TECH INNOVATIONS: CHANGING INDIAN AGRI SECTOR

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Present farming and agricultural operations are far different from those few decades ago. This is because of advancement in science and technology. Sensor systems, appropriate devices, machines, and information technology has changed the face of farming and status of farmers. Now the progressive farmers routinely use sophisticated technologies such as temperature and moisture sensors, aerial images, GPS technology and robots. These advanced devices and precision agriculture has made the agriculture a business. Besides earning profit, efficiency, safety, and environment issues are taken care of.

The share of agriculture and allied sector in Gross Domestic Product (GDP) was 51.9 per cent in 1950-51. It has come down to 13.7 per cent in recent years. That contribution is quite low for a sector that employs about 50 per cent of the country's population. However, this is mainly due to the farmers' inability to generate sufficient income from their farming and meet their debt obligations. The use of innovations in the field of agriculture science and its adoption by quick motivation will definitely change and break the vicious circle of poverty of farmers.

Importance of Agricultural Technology

The challenges of growing enough food to feed the growing population have built huge pressure in the century. We have to arrange food for 1.25 billion people with limited agricultural land and resources. We also need to make better use of scarce factors of production such as land, light and logistics for an increasingly urban population. We also need to ensure zero-waste and low-energy technologies for sustainable and less harmful effect to the environment.

Action taken

In the Budget 2016-17, Rs 412 crore has been allocated for organic farming, Rs 850 crore for animal husbandry, cattle and livestock breeding and Rs 35,984 crore has been allocated for farm sector developments, excluding research and development grant to agricultural universities. Dedicated efforts of scientists and engineers have contributed a lot and are intensely working to make their "lab to land" program successful for use of technical innovations in farms for national interest.

Lot of innovations visible in this area:

a) Innovation of agricultural devices, sensors, and systems

b) Applied researches have been made to deploy technologies economically and with minimal disruption for convenient and quick adoption by farmer community.

c) Assistance for use of new technologies

Consequently, farmers no longer have to apply water, fertilizers, and pesticides across entire fields manually. Instead, they can use the optimum quantities required and target specific areas. Even an individual plant can be treated differently.

Besides, robotic technologies enable reliable monitoring and management of air, water quality and other factors of production. It also gives producers an excellent opportunity of control over plant and animal production, processing, distribution, and storage

In turn the producers, consumers and economy will be benefited:

1. Increase in productivity in turn keeps food prices down

2. Decline in use of water, fertilizer, and pesticides, so that cost pushed inflation can be reined
3. Reduced adverse impact on environment
4. Increased worker safety

Robotic technology with artificial intelligence benefits the farmers for:

1. Greater efficiencies and lower prices
2. Safer growing conditions and safer foods
3. Reduced environmental and ecological impact

Benefits of Technology to Small and Marginal Farmers

More than 85 per cent of farmers are classified as small and marginal group. They operate in 44.5 per cent of cultivable area with average holding size of 0.9 ha. Most of these farms are family-owned. Such farmers are confronted with considerable challenges, such as increased movement of young mass into cities, an aging population in rural, farm fragmentation, and changing weather patterns.

Family and small farms are vital to our economy. Not only do they support the competitiveness and sustainability of rural and farm economies, they serve to:

1. Protect and enhance natural resources and the environment
2. Provide a ground for the development of new activities and create market.
3. Maintain rural populations and prevent urban migration

In particular, focus for those segments should be more of motivational and result base for adoption of alternative advance technologies:

1. Increase confidence, production, and profits for small farm communities
2. Develop new and improved practices to reduce production costs
3. Establish research and demonstration plots to adopt technologies and best practices for real field use.
4. Ensure that all farmers have equal access to development programs and services
5. Ensure that farmers are knowledgeable about:

a) Planning for entire holding

b) Planning for crop selection, rotation, mixed cropping and mixed farming

c) Risk management by adopting mixed farming

d) Market demand opportunities for better return.

Organic Agriculture

Organic farmers, livestock owners, and food processors use agricultural methods intended to preserve the environment. Government restricts the use of certain conventional inputs such as synthetic fertilizers and pesticides. The organic sector is one of the fastest growing agricultural segments. Organic farming benefits by preserving soil health.

Organic farming involves practices that:

1) Maintain and improve fertility, biodiversity, and reduce soil erosion
2) Reduce the risks of environmental, human and livestock damage.
3) Fine-tune farm practices of local conditions and meet the requirement of local market.

Government support in this field includes:

1) Facilitating development of organic production, breeding, and processing methods
2) Evaluating potential economic benefits to producers and processors
3) Exploring international trade opportunities for organically grown and processed products
4) Determining distinct quality of organic commodities
5) Identifying marketing and policy framing for expansion of organic agriculture

Startups came up for farmers with innovative adoptable solutions.

Vertical Farming is an adoptable solution where land resource is very scarce and rampant urbanization puts a threat to land availability for agriculture. In this technique critical elements of farming such as temperature, light and heat are regulated. Plants of different depth of root

zone and shoot zone (canopy management) are efficiently managed in a single patch of land. Vertical Farming is promising because it requires displaceable soil, and can save space and energy–and improve crop yield. It takes advantage of the vertical space rather than turning over expanded land. Advanced greenhouse technology for hydroponics or aeroponics crops can be raised by environmental control that regulates temperature, humidity and light. Vegetables, fruits and other crops can be grown throughout the year. This technique can also be utilised for urban agriculture and roof top cultivation.

