

SUSTAINABLE FOOD AND LAND USE SYSTEMS IN INDIA NATIONAL ROUNDTABLE

NEW DELHI, MAY 13, 2019

Summary report

The Food and Land Use Coalition (FOLU) was launched in 2017 and is a coalition of 8 organisations – including IIASA, SDSN, GAIN, EAT Foundation, WRI, SYSTEMIQ, AGRA, WBCSD – that seeks a transformation of the world’s food and land use systems to better protect our natural environment; provide nutritious and affordable food; strengthen resilience and enhance the prosperity of people; and meet the SDGs and the Paris Agreement.¹

The coalition has recently embarked on an initial phase of work to establish a FOLU platform in India. On May 13, 2019 the FOLU India platform – which includes a network of partner institutions such as the Council for Energy, Environment and Water (CEEW), Indian Institute of Management (IIM) Ahmedabad, The Energy and Resources Institute (TERI), and the World Resources Institute India (WRI India) – convened its first national roundtable: “Sustainable Food and Land Use Systems in India”. Its aim was to discuss critical development, climate, environment, biodiversity and health/nutrition challenges facing India in the coming decades within the framework of the country’s food and land-use systems.

To enable a fruitful discussion, a background paper entitled “Food and Land Use in India – Challenges and Opportunities” was circulated among participants, setting out some key issues to initiate a focused diagnostic analysis. The roundtable was organized as a forum for presenting the findings of the research and to further develop the diagnostic analysis and identify key issues and appropriate policy directions. The agenda of the roundtable is included as an annex to this report.

A broad range of participants attended the meeting, in particular senior people from government, research institutes and civil society (see attached list of participants in Annex II). The meeting was opened by OP Agarwal, Chief Executive Officer of WRI India and chaired by S Vijay Kumar, Distinguished Fellow, TERI.

This report provides a summary of the discussions at the meeting and the recommendations that emerged. The report begins with a summary of the key issues, and is then grouped into thematic areas reflecting the issues contained in the background paper.

¹ See www.foodandlandusecoalition.org.

Key messages

- Land is a scarce resource in India, and agricultural holdings are small and fragmented. Marginal holdings (<1 hectares) and small holdings (<2ha) account for 86% of all holdings and 47% of the area devoted to agricultural production. Subsistence agriculture is widespread, and since 60% of India's total cropped area is rainfed, poverty and inability to take risks, lack of access to credit and inputs, and poor market access all combine to limit the sustainability of food and agriculture systems in most parts of India.
- The Green Revolution in rice and wheat, led and championed by the central government, has given India its basic food security. However, sub-national level management and governance mechanisms that integrate local objectives with national goals and international frameworks need to be improved. India is a federal country and the states are directly in charge of agriculture and related subjects. There is wide variation in agriculture among the states: Madhya Pradesh, Chhattisgarh, Rajasthan, Jharkhand and Karnataka are showing much higher rates of growth in agricultural output than Punjab, Maharashtra, Tamil Nadu, West Bengal, Uttar Pradesh and Haryana.
- With over 50% of the population (and up to 80% in some states) directly or indirectly dependent on agriculture and allied activities, the reform of agriculture is an integral part of the country's poverty reduction strategy. Capital formation in the agriculture sector is low (15-19% of GDP) in comparison with other sectors (approx. 40% of GDP). Multi-stakeholder approaches are critical – stakeholder interests and the diverse perspectives of farming communities, civil society, industry and government need to be central in building resilient institutions for sustainable food and land use systems management on the one hand, and for increasing farm incomes on the other.
- Given the limited capacity of smallholder farmers, institutional environments to counter and manage complex and multi-layered climate risks need support from multiple departments and stakeholders at the central and state levels. Information systems related to land, soils, irrigation, inputs (including credit), prices, logistics, land tenurial systems, farming systems etc. are not available in formats that enable evidence-based decision making at appropriate levels. The issue of ecological footprint needs to be incorporated into decision making with reference to land use, water, biomass and production systems.
- Greater capacity is needed to address smallholder needs and livelihoods and to enhance food and nutrition security while using resources more efficiently; to create and sustain demand for agricultural products which are nutritious and have lower ecological footprints; to design and implement integrated and coherent policies and programs; and to create and sustain networks to augment sustainable food and land use systems.
- Large investments in development-related infrastructure for agriculture and agro-processing are needed. Providing a portfolio of incentives will help farmers conserve agrobiodiversity on-farm. Research and development on small and marginal land holdings and rainfed/dryland areas need to be strengthened, as do value-addition and promoting crop diversification.

- The draft National Land Utilisation Policy 2013 needs to be finalized and the National Land Use Council at the central level needs to be revived, along with analogous policies and institutions at a state level, since India is a federal country. Land-related policies and their integration with policies on agriculture, urbanization, industrialization, forests and water must be ensured so as to provide coherent natural resource management for achieving the Sustainable Development Goals. A greater focus on resource efficiency could contribute to sustainable development and the competitive advantage of many sectors.
- Discussions on agricultural policy need to be holistic and should include other sectors, including health, biodiversity, water and energy. Contradictions between various policies, acts and proposed bills need to be resolved. Women's contributions to agriculture, food and nutrition security need to be acknowledged and obstacles to their broader participation removed.
- A paradigm shift is called for that strengthens diverse local production systems to contribute substantially to local food, nutrition and income security. This means moving away from the current centrally determined approach of single commodity intensification towards the intensification of location-specific farming systems; moving away from viewing growth as per hectare or per animal (single commodity) productivity to system productivity and household income growth; building food security systems (including a decentralized public distribution system) based on locally adapted food crops; and stabilizing and securing diverse cropping by making a focus on “rainfall use efficiency” central to policy.
- Devising appropriate adaptation and mitigation strategies for ensuring food security, equitable access to food resources and enhancing livelihood opportunities for an ecologically sustainable and climate-resilient production system would entail risk and vulnerability assessments, identification of local varieties and farm practices that enable ability to cope with climate change impacts, strategic research and technology demonstration, absorption of improved technology and best practices, creation of physical and financial infrastructure and institutional framework, facilitating access to information, promoting capacity building and improving resilience and coping capacity of remote rural communities.

