

# National Dialogue on Science, Technology, and Innovation Capabilities and Skilling Approaches for Sustainability of India's Food and Land-Use Systems

Date: 30 April 2021  
Time: 2:00 PM to 4:00 PM (IST)



PROCEEDINGS

## About the Study

This scoping study maps the existing information, data, and literature on science, technology, and innovation capability, and human resource status and skills required in India's large, complex, and diverse agriculture and allied sectors from the perspective of sustainable food and land use. This is the first time such a comprehensive review has been undertaken in this field. The study covers a broad conceptual range of capabilities and skills components of India's food and land-use systems, and maps the relevant actors and government institutions along the various stages of the value chain. It develops a framework to guide the exploration of capabilities and skills in a detailed systematic manner, in order to develop appropriate offers for sustainable food systems. It is envisaged that this study will provide a richly informed outset for further investigations to understand and contribute to research, education, practice, and policy in multiple aspects of capabilities and skills in various areas of government and academic and extension systems. Being a multi-sectoral report, it identifies highly disparate but critically important actors/institutions and empirical material. Rather than offering a comparative analysis, the report offers an initial diagnosis, maps what is known, and highlights gaps in knowledge, given the paucity of reliable data. This study is particularly useful for clarifying the vast boundaries of the sector, identifying research and practice gaps, and exploring the connections. It provides recommendations for further policy and research.

## The Energy and Resources Institute

TERI is an independent, non-profit organization, with capabilities in research, policy, consultancy, and implementation. TERI has multidisciplinary expertise in the areas of natural resources, environment, climate change, energy, and sustainability. TERI works with a diverse range of stakeholders across governments, both at the national and state levels, international agencies, and civil society organizations to help deliver research-based transformative solutions. Headquartered in New Delhi, TERI has regional centres and campuses in Bengaluru, Gurugram, Guwahati, Mumbai, Nainital, and Panaji.

## Food and Land Use Coalition

Food and Land Use Coalition (FOLU) is a self-governed community of more than 60 organizations and individuals committed to the urgent need to transform food and land use for people, nature, and climate. FOLU India platform is a joint initiative of Council on Energy, Environment and Water (CEEW), Indian Institute of Management, Ahmedabad (IIM-A), The Energy and Resources Institute (TERI), Revitalising Rainfed Agriculture Network (RRAN), and World Resources Institute India (WRI India).

## Documentation

The proceedings were prepared with rapporteuring support from Ms Nivedita Cholayil with technical inputs from Ms Shailly Kedia, and copy-editing and design support from Muskaan Johri and Raman Kumar Jha, respectively.

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# KEY MESSAGES

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- Despite a major focus on food security in India, for natural resource management and agriculture extension services, in India, there has not been much research and development.
- Any science, technology, and innovation undertaken in the agriculture sector should be region specific and based on an interdisciplinary approach.
- Value chain-based approaches are key to skilling. Technologies can be developed to increase outreach to farmers and other participants in the value chain, which can result in a revolutionary impact on skills development in the agriculture sector.
- There is an urgent need for data reporting and monitoring systems to be strengthened on skills and capabilities for sustainable food and land-use systems – what does not get measured, does not have a strategy and vision.
- There is a need to enhance skills on land and water management to impair the dearth of skill sets at the grassroot level. In the coming years, the issue of water scarcity will become greater, thus there is a need to rationalize water and encourage water-use efficiency.
- As the Indian agriculture is shifting towards collectivization, and as a result, farmer producer organizations are emerging as an important institutional mechanism, there is a need of managerial skill sets for these organizations.
- It is required that the institutional mechanism should reach down to the village level, so that knowledge is delivered to the village functionaries.
- Women in the agriculture sector should be skilled as they constitute a huge part of the agricultural taskforce.
- Along with macroeconomics and agronomic research-directing strategies, there is a need for stronger microeconomic approaches in the field to drive change and feedback into the strategic learning loop.
- Farmers need to be competitive to access the markets. Research and science need to consider market-based approaches in order to effectively contribute to a sustainable food and land-use system. The consumer is becoming an important part of the agriculture and food sector, and the biggest challenge that the farming



- sector faces is value capture. Farmers should respond to market signals.
- The government plays a vital role as it formulates and drive policies including incentive and disincentives. Thus, skill sets of policymakers and governance are key. Presently, the policy focus is heavily centered on infrastructure.
  - The common purpose must include equity, and equity is different than equality. Human resources need to be prioritized and capabilities need to be built, then infrastructure will automatically fall in place. And, this is something that should be incorporated in every food system policy.
  - Just growing food and making it sustainable is not enough. Equity is important for producers. While considering the environmental aspects of agriculture, social and economic factors should be given importance to change the mindsets of the farmers.
  - Other areas of research as a follow up to this report include capacity of government functionaries, governance aspects, comparison of skill sets between public and private sectors, government incentives, market-based approaches, and effectiveness of existing government programmes.



