GOVERNMENT OF INDIA MINISTRY OF AGRICULTURE AND FARMERS WELFARE DEPARTMENT OF AGRICULTURE AND FARMERS WELFARE

LOK SABHA UNSTARRED QUESTION NO. 2258 TO BE ANSWERED ON THE 20TH DECEMBER, 2022

IOT AND AI IN AGRICULTURE

2258. SHRI SUSHIL KUMAR SINGH

Will the Minister of AGRICULTURE AND FARMERS WELFARE कृषि एवं किसान कल्याण मंत्री be pleased to state:

(a) whether the Government is considering any proposal of using IoT and AI in agriculture;

- (b) if so, the details thereof;
- (c) the details of applications of IoT and AI in agriculture; and
- (d) the steps being taken by the Government to attract agri-tech funding in the country?

ANSWER

MINISTER OF AGRICULTURE AND FARMERS WELFARE

कृषि एवं किसान कल्याण मंत्री (SHRI NARENDRA SINGH TOMAR)

(a) to (d): Various activities have been taken up by the government, using Internet of Things (IoT) and Artificial Intelligence (AI) in agriculture. Some of the activities are given below:

I. Department of Science & Technology (DST) is implementing a National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS). Under the Mission, 25 Technology Innovation Hubs (TIHs) have been set up in premier institutes of national importance across the country in advanced technology verticals. Three of these TIHs are involved in the applications of Internet of Things (IoT) and Artificial Intelligence (AI) in Agriculture with objective of carrying out research, translation and technology development for various technologies including IoT and AI, namely :

a. Technology and Innovation Foundation in technology vertical of "Technologies for Agriculture and Water" set up at Indian Institute of Technology (IIT), Ropar,

b. TIH Foundation of IOT and Internet of Everything (IoE) in technology vertical of "Technologies for Internet of Things and Internet for Everything" set up at IIT Bombay

c. AI4ICPS Foundation in technology vertical "Artificial Intelligence and Machine Learning" set up at IIT Kharagpur.

Some of the applications of AI and IoT in Agriculture are in the areas of Precision Farming, Agricultural Drones and Hopping systems, Livestock Monitoring, Monitor Climate Conditions, Smart Greenhouses, AI and IoT based Computer imaging etc. The work/activities taken by the above 3 institutes are given below:

a. IIT Ropar-Technology and Innovation Foundation is working towards IoT based devices and sensors that are being introduced to the saffron production and supply all over India.

b. TIH Foundation of IOT and IOE is executing a project of effective and efficient agriculture technology, which aims to develop an end to end solution for Agriculture Technology (AgriTech) to predict crop production in the season. EAgriS is an IoT-based platform developed for this purpose. As an application of IoT in Precision Agriculture, the TIH focuses on Aerial Robotics for Soil Parameters Monitoring, Drone based Imaging and Drone based spraying. For the application of AI in Precision Agriculture, the focus of TIH is to develop a predictive data analysis model to make intelligent decisions based on ambient conditions (temperature, humidity, wind speed and direction rainfall), soil parameters (moisture, temperature, electrical conductivity, pH, NPK, Sulphur) and leaf wetness.

c. AI4ICPS Foundation is developing AI based technologies for Precision Agriculture, Predictive and Forecasting models using AI for Crop Health Monitoring and Soil health Monitoring.

- II. Under the Digital India initiatives, Ministry of Electronics and Information Technology (MeitY) along with NASSCOM and state governments has set up Centres of Excellence on Internet of Things at Bengaluru, Gurugram, Gandhi Nagar and Visakhapatnam. One of the objectives of these centres is to enable India to emerge as an innovation hub in IoT through democratization of innovation and realization of prototypes. One of the focus areas of Centres of Excellence on IoT at Visakhapatnam is on Agri-tech and it connects various entities such as startups, enterprises, venture capitalists, government and academia.
- III. Under the National e-Governance Plan in Agriculture (NeGPA) program under Department of Agriculture & Farmers' Welfare funding is given to State Governments for Digital Agriculture projects using emerging technologies like Artificial Intelligence and Machine Learning (AI/ML), Internet of Things (IOT), Block chain etc.
- IV. A progamme called "Innovation and Agri-Entrepreneurship Development" has been in operation under Rashtriya Krishi Vikas Yojana (RKVY) since 2018-19 with the objective to promote innovation and agripreneurship by providing financial support and nurturing the incubation ecosystem. Start-ups pertaining to agriculture and allied sectors are being encouraged in order to contribute directly and indirectly to enhancing the income of farmers by providing opportunities to them and to provide employment to youth. In this connection, five (5) Knowledge Partners (KPs) and twenty four (24) Agribusiness Incubators (R-ABIs) have been appointed by this Department to advise

on smooth and efficient execution of this programme in various States across the country. The details are at Annexure -I.