Land use and land degradation

- **Checking land degradation:** Land degradation in some form or another affects 29% of India's total land area (SAC 2016). Water and wind erosion is a major factor, and economic losses from land degradation and change of land use stand at about 2.5% of India's GDP in 2014/15 (TERI 2018). The degradation of this natural resource base threatens agricultural productivity, *in-situ* biodiversity conservation, water quality and the socio-economic well-being of land dependent communities. To reclaim degraded land and combat degradation, a robust land-use policy is required that must be strictly implemented. This needs to be coupled with strengthening capacities at various levels to regulate and manage land resources effectively and sustainably, including through watershed approaches to land management.
- **Promoting sustainable land use:** Though agriculture contributes only 14% of India's GDP, over 50% of the population relies on it as their main source of income. Agriculture and forests are an economic lifeline for at least 700 million people, including smallholder farmers, tribals, and

other marginalized groups who live in rural India. Forests provide fuelwood, fodder, small timber and non-timber forest products to the people who live in and around them. In times of scarcity, forests also contribute to household food security. Additionally, forests provide globally valued ecosystem services, including 8% of global biodiversity, more than 7 billion tonnes of carbon stock and sustained supplies of fresh water. However, decision making on land use and natural resource priorities is not always integrated. The interdependent and complex interrelationship between forests, agriculture and sustainable development calls for looking at the forestry and agriculture sector in a balanced and integrated manner, while recognizing that integrated farming systems that include livestock are key to sustainable development. Consequently, there is a need for better coordination between policies on forests and those on agriculture, food, land use and rural development. Long-term collaboration among stakeholders is required to increase the sustainability of local landscapes.

- ***Improving governance, management and conservation of forest land and resources:*** India's forested lands (about 22% of the country's land area) are under pressure. While India has managed to maintain its forest and tree cover, conflicts over the diversion of forest for non-forest purposes – particularly for mining, hydroelectric projects and infrastructure projects which are part of the country's growth and poverty reduction effort – are a major challenge. In some areas the use of forest lands by local communities to meet their fodder, fuelwood and biomass needs is unsustainable (particularly degraded forest land with less than 10% canopy density). Striking a balance between reversing forest degradation through protection and restricting extraction on the one hand and ensuring the minimum basic needs of all citizens on the other is difficult. Strengthening community institutions and building their capacities to manage these resources effectively is key, as is making them aware of forests' local and global relevance.
- ***Sustaining farmland:*** Intensification of agricultural practices, including the increased use of fertilizers and pesticides, and the specialization and concentration of crop and livestock production, is damaging farmland and undermining future gains from land and water resources. Water logging and salinity resulting from intensive irrigation are also causing land degradation and affecting crop productivity. To minimize the harmful effects of the intensive use of chemical fertilizers and pesticides, a holistic view of soil fertility is required. This is based on retaining its organic structure and natural nutrients rather than the standard approach involving NPK soil analysis followed by the application of chemical fertilizers. For this, a crop management system that promotes the use of organic manures, biofertilizers and biopesticides and the judicious use of agrochemicals needs to be balanced with the imperatives of food security.
- ***Managing pasturelands and commons:*** The availability and quality of pasture and grazing lands is in decline. Rainfed areas, which support about 78% of the country's cattle, 64% of the sheep, and 75% of the goats, supply most of the meat markets in the country (Gol 2011). Common lands provide a considerable portion of livestock forage, particularly small ruminants maintained by poorer sections of the rural society who have little or no land of their own. A large number of nomadic or semi-nomadic pastoral communities in remoter areas are also dependent on these commons for their livelihoods. However, the commons are usually treated as a residual category and are under threat from land-use change; they are barely able to support the livelihoods of the dependent populations. Given the importance of these common

lands for food and nutrition security and for the strong interdependencies of traditional dwellers, these landscapes need special policy attention and institutional investment.

Furthermore, pastoral land management and livestock production need to be looked at in an integrated manner and the strategies for agriculture, animal husbandry, dairy and fisheries need to work in greater synergy. There is a need to strengthen extensive livestock systems which are dependent wholly or partly on commons and agricultural residues through intensive efforts in improving health care, feed, fodder, drinking water, shelter, institutions etc. Public policy and interventions must shift to these issues from the current almost exclusive focus on high-yielding breeds.

- ***Modernising land reforms and land records:*** Though the country's land records system (based on presumptive titling) has been systematically computerized over the last two decades, updating the records to reflect ownership, occupancy and land use remains a major challenge. This is compounded by tenancy and land ceiling laws which discourage the recording of certain land-related transactions. The laws on tenancy and land ceiling are acknowledged to have outlived their utility, but considerable political will at central and state levels is required to make a change. There is also a need to modernize land records further to incorporate spatial data and new technologies, such as blockchain technology, to build robust infrastructure at all levels. The implementation of distributed ledger or blockchains which can store all relevant information (land records, transfer records, cadastral maps, etc.) can help ensure transparency and traceability to farmers, consumers and other agriculture value chain actors. These upgrades will help achieve the ultimate objective of land reforms, which has to be to free up the rural land market to drive efficiency.
- ***Effective implementation of land use policy measures:*** Revisiting the legislation on the ceiling on land holdings, tenancy etc. from the perspective of livelihood and sustainable food and nutrition security is necessary. But this has to be part of a broader reform of the land governance framework to ensure that land is used to its best potential within the context of sustainability. A comprehensive land-use policy framework is essential for sustainable land management. The government brought out a draft Land Utilisation Policy in 2013 which advocates setting up a National Land Use Council, with the recommendation that similar policy and institutional mechanisms be created at the state level. The policy is intended to ensure proper planning for land and its resources, so as to allow for the rational and sustainable use of land catering for social, economic, developmental and environmental needs among others. The draft policy recognises that proper land-use planning must be based on sound scientific and technical procedures, and on land utilisation strategies that incorporate participatory approaches to involve land users in decisions on how to appropriately allocate and use land and its resources in a way that meets both present and future demands. Setting up of the Land Use Council at national and sub-national levels is important to achieve sustainable food and nutrition security.