# DISCUSSIONS

**The event started with a concise introduction by Ms Shailly Kedia, Fellow, The Energy and Resources Institute, who also moderated the event. The Agenda of the event is provided in Annexure 1 of this document.**

**2:00 PM – 2:10 PM**  
**Welcome Remarks**

**DR VIBHA DHAWAN,**  
*Director General, The Energy and Resources Institute*

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In her welcome remarks, **Dr Vibha Dhawan** discussed about the underlying problems in the India's agriculture sector. She said, 'India witnessed great improvements after the Green Revolution, which led to the widespread use of pesticides and fertilizers. About 50 years ago, we chose high-yielding varieties to increase production, but a price was paid.' She enumerated that firstly, India did not invest in research and development, due to which there were disparities in production across states. Secondly, in terms of irrigation, state governments subsidized water and electricity to the farmers, which led to the misuse of these inputs. Crops were being grown in inappropriate areas which disrupted groundwater table. Thirdly, subsidies given for fertilizers led to a greater use of fertilizers, thus causing a decline in soil quality over the years. Further, she mentioned that farm profitability is still a major challenge for agriculture, with

the farmer's income being far below an average Indian. This decrease in income is accelerated by depleting natural resource base, which further hurts the farmer. She said, 'Just like coronavirus is mutating, farm insects are also mutating, and new variants are emerging.' This forces farmers to use insecticides and pesticides more intensively, leading to deteriorated soil quality and a vicious cycle.

All of this is coupled with the effects of global warming and climate change, which worsens the condition of the sector. She called for research and development as the need of the hour, as well as public investment in rainfed agriculture since it represents 52% of the total cropped area, and the crop production is quite low. She added, even though India considers itself to be self-sufficient, there is still a problem when it comes to nutrition, both in terms



of malnutrition and low calories. While asking for 'what is the future of sustainable agriculture?' she suggested that climate change needs to be factored in for sustainable agriculture in India. She said, 'because of its negative effects, 275 million people who depend on agriculture will suffer. Any science, technology, and innovation undertaken in the agriculture sector should be region-specific, and should be based on an interdisciplinary approach.'

For India to achieve food and nutrition security, she recommended that more research and development needs to be undertaken in terms of:

- the role of food and land-use system in the context of improving agriculture and natural resources;

- human resources and skilling required to achieve sustainability in agriculture; and
- focus on sustainability across the agriculture value chain.

Talking about the study, she said, 'it aims to highlight the varying levels of capabilities and skills requirements across the agriculture and allied sectors from the perspective of sustainable food and land-use systems. It aims to increase the understanding of the desired capabilities and skills base for innovation, and the policies that might enhance their development.'



**2:10 PM–2:15 PM**  
**Preliminary Remarks**

**S VIJAY KUMAR,**

*India Lead, Food and Land Use Coalition; Distinguished Fellow,  
The Energy and Resources Institute*

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While delivering the preliminary remarks, **Mr S Vijay Kumar** pointed out the important factors for sustainable agriculture in India. He said, 'FOLU India in its early stages was looking at the critical transitions required to transform food and land use in India. In this context, food and nutrition security was central to the discussion. Fork-to-farm approach was considered essential which was a more consumer-oriented or demand-side approach to food security. So, it was also suggested that there is a need for deep dives into the areas and practices of state and central governments on the three important subjects: food loss and waste; sustainable agriculture; and human resources and skills.' Of the three, he mentioned that 'human resources and skills' is the deep and complex issue, and the scoping for data and reliance on RTI applications for this report points out to the very difficulty in getting the data. He further said that the discussions on human resources and skilling also meant to consider some of the core issues of depletion of natural resources and sustainable agriculture, towards something very fundamental that it was almost always under discussed and overlooked.

He explained from the study that for skills and capabilities needed to develop and absorb the science and technology, and to generate innovation, it requires a cross-sectional and a multi-sectoral analysis. A spatial dimension to it also needs to be incorporated. One of the innovations in FOLU India is the adoption of agro-climatic zones as a fundamental framework for proceedings, and the skill sets have also matched with that, he mentioned.

Mr Kumar asserted that the skill sets should be developed not just for farmers, but also for the extended farming community which includes all stakeholders of the agriculture value chains as well. At every stage from pre-production, to production, to marketing and consumption, capabilities and skills need to be enhanced.

Further, he said, 'because it is so vast, no single ministry or single agency is able to look at it in its entirety and develop a strategy for the same. It is also exceedingly difficult to measure, and almost always in government, what does not get measured does not get done, and no way of knowing what gets done.' Thus, he emphasised on the urgent need for strengthened data reporting and monitoring systems.