Skymet is one of the largest weather monitoring and agricultural risks solutions company of the country. They measure, predict, and minimize climate risk to agriculture, thereby limiting losses incurred due to weather abrasions. This website forecast weather information, suggests for crop insurance and related risk management. Weather forecast can help farmers for preparing against possible hazards to farming and help them to take befitting preventive measures. They claim to be accurate in their prediction.

Frontal Rain Technologies is accessible through computer and mobile devices. It is useful for firms dealing in commodities like groceries, basmati rice, seeds, cattle feed, sea food, dairy products and edible oil. The website creates a scope for demand and supply of agricultural products on the cloud. Rain+ solution helps companies at different stages of the value chain, starting from sowing, growing, processing, logistics, wholesale and retail trade and exports.

Digital Green is a non-profit making international development organization. The company focuses on imparting training to the farmers through the method of **'seeing is believing'**. The company prepares and exhibits short videos where they record problems and achievements, share different ways of solutions and highlight success stories as community group engagement to improve lives of rural masses.

This technology shows the rural masses through videos, the way of behavioral changes by bringing together researchers, development practitioners, and rural communities. They are imparted with the value of preservation and protection of environment for healthy life.

Agrostar provides genuine agricultural inputs to the farmers at their doorstep. It is a Pune-based m-commerce platform, directly linked to the farmers. AgroStar helps farmers to procure agricultural inputs such as seeds, plant nutrition, plant protection and agriculture equipments by simply giving a missed call on the company's toll free number, 1800 or through their mobile app to prevent hardship of unavailability of products. Substandard and spurious agricultural inputs can be easily avoided.

Ekgaon Technologies is an IT based network integrator. It provides a technology platform to the farmers with provision of range of services. They provide financial counseling, guide for agricultural input availabilities and provision of government assistance etc. They have mobile banking platform for delivery of financial services. It also provides information and counseling of credit, savings, remittance, insurance, investment and mortgage etc at the door step and information regarding microfinance institutions available in the locality. They also provide local language base agriculture advisory services to the mobile users through

interactive voice response system (IVRS).They also provide web based information on weather, market, price, soil health management etc.

Biochar based organic Soil Amendment Technology (BIOSAT) is a technology base solution to soil additive and amendment. It is made off of different organic nutrients. The product restores soil fertility, reduces carbon emissions, maintains the health of topsoil and increases productivity. This reduces the use of chemical fertilizers. It ensures enhanced productivity with optimum use of resources.

Besides being expensive, the use of toxic pesticides for control of pests contaminates water bodies meant for use of human and animals. Scientists have developed environment-friendly plant protection methods after much research on products. It supports organic farming with minimum expenditure. This is pheromone base pest control method which is quite popular now a day. This pest control traps have artificially synthesized smell attractant that attracts and traps harmful pests. Before eating the crops, the pests are trapped and are killed. This is a sticky sheet, known as ***Barrix*** (hormone base pest control trap). It uses bright yellow and blue colored recyclable sheets of wavelengths between 500 nm to 600 nm. At least 19 high-risk pests are trapped and are killed.

MITRA (Machines, Information, Technology, Resources for Agriculture), is a set up, aims to improve mechanization at horticulture farms with the use of highly effective farm equipments. These are created through Research and Development and launched after rigorous field trials. They have developed Air blast sprayers. It is very useful for fruits and vegetables crops. It is also effectively utilized for grapes and pomegranates. The sprayers are used to spray hormones that help the growth of crops. It considerable reduces the expenditure on manual labour and is less time-consuming.

CropIn Technology Solutions offers information on a cloud-based platform through mobile base application. It is known as 'Smart Farms'. It allows companies to track status of the crops around the country. It helps companies to remotely monitor farms, interact with farmers and make every crop traceable and visible. It also helps farmers in adopting advance farm practices and improves productivity by providing high yield methods and productivity forecasts. This technology solutions startup invented by a software engineer, it provides smart and safe food supply for consumers around the world by considering agriculture as a business.

Eruvaka Technology is a unique way to measure and control water health. Poor knowledge of water health sometime put the fish farmers in a great loss due to rampant and mass death of fishes and damage of aquaculture produces. An organization of Andhra Pradesh encourages farmers in a mission mode for use of this technology in aquaculture for control of water health to save farmers from big risk

It is solar-powered flouting equipment that measures oxygen level, temperature and pH range of water and suggests conduciveness of aquaculture and possible remedies. This is very crucial for the growth and survival of fishes. The information collected by the equipment are uploaded on the cloud and transmitted to individual farmers through mobile app, SMS, tele-call or the internet. Farmers can rectify the water body by remotely controlled equipment such as aerators and feeders.

Conclusion

It is high time for us to rethink the role of knowledge, science and technology in achieving equitable and sustainable development in rural sector. The focus must be on the needs of small and marginal farmers who are of great need for the same. This means improving rural livelihoods, empowering farm communities with weapons of technologies for sustainable natural resources, enhancing multiple benefits provided by eco-systems, considering biodiversity, and providing fair market access for farm products along with availability of factors of agricultural production are essential emerging needs of present time.

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