Water

- **Increasing the efficiency of surface water use in agriculture:** India accounts for about 18% of the world's population but only 4% of the world's freshwater resources (CWC 2014). Distribution of these water resources across the vast expanse of the country is also uneven. India receives an average of 4,000 billion cubic meters of precipitation every year. However, only 48% of it is captured in India's surface and groundwater bodies. A dearth of storage and exploitation infrastructure and inappropriate water management mean that only 18-20% of the water is actually used (Dhawan 2017). Nationally, compared to 68 million hectares (mha) of net irrigated area, irrigation potential is 140 mha out of a total geographical land area of 329 mha: of this 58.5 mha could be covered by major and medium irrigation structures, 17.4 mha by minor surface irrigation and 64 mha by groundwater. The gap between potential and actual water availability could partly be closed by completing tail-end distribution infrastructure in the command area and improving maintenance and regulation of supply, as well as reducing loss of arable land to waterlogging caused by poor surface water management.
- **Regulating groundwater use in agriculture:** Large shifts from rainfed agriculture (and even canal irrigated agriculture) towards groundwater irrigation have occurred in many parts of the country. Today 64 mha are irrigated from groundwater. This has resulted in a fall in groundwater levels in several agricultural regions, where withdrawals exceed replenishment rates. The Central Groundwater Board categorizes 16.2% of the total assessment units (spread across 15 states and 2 union territories) as 'over-exploited', and an additional 14% as either 'critical' or 'semi-critical'. There is no limit to the amount of groundwater a landowner can extract from his or her land, and in most states the electricity for the pumpsets is either free or highly subsidised. Regulation of groundwater use to promote conjoint use of surface and ground water is weak and ineffective and a central model law for regulating groundwater use has not been taken up by the states and enacted into law. Some states have started separating the electricity lines for agriculture in preparation for metering supply. This needs to be taken forward and leveraged to its full potential by delinking the subsidy from the metering (through direct benefit transfer) so as to promote more economical use. According to a survey, only 3% of India's some 8.5 million tube-well owners used drip or sprinkler irrigation and 88% delivered water to their crops by flooding through open channels.

In 2011 the erstwhile Planning Commission of India circulated a model Protection, Conservation and Regulation of Groundwater Act for consideration by the states. This was then revived in 2016 as the model Protection, Conservation, Regulation and Management of Groundwater Act. However, states have yet to pass operative legislation based on the model law. The way forward may be to shift policy focus from water use efficiency of irrigation water to "rainfall use efficiency" by way of promoting measures for *in situ* conservation and efficient use of rainwater; and investing in shared well and tubewell irrigation and protective/supportive irrigation, especially in drought prone and rainfed areas.

- **Managing demand:** The National Water Policy 2012 states that meeting future needs for water will depend more on demand management, especially a) creating an agricultural system which economizes on water use and maximizes value from water; and b) maximizing efficiency in water use and avoiding waste. Instituting efficient irrigation and agronomic practices through

managing demand is an extremely important strategy for those irrigation projects constructed and managed by government authorities, such as irrigation departments, which are more supply-oriented. Demand management should aim to optimize physical and economic efficiency in the use of water resources, including installing efficient irrigation systems and practicing 'more crop per drop' approaches, i.e. maximizing productivity by optimizing water use. Modern irrigation techniques like drip irrigation, sprinklers etc. should be provided to farmers through effective policies and incentives. At the same time, more accurate meteorological forecasting and better farmer advisory services can help reduce groundwater use.

- **Managing supply:** The National Water Policy 2012 gives high priority for allocating water to basic domestic needs (including animals), achieving food security, supporting subsistence agriculture and minimum ecosystem needs. However, since water management is actually in the state domain, water resources projects – despite being multi-disciplinary with multiple stakeholders – are being planned and implemented in a fragmented manner without due consideration to optimum utilization or environmental sustainability. Technical and regulatory capacity in most states is weak and ineffective, particularly for enforcing the useful principle laid down in the policy that "...water, particularly, groundwater, needs to be managed as a community resource held, by the state, under public trust doctrine to achieve food security, livelihood, and equitable and sustainable development for all" (GoI 2012).
- **Pricing water:** Water valuation can be an important tool for managing water demand, thus facilitating effective management of water services and resources. The economic valuation of water use in agriculture is rapidly emerging as a key issue in water resources management amid growing water scarcity, increasing competition from industrial and domestic users, and alarm over the degradation of ecosystems. The National Water Policy 2012 already recommends that "Pricing of water should ensure its efficient use and reward conservation. Equitable access to water for all and its fair pricing...should be arrived at through independent statutory Water Regulatory Authority, set up by each state, after wide ranging consultation with all stakeholders" (GoI 2012: 7). However, the states are treading cautiously, since the matter is politically sensitive.
- **Scaling up integrated watershed management:** India's annual rainfall is around 1183 mm, 75% of which is received in a short span of four months during the monsoon (July to September). Watershed protection is important for soil moisture conservation, aquifer recharge and balanced land use. Forest ecosystems are essential for watershed management, as deforestation and forest degradation lead to significant soil erosion, with substantial economic and environmental costs. At a time when the lack of water in many regions threatens food security, livelihoods and human health, watershed management can reverse the water depletion process if forests are included as part of a 'ridge to valley' approach for watershed development. Integrating watershed development activities with groundwater perspectives can increase soil moisture, reduce land degradation and boost overall land and water productivity. Such programs have long formed part of India's Drought Prone Areas Programme and Wastelands Development Programme, and most states have developed technical and institutional capacity and methodologies and practices which empower local communities to manage such activities. There are many excellent examples of watershed management in water-stressed areas which incorporate water budgeting and crop planning and diversification.