**2:15 PM–2:20 PM**

**Virtual Launch of the Report by all Speakers**

*Following the preliminary remarks, the report was launched virtually by all the speakers.*

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**2:20 PM–2:35 PM**

**Presentation by the Study Team**

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**Dr Manish Anand, Fellow, TERI** gave a presentation on the study on behalf of the team. The presentation highlighted that agriculture has made tremendous progress since the Green Revolution, which more or less emerged as a technological solution to meet the challenges of feeding India's population in the 1960s. However, the intensive use of land and related resources has raised serious concerns about land degradation and unsustainable and inequitable use of water, particularly groundwater for irrigation. In recent years, the agriculture sector has been facing several challenges, including declining farm profitability, depletion of natural resources, resurgence of pests and diseases, global warming, climate change, and all of these are posing potential and serious threats to the sustainable agricultural production. So, meeting the objectives of food and nutrition security, conservation of natural resource base, and building sustainable and resilient rural livelihoods demands significant capabilities and high-quality human resources.

The report aims to:

- assess the capabilities and skills in the agricultural sector in order to underpin its long-term competitiveness and sustainability, and
- inform policy and excellence for addressing agricultural practices and its messages in the sector.

The key issues and skills are investigated through an assessment of trends in education, research, and extension, and the capacity of various institutions to meet the science, technology, and innovation needs of the sector. The report identifies skill gaps, and proposes solutions through a comprehensive scan of existing programmes, resources, reports, and studies on human resources needs in the sector.

In terms of the research process, much of the data and information were gathered from the websites of respective institutions in agricultural research and education system, as well as from the grey literature. The information was also obtained from relevant government agencies by email and also through online RTI applications.





Some of the key findings of the report are as follows:

- Research and development spending has not kept pace with the growth in India's agriculture gross domestic product (GDP) over time. This has led to a decline in the agricultural research intensity ratio in recent years, which remained unchanged during 2000–2017, ranging from point 2% to 2.3% of the agricultural GDP.
- The effective number of scientists engaged in actual research represents a small percentage of the total number of scientists in the system. Many of them spend more time in teaching and administrative work. This, combined with inadequate funding is posing a big challenge.
- A disproportionate share of research activities involves food crops in irrigated areas. However, the composition of gross value added and the food plate of an average Indian has changed over the years to emphasize poultry, fruits, and vegetables. Accordingly, the focus needs to shift to these and to rainfed agricultural systems.
- The interaction between research and extension and between research and farmers is lacking. Also, the links between science and public policy and between scientists and farmers need to be strengthened.
- There is a scope for updating training institutions and cooperatives in terms of content and capabilities to meet the challenges of institution building.
- Skilling programmes related to crop diversification should be included in the National Skill Development Corporation. These skills are urgently needed as crop diversification will help in addressing issues such as groundwater depletion in Punjab, Haryana, and Uttar Pradesh, and also tackle other externalities such as air pollution.
- There should be a focus on building skills along the entire food value chain, rather than the prevailing bias towards upstream production systems. The focus should be on better value capture by farmers such as food loss prevention and better processing.
- Instead of focusing on individual components or short-term outcomes, food and land use need to be looked at as a system. Assessment approach should be linked to changing market trends, to utilize information technology in the agricultural sector, and also to enhance agro-processing.



After the presentation, a panel discussion, which was chaired by **Mr T. Nanda Kumar, Former Secretary, Ministry of Agriculture and Former Chairman, National Dairy Development Board**, was held. Mr Nanda Kumar commenced the discussion by asking a few questions: what is the skill set of the farmers; how can we enhance these skills; and how do we keep up to ensure that the farmer is doing best for himself and the environment?

Expounding on the disparity in skill development programmes in India, **Mr Manish Kumar, Managing Director & Chief Executive Officer, National Skill Development Corporation** said 'the impasse in skills and agriculture is very apt. In India, we have about 400 million people in the workforce – approximately half of the people who are of the working age group. Of the 400 million, 200 million are in the agriculture sector, and the remaining 200 million are in other sectors of the economy.' He informed that National Skill Development Corporation (NSDC) has 37 skill development councils, of which 36 councils support the non-agriculture workforce. There is only one council that supports the agriculture workforce. The fact that the agriculture sector in India has a huge number of people who require skilling and to cater them there is only one skill

council is a worrisome issue, he shared. He reasoned that partially this is because NSDC is concerned with the market, and in agriculture, it is feeble. Though there are parts of agriculture which have good market linkages, there exist others too that face market failures.

He said, 'with our capacity, we skill about 5 million people annually at the moment, and the Government of India, through its various agencies, ministries, and state governments skills other 10 million people. If 200 million or 400 million is the target, then even this skilling capacity is very low.'