Start-ups under the programme are taking up projects in various fields of agriculture and allied sectors like Agro-processing, Food Technology & Value Addition, Artificial Intelligence (AI), Internet of Things (IoT), Information & Communication Technology (ICT), Block Chain Technology (BCT), precision farming and Digital agriculture, Block Chain technology, Agri. Logistics, Value & Supply chain management, Online/virtual platform, Agri. Extension, Agri. Inputs, Farm mechanization & innovations, Organic farming & products, Natural Resource Management, Renewable Energy, Waste to Wealth, Animal Husbandry, Fisheries, Dairy, Secondary agriculture, etc.

So far, 1102 start-ups operating in agriculture and allied sectors have been selected and Rs. 66.83crore has been released in installments. These start-ups were trained for two months at various agribusiness incubation centres i.e KPs &R-ABIs before providing financial assistance.

- V. The Institutes under Indian Council of Agricultural Research (ICAR) have initiated work on application of IoT and AI in agriculture. A list of activity initiated is given in Annexure-II.
- VI. Mahalanobis National Crop Forecast Centre (MNCFC) has conducted few pilot studies under Pradhan Mantri Fasal Bima Yojana using innovative technologies for crop yield estimation through various Government and Private Agencies. During 2019-20, pilot studies were conducted envisaging space technologies through 12 agencies in 64 districts of 15 States for 9 crops, while these approaches were validated in Rabi 2019-20 in 15 blocks of 6 States. Further, during 2020-21, the pilot studies were scaled up to 100 districts spread over 9 states of the country, with the help of 7 agencies for paddy crop in Kharif 2020, which continued in Rabi 2020-21 for Rabi Rice and wheat crop.

Various technologies viz., Satellite, Unmanned Aerial Vehicles (UAVs), Simulation models, IoT devices and AI/ML techniques were used in the study to derive the yield estimates at Gram Panchayat level.

List of 5 Knowledge Partners (KPs) and 24 R-ABIs under RKVY Startup programme

1. Knowledge Partners (KPs):

- i. National Institute of Agricultural Extension Management (MANAGE), Hyderabad
- ii. National Institute of Agricultural Marketing(NIAM) Jaipur
- iii. (3)Indian Agricultural Research Institute (IARI) Pusa, New Delhi
- iv. University of Agriculture Science, Dharwad, Karnataka and
- v. Assam Agriculture University, Jorhat, Assam

2. RKVY Agribusiness Incubators (R-ABIs):

- i. Chaudhary Charan Singh University, Hisar, Haryana
- ii. CSK Himachal Pradesh Krishi Vishva vidyalaya, Palampur, Himachal Pradesh
- iii. IIT-BHU, Varanasi, Uttar Pradesh
- iv. Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh
- v. ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh
- vi. Punjab Agricultural University, Ludhiana, Punjab
- vii. Indira Gandhi Krishi Vishwa vidyalaya, Raipur, Chhattisgarh
- viii. Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu, J & K
- ix. IIM, Kashipur, Uttarakhand
- x. Kerala Agricultural University, Thrissur, Kerala
- xi. ICAR-Indian Institute of Millets Research, Hyderabad, Telangana
- xii. Tamil Nadu Agricultural University (TNAU), Coimbatore, Tamil Nadu
- xiii. Agri innovation and entrepreneurship cell, ANGRAU, Andhra Pradesh
- xiv. National Rice Research Institute, Cuttack, Odisha
- xv. SKN Agriculture University, Jobner, Rajasthan
- xvi. Indian Institute of Technology Kharagpur, West Bengal
- xvii. Bihar Agricultural University, Bhagalpur, Bihar
- xviii. Anand Agricultural University, Anand, Gujarat
- xix. ICAR-Central Institute for Research on Cotton Technology, Mumbai, Maharashtra
- xx. Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra
- xxi. ICAR-NIVEDI, Bengaluru, Karnataka
- xxii. College of Fisheries, Lembucherra, Tripura
- xxiii. Dept. of Veterinary Medicine College of Veterinary Sciences & Animal Husbandry, Mizoram
- xxiv. College of Horticulture & Forestry, Pasighat, Arunachal Pradesh

S.No.	Activity	Application
1.	Development of image (Visual and X-Ray) based mango sorting and grading system and sensor-based monitoring system with block chain technology for supply chain of banana	For grading of mangoes into different quality grade which is the prime needs for mango processing industries as well as for any commercial applications. Block- chain technology will be used to access and monitor the quality of banana in supply chain and hence traceability of the banana from source till the end point.
2.	Development of IoT-Based Real-Time Intelligent Monitoring and Controlling System for Cold Storage	For real-time monitoring and control of micro-environment inside storage room for prediction of status of product quality for commodity being stored.
3.	Development of Vision guided Al-enabled Robotic Apple Harvest Under National Programme on Electronics and ICT Applications in Agriculture and Environment.	For identification of the matured Apples using Machine Vision Techniques and harvesting and safety conveying of apples in a storage unit.
4.	Development of Automatic Jute Grading System.	For efficient grading of jute.
5.	Development of IoT based irrigation system	For automatic and efficient irrigation of agricultural crop.