However, scaling up remains a challenge, primarily due to competing demands on limited public funds.

- **Improving water governance:** Representative participation in water governance has been touched upon in the context of demand-responsive provision of water; however, this should be balanced with a regulatory framework which encourages efficient water use through the proper valuation of water resources. Governance mechanisms that integrate surface and groundwater objectives with socio-economic goals and suitable service delivery models for sustainable water use need to be explored. The need for a National Framework Law as an umbrella statement of general principles governing the exercise of legislative and/or executive (or devolved) powers by the center, the states and the local governing bodies has already been recognized in the National Water Policy 2012. However, the draft legislation (2016) of the National Framework Law is not able to move forward as the states are unwilling to accept a framework which in effect will constrain their ability to pass legislation or take action in accordance with the state's own perceived interest.

Farming systems

- **Mainstreaming smallholder agriculture:** Agriculture in India – particularly smallholder agriculture, which accounts for nearly 86.2% of farmers (10th Agriculture Census 2015-16) – is the mainstay of the rural economy. The average size of landholdings has been declining, from 2.82 ha in 1970 to 1.08 ha in 2016. Per-capita availability of agricultural land has decreased from 0.5 ha in 1950 to 0.12 ha in 2016. Formal financial institutions account for 66% of the seasonal credit offtake for agriculture, with a concentration in the southern states; followed by northern and western states; and the eastern states. Bihar, Jharkhand, Odisha and West Bengal show a significant lag. The small size of holdings – which prevents diversification – makes agriculture a risky enterprise given the rising cost of inputs, volatile prices and climate-related vulnerabilities. There is a need to focus on smallholder agriculture, not only to increase farm and farmers' incomes, but also to make their incomes more climate proof. The recent report of the Committee on Doubling Farmers' Income (2018) contains many useful suggestions (Gol 2018). Its implementation requires the joint efforts of central and state governments and a long-term commitment to improving the agriculture sector. It will be important to prioritize its recommendations and take up those with structural, governance and institutional implications at the earliest.
- **Shifting to sustainable food systems:** While the Green Revolution has enabled the country to move from a food-deficit to a food-secure nation and further to having a food surplus today, some of the practices that have led to this transformation are now threatening production sustainability, as well as ecological and economic viability, with diminishing marginal returns on inputs. Depleting ground water, land and soil degradation – including the spread of problem soils (acidic, saline and alkaline) – loss of soil organic carbon, etc. are symptomatic of the various dimensions of the problem.

Without sacrificing food security, there is a need to shift away from industrial agriculture based on chemical-intensive inputs, cheap fossil fuels, flood irrigation, and genetically improved cultivars and animal breeds to a more sustainable and integrated farming and food system. This

takes into consideration local ecosystems and socio-economic services, technologies and practices along the food chain – production, supply and consumption. Ideally more circularity is needed in the system, such as zero budget natural farming (ZBNF) already being piloted on a large scale in some of the states.

- **Supporting rainfed and dryland farming:** Rainfed and dryland agriculture has not been given adequate attention. These areas are important from the perspective of nutritional security, since they support a large share of the production of nutritious crops such as millets, pulses, oilseeds, as well as livestock. However, landholdings are small and fragmented, and access to credit, R&D and markets is often also more limited. Such areas have high levels of poverty and indebtedness, as well as high levels of soil degradation. The extent of risk is higher in these farming systems, yet 97% of government investment in food grain procurement goes towards cereals in irrigated areas. Although rainfed and dryland farming supports a large livestock population base there is an apparent bias against an integrated perspective of farming systems. For instance, though data on fodder yield and quality are recorded, the criteria for releasing crop varieties in rainfed regions has been on the basis of grain yields, without regard to the fodder potential.

The government has already created a National Rainfed Areas Authority (NRAA) with the mandate for networking and coordinating with the key ministries of agriculture and farmers' welfare, rural development, water resources, environment and forests and Panchayati Raj (elected local self-government).

The NRAA is required to prepare a perspective plan, outlining the national strategy and roadmap for the holistic and sustainable development of rainfed farming areas. Its other roles include:

- coordinating and bringing coherence to agricultural and wasteland development programs being implemented in rainfed areas of the country
- identifying rainfed areas in different states which need priority attention and preparing watershed development programs for integrated natural resource management in consultation with states, focusing on multi-dimensional crop, livestock, horticulture, agri-pasture integrated systems and programs for landless farming communities
- identifying gaps in input supply and credit availability and disseminating appropriate technology and other requirements relevant for developing rainfed areas
- developing plans and programs for building the capacity of central and state government functionaries in rainfed areas
- suggesting ways to strengthen national and state institutions concerned with rainfed/dryland areas, and establishing institutional linkages with prioritized watersheds
- setting the research agenda, including a critical appraisal of existing programs and diffusing the required knowledge for integrated farming in rainfed areas.

Making the NRAA effective as a coordinating and agenda-setting institution would clearly be the way forward for addressing the issues relevant to rainfed areas.