He enunciated that in total, NSDC has created 2400 job roles across all sectors, but only 179 roles are attributed to agriculture, which is less. These 179 roles cater to about 200 million people in the agriculture sector, thus creating a huge gap in the sector. Further, he said, 'we have also noticed a decline in the number of people who want to work in the agriculture sector. Continuously working for 12 months in agriculture is an oddity, and therefore, the workforce in agriculture try to adjust the agricultural life and search for a second job. If livelihood opportunities within rural India are created, then many of them will be more than happy to stay there. The report picked up a few things that can wonderfully weave those opportunities.'



Furthermore, he discussed about the important role of government in bringing technology in agriculture (e.g., drones) and providing skills needed to use them. He also talked about the gender aspect in Indian agriculture. He said, 'of the 400 million workers in India, about 85–90% are women, and, 80–90% of that would be actually from rural India. So, there is a huge number of women who are in rural areas, potentially in the age group where they could be working, but do not have work.' He suggested to create technology platforms that enable these women to use the technology in agriculture. He said, 'if we can focus the report and its advocacy towards these aspects, it will really help, and also bring government's attention.'

Another thing he highlighted is the need of an institutional mechanism to reach down right up to the village level to deliver knowledge to Gram Pradhans and village functionaries. He suggested that apart from creating skills, a pathway needs to be laid out and mechanisms to be created through which knowledge can be transferred from the national level, where

technical know-how is generally higher, to the village level, in local language. He said, 'so how do we ensure this happens and what are the institutional mechanisms through which we can push this knowledge? These are some of the things that we need to reflect on. Instead of perhaps creating new programmes, there are existing mechanisms within the Ministry of Agriculture, we need to build on those social capital structures that have been created over time, and then take benefit out of them.'

While concluding his remarks, he said, 'I truly believe that we can bring more focus to the agriculture sector through this particular report. The reason is – this is perhaps the first report that goes so deep for almost 200 million people. There is a concept of 'Recognition of Prior Learning' which is missing from this report, but can be added during the advocacy when we deal with the Ministry of Skill Development & Entrepreneurship, and strengthen the skilling, reskilling, and upskilling arguments which often come up.'



Recognizing the fact that there is a need of upskilling in the agriculture sector and placing systems at the ground level **Mr G. R. Chintala, Chairman, National Bank for Agriculture and Rural Development** said, 'it is not completely true that all the people who are working in agriculture are not skilled. When we go and talk to people, it is seen that the present generation who are engaged in agriculture have absolute access to the information and they possess some skills too.' By giving an example of horticulture, he shared that most of the horticulturists have quite a lot of knowledge about what they are doing; while, this is not the case for those in normal agriculture.

He said, 'institutions like agricultural universities, Indian Council of Agricultural Research, and Krishi Vigyan Kendras impart quite a lot of knowledge and there is some knowledge partnership, however, further hand-holding may be required.'

Talking about the innovations at the ground level, he brought out the case of precision agriculture. He discussed that there is a need of substantial skill set improvement in this field. Two kinds of skill sets are required in this field – one is to operate the farm machinery, which is especially designed for precision agriculture, and the other to synchronize with the use of satellite data to understand how precision agriculture is done.

Following the Green Revolution, there has been a lot of development in agriculture in India, but also due to lack of knowledge, in many places, there has been excess irrigation, leading to salinity and alkalinity; in dry areas where new crops are being cultivated, readily available irrigation facilities lead to overflowing; and overuse of fertilizers resulted in many problems, he discussed.

Further, he said, 'another area is land and water management, where the skill sets are absolutely lacking. Take the case of water management. There is a need to rationalize water and encourage water use efficiency. How many farmers have this knowledge? And, even if they are aware of the concept of water-use efficiency, does they have access to any mechanism to put this water-use efficiency in place? As a financier, I really worry whether the things are properly used or not, and that is why skill sets are required.'

Deliberating on value chain financing, he said, 'value chain is used very loosely, though it has a greater connotation. Value chain starts from the farm – whether it is the sourcing of fertilizers, pesticides, seeds, or irrigation facilities. Then it goes to the aggregation or procurement level, where people should have the skill sets to see that the quality parameters are adhered to, or whether there is enough moisture in the soil



or not. These skill sets are largely lacking at the ground level. For instance, while visiting mandis, it is seen that there is a very cursory evaluation, and it is not very scientific. In the process, the farmer loses out a lot due to wrong classification of his produce by the aggregators. Therefore, there is a need of developing skill sets in these areas too. The next level is the transportation, especially in rural areas, where skill sets as well as investment to ensure proper movement of goods are needed. After that comes storage, cold storage, godowns, and silos. While we are still in the infancy stage as far as silos are concerned, the time has come to develop skill sets related to bulk handling of goods, as well as proper facilities and investment to enhance this mechanism.'

