



Prosperity



Farm Technologies

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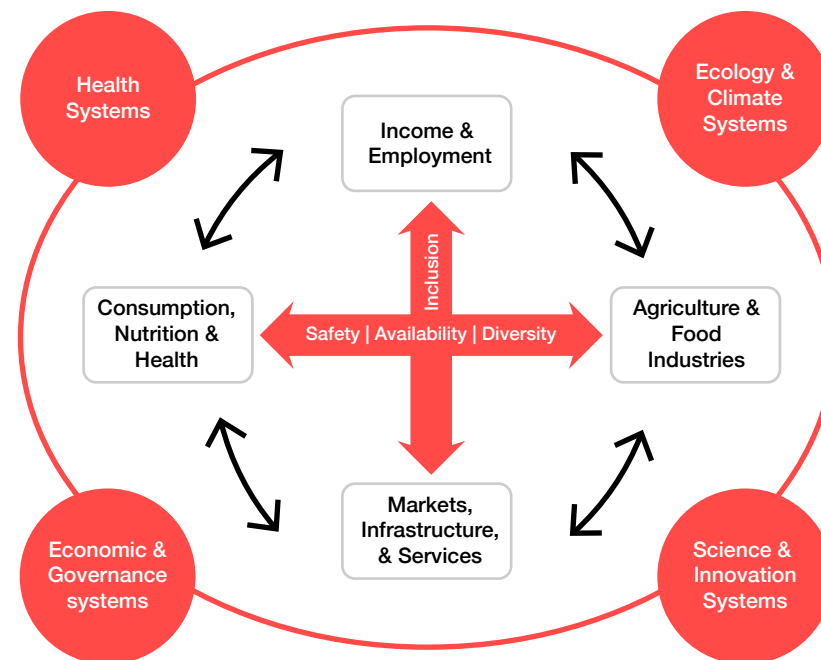


Actionable Area

Providing access to all the small and marginal farmers in the on farm technologies that are already developed for testing, demonstration and adoption.

Issue

- Indian population is expected to surpass China in 2027 as the world's most populous country. Though Green Revolution has tripled the food grain production with only a 30 percent increase in land under cultivation, this growth in food production has challenged the country's resource base, resulting in varied economic access to nutritious diets indicating high rates of stunting amongst children. The resource-intensive food production systems of the past 7 decades in India, the challenges of nutritional security, and the degrading resource base in the country call for transformation in food systems.
- Anchored by the Indian Council of Agriculture Research (ICAR), technological contribution towards production and productivity enhancement has made significant strides in the last few decades. Contributions from this public system to the fields of germplasm conservation, varietal/breed improvements, good agricultural practices, pre-production – production – post-harvest equipment and machinery, processed food compositions, and shelf stability for diverse products from Camels, Goat, Poultry, Mithun, supply chain technologies, climate-smart technologies (soil, water, nutrient conservation, and crop husbandry) has been multi-fold. These technologies, which hold huge potential, need to find their way to on-farm adoption.





- India's economic growth since independence has seen the co-existence of the 'best' and 'not so best'. Despite India's economic progress, the persistence of regional inequalities, and malnutrition exacerbated by the growing population, the country can get into a public health challenge if not addressed immediately.
- These nutritional deficiencies in society result from various challenges that the three principle stakeholders of India's food system, viz., 'producer', 'consumer', and the 'value chain player', are facing. Indian food systems are fraught with multiple dimensions from farm gate to the consumer plate.
- Various challenges at the ecosystem level include (a) Deteriorating quality of natural resources viz., soil (overuse of nitrogenous fertilisers and very low use of micronutrients), water (overuse of groundwater to depletion levels), and air. (b) Climate change (rising temperatures, frequency & distribution of rainfall – droughts & floods). (c) Poor access to land, credit, technology, and infrastructure to marginalised communities in the food production systems.
- Various challenges in food production and distribution constituted (i) Fragmented landholding and continued decline in landholding size – with implication on increasing extension, aggregation and agency costs which in a way influences both the availability, access, and cost implications at consumer plate; (ii) Food supply system losses to the tune of 40% leading to inefficient use of production factors; and (iii) Poor logistics in agriculture (input supply, produce aggregation and connect of rural-urban production-consumption centres) and urbanisation leading to high transaction costs.
- Challenges of Indian food systems at food basket level include – (a) High emphasis on twin staples; (b) Calorie sufficiency focus and neglect of quality & diet diversity; (c) Differential dietary / nutrition requirements across socio-economic strata of the society; and (d) Mismatches in consumer demand (for diversified foods) and production planning – leading to issues of cost, access, convenience, and the default choice.
- While India is aspiring to harvest its demographic dividend, it is time nutritional security with an implication on the mental & physical growth of its population is paid at most attention, a pre-requisite to the economic and social progress of the Nation.
- Technological innovations in the supply chain have been fundamental drivers of dietary change throughout human history. A shift to healthy and sustainable food habits would need transformation in the land use, crop diversity, aggregation, and seamless supply to the end consumer through big data analytics, given smaller land sizes in India and disaggregated supply centres. An analysis of land use to deliver a healthy diet to everyone revealed that land under cereals, oil crops, and sugar crops would decline by 150, 105, and 30 million hectares, respectively. For vegetables & fruits, it would increase by 170 million hectares.
- The multi-dimensional transformation is only feasible through higher digital inclusion that can potentially increase on-farm technologies to farmers, especially the majority – small and marginal categories. The technologies developed by public and private systems are demonstrated and facilitated for adoption through strong digitally-driven extension systems.