- **Promoting crop diversification via crop management:** Crop diversification is important for sustainable food and land-use systems, but policy support for staple crops like wheat and rice make it challenging to implement. It will be very difficult to substitute the paddy-wheat cropping pattern in Punjab and Haryana in the short and medium term, as an entire ecosystem has developed to support it, including incentives in the form of free/highly subsidized electricity, minimum support price (MSP) and procurement support, and the presence of a strong network of input industry/dealers as well as processing units. As crop choice depends on the market situation, mechanization etc., it may be more realistic in the short-term to focus on resource efficiency and better crop management practices, with issues such as crop diversification being nudged through region-specific mixes of policy, regulation, incentives and R&D support.
- **Mainstreaming sustainable farming practices:** India's consumption of synthetic fertilizer is still rising. Consumption increased from 105.5 kg/ha in 2005-06 to 129.2 kg/ha in 2016-17, though with wide inter-state variations. There is a need to ensure a more balanced use of nutrients to avoid some of the problems already facing states with high fertilizer use. Currently, pesticide use levels in India are 381 gm/ha (again with wide inter-state variation), compared with the global average of 500 gm/ha. Some form of integrated pesticide management takes place on about 90 mha of farmland (out of a total 195 mha).

Shifting to farming practices such as conservation agriculture (CA) and zero budget natural farming (ZBNF) will be important for future productivity gains while sustaining natural resources. These farming practices can potentially increase climatic resilience, food security, soil nutrition and crop diversification; reduce farm energy consumption; and enhance farmers' incomes. Sustainable farming practices need to be mainstreamed across departments, schemes and policies. There is an urgent need to develop technologies suited for smallholders, boost awareness among farming communities about the benefits and create an effective policy framework and strategies for promoting sustainable farming practices.

Nutrition

- **Addressing the underlying issues:** The causes of under-nutrition in India are many and start during infancy/childhood (low birth weight, poor breastfeeding/complementary feeding, frequent infections) and continue during adolescence (low caloric intake, gender/anemia). Young and pregnant women suffer from inadequate purchasing power, leading to inadequate caloric intake, a lack of protein and iron and micronutrient deficiency; while old people's nutrition is also undermined by decreased purchasing power, illness and neglect. Micro-nutrient deficiency is quite common, especially in iron, vitamins A&D and iodine.
- Dietary trends noticed in the National Sample Survey point to a decline in the consumption of cereals and pulses. Pulse consumption is less than the official Recommended Dietary Allowances (RDA) everywhere, with some states like Kerala having very low consumption levels. According to the National Sample Survey Office (NSSO), per capita consumption of calories and

proteins is falling in rural India; only one-third of preschool children meet protein and calorie adequacy.

- **Improving evidence-based policy:** The incorporation of available evidence on nutritional trends into state implementation frameworks² is still patchy and variable across states. In particular, the Integrated Child Development Scheme (ICDS) needs to focus on the 0-2 years age group in addition to 3-6 years. There are discrepancies in data on nutrition. There is a wide gap between actual and reported figures on malnourished children. For instance, in the Jharkhand there are only 2% children identified as malnourished according to government data, while the latest studies show it as high as 16%.
- **Boosting food and nutrition security:** India produced a record 284.83 million tons of food grains in 2017-18, yet farmers' incomes remain stagnant and 15% of the population continues to be undernourished. Access to adequate food is an important determinant of food security, but this is often hampered by poverty: the prevalence of poverty is closely linked with the issue of food security as the poor are often either undernourished or vulnerable. Policy instruments should target food production systems as well as nutritional security by promoting more sustainable agriculture on the one hand and ensuring more nutritious diets on the other. It will be difficult to overcome hunger and malnutrition through distribution policies without focusing on farming related issues and on sustainably increasing farmers' incomes. There is a need to shift from food security to farmers' income security.
- **Reorienting agriculture towards nutrition security:** Government policies have influenced crop choices, cropping intensity, use of agrochemicals, etc. but have largely ignored issues of crop diversity and soil health status. Furthermore, policies on agricultural growth and development have neglected the nutritional requirements of the population and are therefore failing to adequately address malnutrition. The agriculture sector needs to be redirected towards nutritional security through legislative changes and public-private participation models with a focus on better farming practices and adopting protein-based and other nutritious crops; creating smarter value chains; improving access to credit, technology and markets; increasing the focus of food processing industry on alternative crops; and, enhancing the food safety.
- **Enforcing the right to food:** The National Food Security Act 2013 created a right to food, but the ability of the states to maintain a reliable and corruption-free infrastructure to provide food grains, pulses and cereals to the eligible population is limited despite the fact that they have been running similar programs for decades. Some states, like Chhattisgarh, have now adopted technology to monitor food grain movement and distribution, using GPS to track the movement of supplies and biometric identification to ensure eligibility. However, there is also a move to replace food with direct benefit transfers, which may have adverse implications for poorer and more remote rural areas where private supply chains may not be robust enough. Public food distribution chains may also be necessary for supplying fortified food (with iron, iodine, minerals, etc.).

² The policy framework includes the National Nutrition Policy 1993; National Action Plan for Nutrition 1995; Integrated Child Development Scheme (ICDS) for supplemental nutrition for women and children from Aanganwadis; National Health Mission; Mid-Day Meal scheme and National Food Security Act 2013.

Food supply chain, food safety and food quality

- **Increasing the efficiency of supply chains:** It is estimated that up to 18-25% of food losses in India take place along supply chains. The majority of India's losses occur within the post-harvest, processing, and distribution stages of the food chain, mostly due to poor management, refrigeration and preservation practices during storage and transportation. An efficient and complete food system is necessary to deliver all basic nutritional requirements. Supply chain inefficiencies and losses have received significant attention in their contribution to malnutrition.
- **Improving food safety:** There is concern about the quality and safety of the food being produced and made available across supply chains and its consequent impacts on human health and environment. In this regard good agricultural practices need to be promoted and misuse of agro-chemicals, including pesticides, growth hormones and veterinary drugs should be curtailed through proper legislation and ensuring their compliance on the ground.
- **Strengthening storage infrastructure:** For connecting the consumption zones to the production zones and for avoiding food losses, there is a need for stronger logistical support, particularly for perishables. Focus should be on ensuring community access to sustainable cooling systems, not just for comfort but also for food storage.
- **Building capacity:** Information asymmetries and lack of institutional strength prevent farmer producer organisations and agri-entrepreneurs from being part of the larger value chain. They need to be equipped with appropriate technologies, market linkage support and business skills to be active supply chain participants.