Other important areas he highlighted where skill sets are required are agriculture financing, agriculture insurance, and land record maintenance. He added that there is a need to develop skills beyond agriculture, as most of the workforce in agriculture is disguised workforce. Thus, people whose primary occupation is agriculture need to be skilled. Recognizing the importance of

digitization at the ground level, he asserted that this is one universal skill set that needs to be imparted to everyone, not just in agriculture but in other sectors too. This will enable people to use internet to gain knowledge, especially in the language of their choice.

He said, 'at NABARD, half of the focus is on agriculture, and other half on rural development. In terms of rural development, off-farm sector activities should also be a focus, which require a skill upgradation and technology infusion, so that bankers and mainstream financial institutions will also finance.'

Lastly, he said, 'right now, agriculture in India is shifting towards collectivization, leading to the emergence of farmer producer organizations (FPOs). We require managerial skill sets in FPOs as well. We have seen that 10–15 FPOs are imparting knowledge to the farmers themselves. From studies conducted across India, we have seen that 25–40% of their revenue increase comes from peer learning and knowledge transfer through FPOs.'



**Mr Ulac Demirag, Country Director and Head of South Asia Hub, International Fund for Agricultural Development** said, ‘three

points of this study stood out for me. First, the reference to the issue of extending science and technology to farmers, which has significant shortfalls, with some vacancy rates of up to 85% in certain states. Second, the conclusion that the linkages between science and policy and the linkages between scientists and farmers are weakening; this should really ring alarm bells. Third, that is on the private sector side; there seem to be certain capacity gaps.’

‘As a specialized agency of the United Nations and as an international financial institution, International Fund for Agricultural Development (IFAD) is committed to expand its outreach and deployment impact to make a profound contribution to meeting the sustainable development goals,’ he said. In doing so, he informed, IFAD has really revamped its delivery model, placing much greater emphasis on non-ending activities, including knowledge management, policy engagement, and partnerships, so that it can really leverage the public investments and projects that it supports.

Deliberating on what can be done to improve the science, policy, and practice interface for advancing on sustainable food and land-use systems, he took an example of Fostering Climate Resilient Upland Farming Systems in the North East (FOCUS) project. In north-east India,

given the region’s specific vulnerability to climate change and its rich biodiversity, as well as its unique upland farming systems that rely on shifting cultivation, the Ministry of Agriculture is convening a multi-stakeholder committee to look into the sustainable management of shifting cultivation. And in this context, the FOCUS project of Nagaland and Mizoram combines indigenous knowledge of shifting cultivation with more modern cultivation practices and techniques around soil, water conservation, intercropping, crop rotation, and the productive use of fallow land by building on local traditional knowledge and involving the communities in planning and research, he informed. With this, he said, ‘farmers have direct control of their choices, backed by science, and enabling them to improve their nutrition and incomes. Thus, farmers need practical solutions to help them graduate on the path of prosperity while contributing to a sustainable and nutritionally rich food system.’

Furthermore, he discussed that about 60% of IFAD’s financed projects have an agroecology component. The recent initiative on more than 200 projects indicates a clear positive correlation between projects promoting sustainable technologies and incorporating nutrition, climate change, and using the IFAD portfolio. He said, ‘environmental sustainability concerns and safeguards are mainstreamed at IFAD through investments – first, around improving agricultural



productivity through sustainable low-external input technologies, such as chemical fertilizers and pesticides, which are then replaced by organic and biological alternatives. And second, for sustainable intensification through diverse cropping systems. For instance, in Jharkhand, rice fallows are cultivated with oil seeds and pulses. All this is combined with drought-tolerant crops during the Rabi period so that this can enable small-scale producers to engage in diversified value chains with high productivity and low production cost.

‘The key to fully integrate knowledge and research as part of the food system is to foster a culture of customer orientation and agility,’ he said. He suggested that while macroeconomics and agronomic research help in directing strategies, there should be a strong interface with microeconomic approaches in the field to drive change, learn, and receive feedback.

He further discussed that research and policies must be clearly targeted at their prime users, and must generate value for them. This means that farmers, rural households, consumers, and various business enterprises should be provided with options and value propositions to enable them to make smart choices in managing their labour costs, cash flows, consumption, savings, and risks.

Lastly, he said, ‘if we want citizens, farmers, and enterprises to be the drivers of change, we need to really focus on the incentives. Resilience and prosperity cannot be achieved outside the market system. Thus, market systems need to be incentivised. And, ultimately farmers need to be competitive to access the markets. Hence, I believe that for research and science to be really relevant and effective in contributing to a sustainable food and land-use system, they need to start from the market.’



