MSP). Collaborating with state governments to ensure cost parity for MSP and developing sustainable procurement policies for private players can help bridge this gap. Access to bank credit has been pivotal in enabling farmers to invest in climate-resilient practices. Expanding access to credit and making it more affordable can be a powerful tool for promoting sustainable agriculture.
- There is a growing trend of PPP in the realm of sustainability and climate change adaptation. The private sector is increasingly becoming involved in initiatives like sustainability-based green bonds that are designed to generate funds for climate adaptation and mitigation efforts. Some bonds, such as catastrophe bonds and impact/outcome-based bonds, are being used to funnel resources into climate adaptation initiatives. Ensuring that value chain operators and FPOs have access to finance is critical for the success of such initiatives. Applying a climate lens to agriculture can enhance the resilience of farming communities.

An essential aspect often overlooked is the development of exit strategies for adaptation projects. Many strategies are project-based, and there is a need to devise ways to sustain these initiatives beyond their life cycles. Understanding how these projects intersect and build upon each other is vital for long-term success and impact assessment.

In summary, India's efforts to enhance climate resilience in agriculture involve accessing district level climate data, harmonizing plans, making state actions plans actionable, addressing measurement challenges in the carbon market, leveraging green credit, conducting sub-district climate risk analyses, and fostering community engagement. Integration of development and climate initiatives, capacity building for financiers, and informed investments in climate-resilient agriculture are pivotal. Additionally, climate finance should be closely linked to co-benefits, ensuring that investments in resilience also contribute to broader development objectives and sustainability. Exploring opportunities to leverage mitigation activities for adaptation and ensuring political will and efficient finance allocation are essential to drive effective climate resilience initiatives at the local level.

SDG 14 (Life Below Water)

The interplay of agriculture and coastal/marine environments in India presents a complex set of challenges and opportunities that need careful consideration.

Linkages between Agriculture and marine ecosystems were discussed through following interfaces:

Agricultural runoff

Agriculture contributes to soil erosion and nutrient runoff, which can have detrimental effects on marine ecosystems. Excessive use of fertilizers and pesticides leads to these polluting rivers and ultimately into the ocean, causing algal blooms and harming marine life.

Addressing the agricultural runoff into coastal areas poses significant challenges, with implications for legislative frameworks such as the **Coastal Regulation Zone (CRZ) rules**, the **Water Act (1971)**, and the **Environment Protection Act (EPA)**. CRZ rules primarily focus on regulating coastal activities rather than land-based agricultural activities, limiting their applicability in managing agricultural runoff. The Water Act plays a crucial role in monitoring and regulating the rate of runoff from agricultural sources. However, accurately quantifying runoff and its impact remains an under-examined aspect. Additionally, the EPA's impact on sustainable agriculture requires examining land-use conversions in protected or coastal areas and finding a balance between environmental protection and agricultural practices.

Existing regulations limits the applicability of land-based agriculture in coastal areas, necessitating innovative solutions. Addressing agricultural runoff necessitates an integration of regulatory measures and soft rules/guidelines which can incorporate the impact of agricultural runoff by involving stakeholder consultations, and encouraging the participation of the public and industries that are involved in marine related activities. Coastal and marine spatial planning, predominantly conducted at the state and district levels, offers a platform for multi-sector stakeholder discussions.

This also includes raising awareness levels in farmers about harmful impacts of excessive fertilizer and pesticide use on marine ecosystems. Effective communication and coordination between government agencies responsible for agriculture and marine conservation will promote integrated management efforts. Upscaling clusters that promote reduced fertilizer and nutrient usage can mitigate nutrient runoff.

To strengthen water quality monitoring mechanisms for agricultural runoff, there is a need for increased human resources and cost-effective monitoring technologies. Quantifying the accurate impact of the agricultural sector on marine pollution is challenging, given the challenge of pinpointing pollution sources. Within programs like the Paramparagat Krishi Vikas Yojana (PKVY), incorporating water quality monitoring and assessing the nutrient export from agricultural fields to water bodies can provide valuable insights. It is essential to factor in the economic value of ecosystem services, nutrient loss, and soil erosion associated with agricultural practices.

Saltwater Intrusion

Overexploitation of groundwater in agriculture as well as climate impacts can lead to saltwater intrusion especially in coastal areas where saline water infiltrates freshwater aquifers. This not only affects the availability of freshwater for farming but also disrupts the balance of coastal and estuarine ecosystems. Encouraging innovation in agricultural methods can not only improve livelihoods but also reduce the sector's negative impacts on marine ecosystems.

Expanding the definition of agriculture to include diverse aspects of coastal agriculture will help sustainable land use. Not only oceans are impacted by agricultural operations, but coastal agriculture is also impacted by the oceans as an environment, with issues like sea level rise, saltwater intrusion, and cyclones impacting coastal areas. Agricultural practices, such as deforestation and land reclamation, can exacerbate coastal erosion. The loss of natural buffer zones like mangroves and wetlands leaves coastlines vulnerable to storm surges and rising sea levels. People clearing mangroves for agriculture and salt-tolerant crops, often due to weak monitoring systems, contribute to habitat loss and coastal erosion.

Creating resilience strategies for coastal agriculture requires a deep understanding of the specific challenges posed by the coastal environment. This includes finding alternative livelihoods for people living in coastal areas affected by saltwater intrusion and sea-level rise. Converting natural coastal habitats into agricultural land disrupts the delicate balance of these ecosystems.

In summary, addressing agricultural runoff into coastal areas involves navigating legislative frameworks, monitoring mechanisms, and the complex interactions between agriculture and the coastal environment. In its introductory chapter, the study can start with a broad framework on broader food systems and then justify the scope of the study to be limited to crop-based food systems. Developing sustainable solutions requires a multi-faceted approach, incorporating both regulatory measures and collaborative efforts to protect coastal ecosystems while ensuring the viability of agriculture in these regions. Additionally, resilience strategies should consider the unique challenges posed by coastal environments and prioritize the well-being of communities dependent on coastal agriculture.