Agrobiodiversity

- **Conserving agrobiodiversity ex situ and in situ:** A combination of biophysical, ecological and socio-economic reasons means there is a decline in the cultivation of certain local crop varieties and animal breeds. Efforts need to be made to identify constraints and opportunities for policy change and to provide incentives for increasing agrobiodiversity both on and off farm. Conservation of certain landraces, folk races (farmer-bred varieties) and animal breeds needs to be prioritized based on their nutritional, medicinal, cultural and market values, in conjunction with farmers and scientists. On-farm conservation has lower potential in irrigated areas where hybrids are prevalent, but this is not the case in marginal areas and in areas where modern agriculture has not penetrated yet. Incentive measures need to be devised for *in situ* conservation of landraces³ and animal breeds.
- **Valuing agrobiodiversity through research:** The characteristics of local crop varieties for different food processing purposes should be studied and recorded to allow the food processing

³ "A **landrace** is a domesticated, locally adapted, traditional variety of a species of animal or plant that has developed over time, through adaptation to its natural and cultural environment of agriculture and pastoralism, and due to isolation from other populations of the species." https://www.google.com/search?q=landrace&rlz=1C1DIMC_enGB839GB839&og=landrace&aqs=chrome..69j57j0l5.1599j0j8&sourceid=chrome&ie=UTF-8

industry to exploit marketing opportunities. The demand generated may provide incentives for conserving agrobiodiversity. Studying the relationship between livestock breeds, sub-breeds, pasture and grasses will be very important for agrobiodiversity conservation.

- **Developing policy frameworks:** There is a need for a comprehensive agrobiodiversity policy framework governing access, exchange, trade, sustainable conservation, use, equitable sharing of benefits, and integration into micro and macro-level policy incentives both horizontally and vertically. Existing policies and programs, such as community food grain banks and midday meal schemes in schools, offer some opportunities to promote the cultivation and conservation of traditional crops, especially local millets and landraces.

Trade, commerce and pricing mechanisms

- **Reforming the agricultural pricing policy:** The agricultural pricing policy in India aims to increase agricultural production through a minimum support price (MSP) to ensure remunerative prices of agricultural produce to the farming community. However, this benefits farmers regardless of their agricultural practices and has resulted in skewed cropping patterns and the growth of unsustainable farm practices delinked from agro-climatic conditions and the natural resource base. A price and trade regime that facilitates crop diversification is required for the agricultural sector over the long term. Alternative mechanisms such as direct payments/income support linked to good agricultural practices need to be explored.
- **Improving market infrastructure:** The central government has recently taken some initial steps to improve market access as follows:
 - The Model Agriculture Produce & Livestock Marketing (Promotion & Facilitation) Act 2017 (APLM Act) was circulated to all the states/union territories in April 2017.
 - The Model Contract Farming & Services Act was shared with all the states/UTs in July 2018.
 - A National Agriculture Market – an online platform known as e-NAM – was launched in 2016.
 - The Model Land Lease Act has been shared with all the states.

However, the states have yet to adopt the APLM Act and the Model Contract Farming & Services Act.

International dimensions

- **Achieving the Sustainable Development Goals (SDGs):** Food and land use issues underpin several SDGs and their sub targets: SDG 1 (no poverty), SDG 2 (zero hunger), SDG 3 (good health and well-being), SDG6 (clean water and sanitation), SDG7 (affordable and clean energy), SDG 12 (sustainable consumption and production), SDG 13 (climate action) and SDG 15 (life on land). There are strong interlinkages among these SDGs which need to be assessed from the perspective of sustainable food and land use systems.

- **International agricultural trade:** International trade in agricultural commodities brings to the fore serious concerns about India's environmental and carbon footprint linked to the sustainability of its food and land-use system. For instance, India relies on imports to meet over 70% of its vegetable oil requirements; almost 60% of this requirement is met through palm oil. India is the leading importer of palm oil globally. Palm oil production is linked with destruction of natural rainforests, loss of biodiversity and ecosystem degradation in exporting countries like Indonesia and Malaysia.

In India, Tree Borne Oilseeds (TBOs), like sal, mahua, simarouba, kokum, olive, karanja, jatropha, neem, jojoba, cheura, wild apricot, walnut, tung etc. are cultivated in the country under different agro-climatic conditions in a scattered form in forest and non-forest areas as well as in wasteland/deserts/hilly areas. TBOs are used for traditional medicine, industry as well as household purposes. Coconut palm is widely cultivated and coconut oil is the main cooking medium in many coastal regions of south India. Oil palm is a comparatively a new crop in India. The central government started an Integrated Scheme on Oilseeds, Pulses, Oil palm and Maize (ISOPOM) in some states in 1992, and about 59,000 ha of land was brought under oil palm. The central government has now created the National Mission on Oilseeds and Oil Palm (NMOOP), which inter alia aims to bring an additional 125,000 hectare area under oil palm cultivation through an area expansion approach in the states, including the use of wastelands as well as an increase in productivity of fresh fruit bunches. It is important to ensure that palm oil consumption in India is not based on use of the oil imported from countries where it is linked to unsustainable land use; nor should palm oil be produced in India in conditions involving unsustainable use of land and water.

Cross-cutting issues

Gender

- **Addressing gender gaps:** There is a gender gap in access to resources and assets such as land, capital and livestock which is linked to agricultural growth and development. Policy mechanisms need to recognize and address gender relations and their role and importance for sustainable food and land use systems.