Speaking from a farmer's perspective, **Mr Ajay Vir Jakhhar, Chairman, Bharat Krishak Samaj** emphasized to develop the skill sets of those whose decisions impact farmers' fate including officers in various government ministries, Prime Minister's office, ICAR, and universities. He said, 'if we talk about skill sets, we need to factor in governance. With good governance, everything else falls in place. Any agriculture policy is incomplete without a chapter on governance. Human resources need to be prioritized; if it is built properly, infrastructure will automatically fall in place. Presently, policy focus is heavily centred on infrastructure.'

Further, he talked about the term 'common purpose' which he finds intriguing with regard to capabilities and skills for innovation and sustainability of the food systems. He said, 'it is defined in context to the profitable, productive, and sustainable food systems. What I find missing is that the common purpose must include equity, and equity is different than equality. And this should be incorporated in every policy of the food system. We are here not only to grow food and make it sustainable. We are here also to make sure that the producers get equity in the system.' As the report talks about various technologies such as biotechnology, nanotechnology, digital, and artificial intelligence, Mr Vir Jakhhar shared his affirmation for the same. However, as the report also talks about advancing a transition towards agroecological farming,

he said, 'I really wonder if biotechnology includes a genetic or gene editing, and if that is in variance with the rules and definition of agroecological farming, there is a need of a further study.'

Speaking in terms of climate change and global warming, he said, 'more than yield reduction due to higher temperatures, reduced availability of water for farming and less moisture in air impact farming. With this, the cultivation will be impacted by at least 10% over the next 10–20 years.'

While discussing new technologies, he raised a few issues including interoperability of data between different government departments, and government and the private sector, and privacy and piracy of government data, and the private sector stealing the data. He said, 'all these give asymmetrical power to a few people, and can be really dangerous.'

For food value chains, he said, 'the way they are developing, they will ultimately lead to consolidation, where input companies, aggregators, packaged food companies, retailers, and e-commerce companies will consolidate, and in each of these segments, four to five companies will control 60–70% of the organized market. We could still live with this, provided the government had proper regulations, institutions, anti-trust laws, accountability, and transparency, but we find those missing. That is why as a farmer, I find it very dangerous and needs full cognizance of policymakers.'





For the success of skill development programmes in India, he called for the science of critical assessment of existing initiatives. He suggested that there should be a mechanism to assess the output of the people who are trained under various programmes, such as National Skill Development Council card holders. The mechanism should be able to assess whether the trained people are able to use those skills to fulfil their livelihood or not. And, if it is found that the results are not impressive, then the curriculum can be relooked, he suggested. He added that any review of an Institute by its own officers or those connected with the Institute earlier will not be a fair assessment to enable a proper restructuring.

He talked about agricultural input dealers. He said, 'we should understand that they are also a problem and data can be generated from the sales data to regulate them. We need to look at how the cumulative data can be retrieved.' Further, for science and technology and skillset, he suggested a new measurement matrix to understand development and progress.

He shared that by looking at the available data on the agricultural research and development spending in last 10–20 years, it is understood that there has been no

substantial increase in the spending, and that remains a big problem. He raised the need of constant retraining of people from top to bottom in the sector, a market intelligence system to help the skillset work and perform better, and to focus more on agriculture economics.

Besides, he shared his fear of private philanthropy to dictate policy. He said, 'private money should not dictate policy, especially concerning food. It should be in the hands of the public sector, and the government is not trained enough to understand where the agenda of the private philanthropy lies.'

In his concluding remarks, he said, 'allowing farmers, as beneficiaries, to assess government programmes improves the efficacy of those programmes. Farmers grow what government incentivizes and consumers demand. As far as farmers are concerned, they are most receptive to technologies, and skillsets have never been a problem. We can use financial levers to change government incentives and to facilitate a green revolution-type transformation, however, the challenge is how do you make it less painful for farmers. The challenge is not to move to different crops and different practices, but how do you make it equitable to farmers?'



**Mr Andrew Goodland, Lead Agriculture Specialist, World Bank** mentioned that a lot of efforts are routed to improve agriculture policy and think how to do farming sustainably than brainstorming for the ways to achieve this in practice and getting skills in place. To discuss skill development, he pointed out the following four questions:

- How do we make the agriculture and food system more attractive choice for careers that include farming-level occupation?
- How do we make this a sector that attracts the best brains and the best talent? And then how do we ensure the skills development?
- How do we make education and training relevant to the needs of the sector? And then how do we ensure the quality of training? A lot of skills development programmes are there. However, sometimes, a lot of effort is wasted because the skills are not utilized.
- Lastly, how access is ensured?

He said, 'the World Bank sees agriculture central to many of the existing global challenges, whether it is tackling diseases like COVID, or climate change, or inequality and poverty, or food security. All are linked to the agriculture sector.'