Status

- With its large network of research institutes, bureaus, directorates, and research centres contribution of ICAR has been into diversified fields of the Indian food system such as genetic improvement, farm machinery (viz., pea depoding machine; poultry processing cum by-product collection unit), value chain efficiencies (viz., Ultraviolet disinfection system, fat-free flavoured makhana, adulteration testing kits for chillies, black pepper, turmeric powder, red chillies, black pepper, coriander), food processing & products (viz., primary makhana roasting machine, soy-based composite edible film, a natural dye extracted from the walnut hull, etc.). While these technologies are piloted, demonstrated, and disseminated through 722 Krishi Vignan Kendra across the country, measuring the success of such technologies' adoption at the producer level and by the food industries are the need of the hour.
- In the age of Google-led translations and free vernacular tools available, professional agencies can reach out to the partially literate at a low cost. It is high time to reach the end-user, and technology adoption finds a place in the evaluations.
- A World Bank report suggested that 'The digital revolution—and the data it generates—are key to building an agriculture and food system that is efficient, environmentally sustainable, equitable, and able to link the world's 570 million farms with 8 billion consumers'. Given the challenges discussed in the above sections, the aspirations of the directorate of digital agriculture to support 'farmers in informed decisions – crop choice, varietal

choice, time and practices for yield maximisation', 'planning by supply chain players based on timely and precise information, 'decision by farmers on when, where and what price to sell' etc., are in the right direction.

- In the recent past, India witnessed the growth of various big data analytics / digital startups that can offer relevant and need-based advisory services ranging from nutrient advisory, crop advisory (pest and disease forecasting, detection) to weather and market advisory, that can potentially bring inefficiencies in the production and supply systems through resource use efficiencies from farm gate to consumer plate. An indicative illustration of such technologies is provided below:

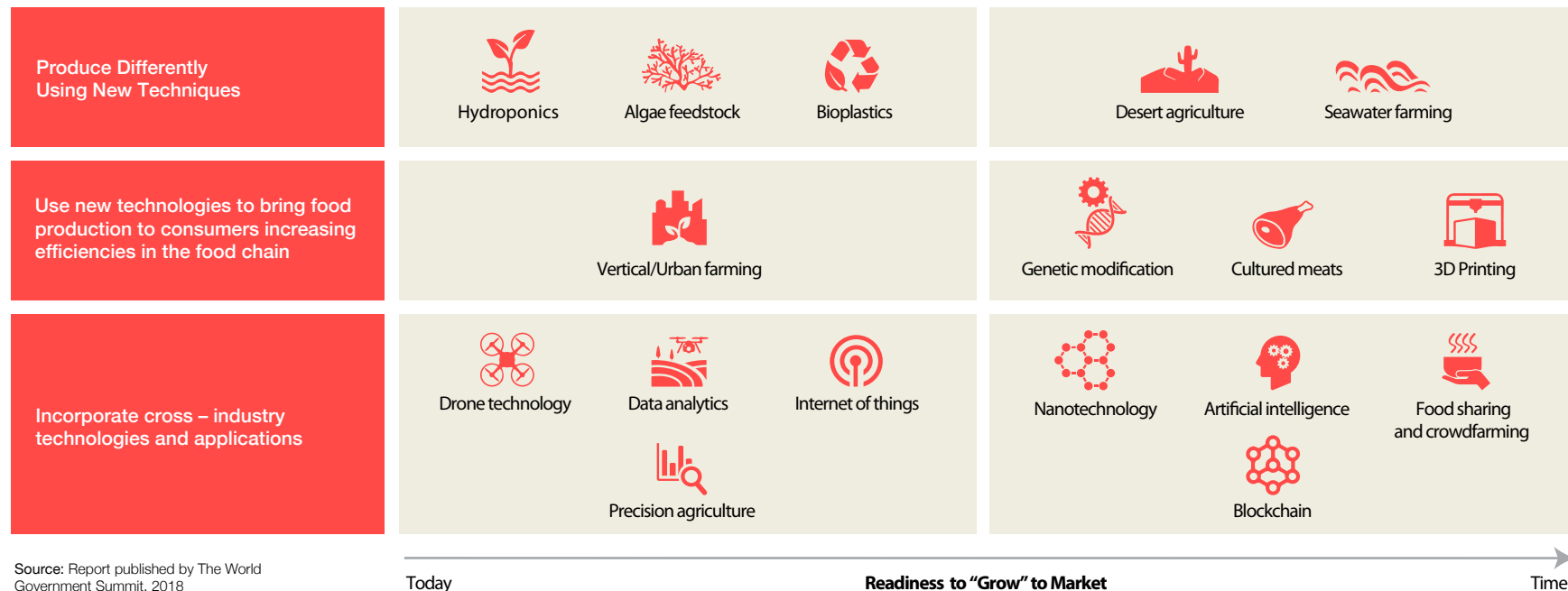
Application utility for farming	Examples
Identification of nutritional status and advisory	Chlorophyll Metre
Pest-disease forecast, diagnosis & package of practices recommendation	Plantix, Cropin / mKrishi / Kisan Suvidha / Kisan Hub
Supply of good quality agri-inputs	Dehaat / Big Haat / Agro Star
Facilitate irrigation water use efficiency	Agsmartic / Kisan Raja / Flybird
Weather advisory	Skymet / Satsure / Yuktix
Access to warehouses with credit linkages	Ergos, Arya Collateral
Access to farm machinery	Oxen Farms / EM3 / Gold Farms
Technology based financial access	KisanDhan/ Arya Dhan / Origo

- Such individual digital technologies that are hitherto unable to offer services at affordable prices are to be brought together for integration viably and sustainably. Private Sector curated models such as ITC e-Choupal, TCS's mKrishi, Better Life Farming Alliance, EM3 are harvesting the technology-driven efficiencies through their model scale-up in multiple geographies.

Vision 2030

- A strong digital backbone of the country is in the making. The farming community across geographies and diverse resource bases is provided access to the on-farm technologies already developed for testing, demonstration, and adoption. On the lines of the UID mission pursued by the country, the inclusion of all the small and marginal farmers by 2030 is the principle means of transforming the food systems for a sustainable future.**

Map of technologies and maturity



Pathways

POLICY



Agricultural extension and advisory services are strengthened towards technology adoption, sustainable production practices, and remunerative income for producers.

Promote staple diversity through policy-driven crop planning and strengthening MSP procurement mechanisms through public-private partnership especially achieving synergies through technological interventions.

IMPLEMENTATION



Innovate the farm technologies on the dimensions of their frugality, adaptability, and relevance of market demand.

Supporting the use of digital technologies with data analytics and the internet of things (IoT)

- a. In achieving resource use efficiency at the farm level.
- b. In enabling supply chain efficiencies from farm gate to consumer plate.
- c. In demand aggregation and production, planning to align production with changing consumer preferences and needs.
- d. In popularising various processed products and technologies that are already developed for wider currency and consumer acceptance.

Supporting outcome-driven partnerships between technology agencies and public-funded institutions in the ambit of Digital Agriculture. Encouraging private sector investments into technology agencies that cater to the needs of end-users (producer/consumer).

Pathways



Communication between MSP and PDS data stacks and promotes nutritious cereals and pulses for the beneficiaries of PDS.

Mainstream use of modern media tools for information exchange and technology transfer.

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