Under the National Rural Livelihoods Mission (NRLM), the Ministry of Rural Development has launched the Women Farmer Empowerment Programme – “*Mahila Kisan Sashaktikaran Pariyojana*” (MKSP) – which involves incorporating climate change resilient and ecologically sound practices through the medium of women self-help groups. Programmes include use of locally available natural inputs for pest management and soil fertility management, the system of rice intensification, promotion of millets and cereal crops, multi-crops, tree-based farming practices, integrated farming practices with small ruminants, natural soil fertility management, integrating livestock with agriculture, *in situ* rainwater harvesting, etc. The scaling up of this successful initiative is a challenging task requiring long continuous engagement, given the wide variation in the strength and vigour of self-help groups in different parts of the country. The NRLM has an inbuilt strategy for the purpose, but the process is likely to take time to spread widely enough to become a potent force.

- **Decreasing women's vulnerability:** Agricultural problems affect women farmers' incomes and livelihoods differently from men. For instance, incidents of crop failure tend to result in greater dropout rates for women than men, with lower disposable incomes. Expanding women's access to land and rural finance, linking women to agricultural value chains, facilitating specialized agricultural training and customized support and a women-responsive climatic risk management plan can have significant implications for addressing gender inequality, risk and vulnerability in the rural economy.

Poverty and social structure

- **Improving farmers' income security:** Agricultural indebtedness and incidences of farmer suicides are growing. Given the need to ensure food security, food policies till now have focused more on ensuring that food prices for the consumer are kept down than ensuring that food production is profitable for the farmer. There is a need to better address the income security of farmers. Also, the livelihoods of people who practice marginal agriculture and are dependent on forests for sustenance need to be taken into consideration. The Central Government has recently been given a report by an expert committee which contains many policy recommendations on making farming more remunerative and sustainable as well (GoI 2018). To strategize for improving income security of farmers and to drive transformative increases would entail inter alia understanding and addressing the systemic barriers faced by farming communities in a given context, including issues such as price levels and volatility, unfavorable public policies, and lack of diverse income generating opportunities.
- **Building institutional capabilities:** There is a need to invest in decentralised and local institutional capacities that enable a shift away from one-off planning to 'iterative planning-implementation-learning cycles' by local institutions. Enhancing institutional capacities in local governance and resource management, particularly related to the commons and strengthening Panchayat Raj, co-operatives and other stakeholder institutions, is absolutely necessary. Such institutional bases are a prerequisite for evolving local and agroecological mechanisms for program design, credit access, filling in infrastructure gaps, marketing etc.
- **Enhancing inclusivity:** The above changes will have an intrinsic positive bias towards women, landless poor, smallholder farmers, pastoralists, and other marginalized people and bring a focus on improving the production systems that are central to their lives.

R&D

- **Investing in R&D for rainfed farming:** Crop production in rainfed and dryland areas is low. To realize the full potential of these areas, there is a need for more R&D and greater public investment.
- **Researching appropriate technologies:** There are technological challenges in terms of inefficient pumpsets, an inadequate number of soil testing laboratories, as well as a lack of low-cost technologies suitable for small and marginal landholdings. There is a need to promote value-adding research into agronomic constraints and post-harvest technologies.

Climate change

- **Avoiding the impact of climate change on livelihoods, food security and the economy:** the impact of climate change on agriculture is likely to have large detrimental effects on the availability of food, on livelihoods and the overall economy. The National Mission on Sustainable Agriculture (GoI 2010) predicts the changes to include an increase in mean *kharif* (monsoon/summer) rainfall, more frequent heavy precipitation events and extreme events (storms and cyclones), more common heat extremes and heat waves, average temperature rise of 1°C (2020) to 3°C (2100), and a rise in sea levels, coastal erosion, and saline incursion. Small and marginal farmers, pastoralists and artisanal fisher folk will be the worst sufferers.

Key risks to Indian agriculture and the economy from climate variability and change include decline in yields (from direct physiological impacts on crop/livestock/fish and indirect impacts on soil, water, nutrients, pests, diseases, etc.); increased farm expenditures (including post-harvest management); reduced farm incomes; increased threat of food insecurity and malnutrition; and, a fall in GDP growth in the medium term of up to 2% per annum (GoI 2010).

- **Building resilience to climate change.** There is an urgent need to develop transformative strategies that increase India's food systems' resilience to changing climate. By mapping the dependence of people on land and forests, a vision for sustainable food systems could be developed. Forests and trees, for instance, also support household nutritional well-being, improve soil fertility, meet energy demand, provide medicine, inter alia (FAO 1991).
- **Adopting a holistic climate risk strategy:** Climate change has been linked to systemic changes that will affect the lives and livelihoods of millions. Thus any strategy that India adopts to reduce climate risk needs to prevent deforestation, restore forests, and improve land productivity to stabilize the climate, promote economic development and reduce poverty.
- **Mainstreaming and implementing the National Mission on Sustainable Agriculture:** The National Mission on Sustainable Agriculture was set up in the Ministry of Agriculture in 2014 as part of the National Action Plan on Climate Change to address the issues likely to arise from climate change impacts. Its vision is to transform agriculture into climate resilient production systems; grow and ecologically sustain agricultural production to its fullest potential; ensure food security and equitable access to food resources; enhance livelihood opportunities; and contribute to economic stability at the national level. Its key focus areas are:
 - Strategic planning at agro-climatic zone level
 - Customized interventions to enhance productivity
 - Creating knowledge and institutional support
 - Linking laboratory to land more effectively
 - Paying special attention to dryland farming

However, in practical terms the mission is yet to be mainstreamed or to establish collaborative links with similar missions on water and forest. The state level climate action plans do incorporate the requirements of the national missions, but no institutional structures or

planning mechanisms have been established and additional budget support for adaptation is yet to be made available.

- ***Focusing on land-based emissions:*** Reducing emissions and increasing carbon sinks in the agriculture and forestry sectors together provide benefits for biodiversity conservation and building resilience to climate change. Intersectoral effects of the forestry and agriculture sectors may be missed by the current international and national legislative frameworks and therefore need to be incorporated in the development, adaptation and mitigation policies.