He discussed that the World Bank works around four interrelated pillars in agriculture – first is around sustainable food systems, which includes production, nutrition, consumption, food safety, food

quality, reducing food losses and waste, and building sustainable systems that are able to conserve natural resources. The second is around climate smart agriculture – which involves adapting and mitigating, and managing risks around agriculture due to climate change. This implies a lot of new skills are required for the sector. The third is around value chains. It deals with the issues such as – how do we ensure the competitiveness of Indian smallholder agriculture; how do we get commercialization to take place; and how do we get FPOs up to the quality they need to be? Finally, the fourth is around rural livelihoods and employment. This includes – how do we create jobs within the sector, both on farm and off farm; how do we create good quality jobs; how do we bring the private sector in to help create those jobs?

Further, he said, 'what I liked about the report is that it does not talk about these issues, but asks a very relevant question, i.e., how do we actually think about skilling ourselves and creating a capacity in order to address some of these issues?'

With regard to technology, he pointed out a few relevant questions – how can technology be used as a teaching method; how to teach digital skills to create more IT-literate students; how to apply digital methods to the agriculture and food industry? He said, 'technologies can be developed to increase outreach to farmers and other participants in the value chain, which can have a revolutionary impact on



skills development in agriculture. So, it is a question of making the current crisis of COVID into an opportunity to really rethink how we take on agriculture skills development.'

Moving forward he emphasized that there are a lot of opportunities to make agriculture and higher education more relevant to skill development. He said, 'the report is very useful in terms of, both verifying some of the approaches we are doing and providing food for thought for how some of the practices which we are already supporting, could be further

Speaking on the matter of capacity development, **Mr Ashok Kumar Singh, Deputy Director General (Agriculture Extension), Indian Council of Agricultural Research** informed that among the various types of agriculture advisories given to farmers, subject matter-related advisories are heavily focussed, while technology-related advisories are usually missing. He said, 'there are not enough experts in agriculture economics who can advise farmers on agriculture-related activities. Thus, capacity needs to be built around these aspects.'

He said, 'for subject matter advisories, there are a large number of ICAR institutions, KVKs, agricultural institutes, and agricultural skill councils that provide training and skills on various aspects. However, the quality of

improved to deliver on the objectives of the project.'

The farmers grow what government incentivizes and consumers demand. As far as farmers are concerned, they are most receptive to technologies, and skillsets have never been a problem. We can use financial levers to change government incentives, and to make a green revolution-type transformation, but the challenge is how do you make it less painful for farmers. The challenge is not to transfer to different crops and different practices, but how do you make it less painful to farmers?

training remains to be seen, and often it is overlooked, especially at the ground level. For the middle- and senior-level officers, particularly in the research sector, there are opportunities in the country as well as abroad to harness skills, while on the farmers' level, this access seems to be lacking.'

'With regard to the horticulture sector, people often gain skills before entering the profession. This is the major difference between those engaged in general farming and agriculture and those in commercial or professional agriculture' he said.

Furthermore, he mentioned that ICAR has come up with different types of models including biofortified varieties in more than 75 different crops. He said, 'while research



is being built around these varieties, there is a need for extension services to follow on this path.'

With reference to skilling and training in agriculture, he suggested to set up incubation centres to attract youth, where continued training and advisory can be provided to business enterprises, not just for a month but for 4 to 5 years. He informed that ICAR tries to identify 150–200 youth in each district who can be associated with incubation centres and KVKs for longer period so that they can start their own enterprises and a regular income comes to their household. He then mentioned that in research and development, focus is given on food security, as the country has a huge population, than on natural resource management and extension services.

He suggested that farmers should be made aware of the benefits of adopting sustainable methods. Also, he mentioned that despite all efforts, farmers in affluent farming states such as Punjab, Haryana, and Uttar Pradesh have not switched to sustainable methods, to diversify their crops. This might be because they do not have the support system in place to make the switch, he postulated.

He said, 'while considering the environmental aspects of agriculture, there is a need to take into account the social and economic factors as well, to change the mindset of the farmers. For this, policies and support systems have to change.'

Another important aspect he highlighted is the lack of entrepreneurship development and employment opportunities at the rural level, which leads to increase in migration. Also, there is a gender aspect to it as well – we need to look at whether the women in rural areas who are dependent on agriculture are being trained properly or not, he added.

Lastly, he said, 'from the food security perspective, we need to start something in a focused way, that is, we should try to focus on our entire agricultural advisory, research, and extension services in a holistic manner, where natural resource management is also properly addressed, income is considered, and farmers' needs are included.'

Talking about the nature of agricultural policies in India, **Mr T. Nanda Kumar, Chair of the Panel** said, 'the policies in the country owe their origin to food scarcity and insecurity. So, all our policies were based on the notion that India will go hungry and it will have to beg for food, and hence it has to achieve self-sufficiency. Today, there is a need to make a policy shift to focus on farmer's prosperity – they need to be looked after and need higher incomes.'