Joined-up governance

- ***Adopting a systems approach:*** Land-use management demands a systems approach and an interdisciplinary orientation to the problems and issues at hand. Multiple agencies and government departments have programs and schemes on agriculture, rural development and food and nutrition security but they are operating in silos. Thus, an effective integrated approach combining production systems and natural resources with environmental, local livelihoods, health and well-being considerations and involving some form of multi-stakeholder process is needed to ensure that proper coordination among various related programs and schemes on sustainable food and land use takes place and that the result is coherent actions.

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Annex I – Agenda of the Roundtable

<p>Welcome and Introduction 10:00 AM – 10:10 AM</p>	<p>Dr O. P. Agarwal <i>C.E.O, World Resources Institute India</i></p>
<p>Introduction of Participants 10:10 AM – 10:20 AM</p>	<p>Dr Seth Cook <i>FOLU China-India Coordinator</i></p> <p>Mr S Vijay Kumar <i>Distinguished Fellow, The Energy and Resources Institute (TERI)</i></p> <p>Dr Chandan Jha <i>Research Fellow, Indian Institute of Management (IIM) Ahmedabad</i></p>
<p>Presentation on Background Paper 10:20 AM – 10:40 AM</p>	<p>Dr Ruchika Singh <i>Director – Sustainable Landscapes and Restoration, World Resources Institute India</i></p> <p>Dr Manish Anand <i>Fellow, The Energy and Resources Institute (TERI)</i></p>
<p>Session 1: Sustainable use of land resources for food and nutrition security 10:40 AM- 12:00 PM</p>	<ul style="list-style-type: none"> • Is there a need for a more structured approach for land use planning in India? If so, what should be the key elements of such an approach? • What would be the pathways to reverse the current land degradation processes while also ensuring food and nutrition security? • How to ensure overall efficient and sustainable use of land resources – soils, water and biodiversity?
<p>Session 2: Food and nutrition security, Climate targets and SDGs 12:00 PM – 1:15 PM</p>	<ul style="list-style-type: none"> • What would be the pathways to transform the current focus from food security to food and nutrition security? • What would be the pathways to scale restoration in India to meet climate targets and SDG related developmental needs?
<p>Summary/Concluding remarks 1:15 PM – 1:30 PM</p>	<p>Dr Vaibhav Chaturvedi <i>Research Fellow, Council on Energy, Environment and Water (CEEW)</i></p> <p>Dr O. P. Agarwal <i>C.E.O, World Resources Institute India</i></p> <p>Mr S Vijay Kumar <i>Distinguished Fellow, The Energy and Resources Institute (TERI)</i></p>
<p>1:30 PM</p>	<p>Lunch</p>

Annex II - List of Participants

Name	Designation	Organisation
Ajay Shankar	Distinguished Fellow	The Energy and Resources Institute Former Permanent Secretary, Department of Industrial Policy and Promotion
Amit Khurana	Programme Director Food Safety & Toxins	Centre for Science and Environment
Ashish Bahuguna	Former Permanent Secretary (Agriculture) Former Chairman, Food Safety and Standards Authority of India (FSSAI)	Ministry of Agriculture
Ashok Dalwai	Chief Executive Officer	National Rainfed Area Authority (NRAA) Ministry of Agriculture
Chandan Jha	Research Fellow	Indian Institute of Management Ahmedabad
Divya Datt	Programme Management Officer	UN Environment Country Office, India
G L Gupta	Joint Director	Department of Land Resources, Ministry of Rural Development
K M Jayahari	Consultant (Sustainable Landscapes and Restoration)	World Resources Institute India
Khem Chand	Director	Indian Grassland & Fodder Research Institute (IGFRI)
Manish Anand	Fellow	The Energy and Resources Institute
Marie Duraisami	Senior Project Associate	World Resources Institute India
Mrinal Mathur	Fellow	The Energy and Resources Institute
N.C. Saxena	Advisor Former Permanent Secretary (Rural Development) and Former Member-Secretary (Planning Commission)	United Nations Development Programme, India
Nagesh Singh	Additional Secretary	Department of Rural Development, Ministry of Rural Development
Nitya Nanda	Senior Fellow & Associate Director	The Energy and Resources Institute
O. P. Agarwal	CEO	World Resources Institute India
Poonam Nagarkoti	Research Analyst	Council on Energy, Environment and Water (CEEW)

Name	Designation	Organisation
Probal Ghosh	Head-Modelling Group	Integrated Research and Action for Development
R R Rashmi	Distinguished Fellow	The Energy and Resources Institute Former Special Secretary, Ministry of Environment, Forest & Climate Change
Ruchika Singh	Director	World Resources Institute India
S Vijay Kumar	Distinguished Fellow	The Energy and Resources Institute Former Permanent Secretary, Ministry of Rural Development
Sabyasachi Das	National Coordinator	WASSAN (Watershed Support Service and Activities Network)
Seth Cook	Associate	The Food and Land Use Coalition
Shashi Shekhar	Senior Fellow	World Resources Institute India Former Permanent Secretary, Ministry of Water Resources
Siraj Hussain	Visiting Senior Fellow	Indian Council for Research on International Economic Relations (ICRIER) Former Chairman, Food Corporation of India (FCI) and former Permanent Secretary, Ministry of Agriculture
T Nanda Kumar	Visiting Senior Fellow	Indian Council for Research on International Economic Relations (ICRIER) Former Permanent Secretary Ministry of Food, Ministry of Agriculture; former Chairman National Dairy Development Board
Tom Williams	Director-Water	World Business Council for Sustainable Development (WBCSD)
Vaibhav Chaturvedi	Research Fellow	Council on Energy, Environment and Water (CEEW)
Vibha Dhawan	Distinguished Fellow	The Energy and Resources Institute
Vilas A. Tonapi	Director	Indian Institute of Millets Research (IIMR)