He noted that sustainability and climate change-related aspects are the limiting factors, thus there is a need for new sets of skills. He said, 'it is evident that there is an overlap between policies and skill development. The policy environment



needs to have a lot of clarity in the next 10–15 years to develop the right set of skills.’

Further, he said, ‘the consumer is becoming an important part of the agriculture and food sector, and the biggest challenge for the farming sector is value capture. How to get maximum value for the farmers in a very competing environment of consumers? Farmers respond to market signals. The

entire horticulture revolution was not because the Government of India puts a lot of money into the sector, but because the market picked up.’

He remarked that to create technologies and institutions through which farmers get a reasonably good share of the market price that consumers pay, a lot of skill sets are required.

**3:55 PM–4:00 PM**  
**Closing Remarks**

**JAYAHARI KM,**

*India Country Coordinator, Food and Land Use Coalition*

In his closing remarks, Mr Jayahari KM said, ‘the present-day agriculture needs much better skills, capabilities in the context of human resources to address the complex problems which were not present during the Green Revolution. With the vision of diversifying the agricultural sector, modifying the distribution system, and intervening into the consumption segment, with cross-cutting issues of livelihoods, combating climate change impact, inclusions, and SDG achievement, FOLU realized that taking up the topic of human resources is important.’

Another point to take forward is focusing on the mechanisms that will enable the farmers, agriculture investors, and other stakeholders to occupy more in the overall value chain, so that they can benefit more, he added.

He mentioned that this report is not just for policymakers but also for FOLU to sharpen their on-ground experiments and as proof of concepts in order to bring policy suggestions.



## Annexure I: Final Agenda

Time	Session
1:50 PM–2:00 PM	<b>Join Webex Event</b>
2:00 PM–2:10 PM	<b>Welcome Remarks</b> <ul style="list-style-type: none"> <li>♦ Dr Vibha Dhawan, Director General, The Energy and Resources Institute</li> </ul>
2:10 PM–2:15 PM	<b>Preliminary Remarks</b> <ul style="list-style-type: none"> <li>♦ S Vijay Kumar, India Lead, Food and Land Use Coalition; Distinguished Fellow, The Energy and Resources Institute</li> </ul>
2:15 PM–2:20 PM	<b>Virtual Launch of the Report by All Speakers</b>
2:20 PM–2:35 PM	<b>Presentation by the Study Team</b> <ul style="list-style-type: none"> <li>♦ Manish Anand, Fellow, The Energy and Resources Institute</li> <li>♦ Jonathan Donald Syiemlieh, Associate Fellow, The Energy and Resources Institute</li> <li>♦ Shailly Kedia, Fellow, The Energy and Resources Institute</li> </ul>
2:35 PM–3:55 PM	<b>Panel Discussion</b> <ul style="list-style-type: none"> <li>♦ Chair: T. Nanda Kumar, Former Secretary, Ministry of Agriculture and Former Chairman, National Dairy Development Board</li> </ul> <b>Panellists</b> <ul style="list-style-type: none"> <li>♦ Manish Kumar, Managing Director &amp; Chief Executive Officer, National Skill Development Corporation</li> <li>♦ G.R. Chintala, Chairman, National Bank for Agriculture and Rural Development</li> <li>♦ Ulac Demirag, Country Director and Head of South Asia Hub, International Fund for Agricultural Development</li> <li>♦ Ajay Vir Jakhar, Chairman, Bharat Krishak Samaj</li> <li>♦ Andrew Goodland, Lead Agriculture Specialist, World Bank</li> <li>♦ Ashok Kumar Singh, Deputy Director General (Agriculture Extension), Indian Council of Agricultural Research</li> </ul>
3:55 PM–4:00 PM	<b>Closing Remarks</b> <ul style="list-style-type: none"> <li>♦ Jayahari KM, India Country Coordinator, Food and Land Use Coalition</li> </ul>

Event Moderator: **Shailly Kedia**, Fellow, The Energy and Resources Institute

Event Rapporteur: **Nivedita Cholayil**, Intern, The Energy and Resources Institute



India's quest for food security will mean building the capabilities and skills for advancing innovation for sustainable food and land-use systems. The Energy and Resources Institute (TERI) as a partner of Food and Land Use Coalition (FOLU) India Country Platform carried out a scoping study on innovation capabilities and skilling approaches for the agri-food systems in India. The event "TERI-FOLU Virtual National Dialogue on Science, Technology, and Innovation Capabilities and Skilling Approaches for Sustainability of India's Food and Land-Use Systems" was held on 30 April, 2021. The present document summarizes the discussions at the event.



The  
**Food and Land Use**  
Coalition



THE ENERGY AND  
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*Creating Innovative Solutions for a Sustainable Future*

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