

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

LOK SABHA
UNSTARRED QUESTION NO. 1162
TO BE ANSWERED ON THE 27TH JULY, 2021

INDIAN INSTITUTE OF HORTICULTURAL RESEARCH

1162. SHRI DHANUSH M. KUMAR:
SHRI GAUTHAM SIGAMANI PON:
SHRI SELVAM G.:
SHRI GAJANAN KIRTIKAR:
SHRI C.N. ANNADURAI:
SHRI ARVIND GANPAT SAWANT:

Will the Minister of AGRICULTURE AND FARMERS WELFARE

कृषि और किसान कल्याण मंत्री be pleased to state:

- (a) whether the Indian Institute of Horticultural Research which was set up to conduct research on various aspects of horticulture has achieved the objective for which it was setup;
- (b) if so, the details thereof and if not, the steps taken by the Government in this regard;
- (c) the steps taken by the Government for the purpose of horticultural research in the country;
- (d) whether any advances/achievements in horticulture technology have been made by Indian Institute of Horticultural Research;
- (e) if so, the details thereof during each of the last three years and the current year;
- (f) whether these advances/achievements have been adopted by farmers in the country and if so, the details thereof and if not, the reasons for the same; and
- (g) the other steps taken by the Government to boost horticulture cultivation in the country?

ANSWER

THE MINISTER OF AGRICULTURE AND FARMERS WELFARE

कृषि और किसान कल्याण मंत्री

(SHRI NARENDRA SINGH TOMAR)

- (a) Yes, Sir. ICAR-Indian Institute of Horticulture Research (ICAR-IIHR), Bengaluru which was set up to conduct research on various aspects of horticulture has achieved the objective for which it was set up.
- (b) The details of research works undertaken by ICAR-IIHR, Bengaluru and its achievements are given in **Annexure-I**
- (c) The steps taken by the Government for the purpose of Horticulture research is detailed at **Annexure-II**.

(d) & (e): Yes, Sir. The advances/achievements in horticulture technology made by IIHR during last three years and the current year are as under:

- **Varieties/hybrids developed:** In fruit crops, a total of 31 hybrids/varieties in fruit crops have been developed and released for commercial cultivation.
- **In vegetable crops,** improvement and production work is carried out in 30 different crops. So far 120 varieties have been released.
- **Ornamental crops:** A total of 94 hybrids/varieties in ornamental crops, 9 hybrids/varieties in **medicinal plants** and 3 varieties in **aromatic crops** have also been released.
- **Germplasm:** A total of 23 numbers of germplasm on different crops registered.
- **IC numbers:** A number of 480 IC numbers of germplasm were obtained on different crops.
- **Gene sequence:** A total of 1557 Gene sequence database were submitted in public database.
- **Seeds:** A total of 16851 kg (2017-18), 23112 kg (2018-19) and 16624 kg (2019-20) of quality seed of various fruits, vegetables, flowers, medicinal plants, loose flowers and bulbs were supplied to the farmers.
- **Planting Material:** A total of 62000 kg, 51664 kg and 48538 kg planting material of fruits were supplied during 2017-18, 2018-19 and 2019-20, respectively.
- **Seed programme in 2020-21:** 11557.985 kg of seeds was produced during kharif in 67 vegetable varieties/ hybrids. The seed production program in Rabi season was 25000 kg seeds of 60 vegetable varieties/hybrids. 239795 kg of planting material and 20420 kg of seeds of ornamental crops were produced. Through sale of planting material of fruit crops, Rs.5286621 was realized in 2020-21.
- **Patents:** A total of 8 patents were applied out of which 4 got approved till now. A total of 14 registrations were done in PPVFRA.
- **Publications:** ICAR-IIHR has uploaded 815 recent publications, two data inventories, 109 videos and 51 variety registrations of the institute in ICAR Central Repository "**Krishi Portal**" <https://krishi.icar.gov.in/dashboard/>.
- **Programmes organised:** A number of programmes organised/conducted towards capacity building during the last four years wherein more than one lakh persons were trained on different aspects of horticultural production and cultivation.

(f) Yes, Sir. The details are given at **Annexure-III**.

(g) Following steps are taken by the Government to boost horticulture cultivation in the country:

➤ **Mission for Integrated Development of Horticulture (MIDH)**

- Mission for Integrated Development of Horticulture (MIDH), a centrally sponsored scheme has been launched in 2014-15 for holistic development of horticulture sector in the country through area based regionally differentiated strategies which includes research, technology promotion, extension, post harvest management, processing and marketing in consonance with comparative advantage of each state/region.
- Under MIDH, Government of India contributes 60% of the total outlay for developmental programmes in all the states (except North Eastern and Himalayan states where GOI contributes 90%) and 40% is contributed by State governments.
- It has following five major schemes on horticulture:
 - ✓ National Horticulture Mission (NHM)
 - ✓ Horticulture Mission for North East and Himalayan States (HMNEH)
 - ✓ National Horticulture Board (NHB)
 - ✓ Coconut Development Board (CDB) &
 - ✓ Central Institute of Horticulture (CIH), Nagaland

➤ **National Horticulture Board (NHB)**

- It was set up in 1984 on the basis of recommendations of the "Group on Perishable Agricultural Commodities" headed by Dr M. S. Swaminathan.
- Objective is to improve integrated development of Horticulture industry and to help in coordinating, sustaining the production and processing of fruits and vegetables.

- ICAR-IIHR, Bengaluru conducts research on various aspects of horticultural crops viz. fruits, vegetables, ornamentals and medicinal plants for improving their productivity, quality and utility. In addition, IIHR has three regional stations viz; Central Horticultural Experiment Stations at Chettalli in Kodagu district of Karnataka, Bhubaneswar in Orissa and Hirehalli in Tumkur district of Karnataka as well as two Krishi Vigyan Kendras at Gonikoppal in Kodagu and Hirehalli.
- The ICAR-IIHR has been mother to two National Institutes viz. Central Institute for Subtropical Horticulture, Lucknow and Central Citrus Research Institute, Nagpur; fostered three NRC's viz. National Research Centre for Banana, National Research Centre for Pomegranate, Solapur, National Research Centre for Grapes, Pune and one Directorate viz. Medicinal and Aromatic plants, Anand. This institute has provided the initial nurturing for CISH, Lucknow and NRC Citrus, Nagpur, which were initially the regional stations of IIHR. Two more regional stations viz. CHES, Godhra in Gujarat and CHES, Ranchi in Bihar were transferred as regional stations to Central Institute for Arid Horticulture, Bikaner and Directorate of Water Management Research, Bihar respectively after establishing and fostering them successfully.
- With the emergence of new challenges in horticulture, emphasis is now given to breeding hybrids/varieties for biotic and abiotic stresses, developing integrated water and nutrient management protocols, pests and disease management technologies, efficient post-harvest management practices and conducting frontier research in the areas like hi-tech horticulture, precision farming, information technology and biotechnological interventions.
- Since inception, IIHR has been actively collaborating with national and international organizations on research, education and training. The Institute has a large contingent of one hundred and fifty trained scientists with expertise on major areas of horticultural research.

Some of the important contributions of the institute in the recent past are:**Varieties/hybrids**

- In fruit crops, a total of 31 hybrids/varieties in fruit crops have been developed and released for commercial cultivation of which the varieties such as Arka Udaya (mango), Arka Kiran and Arka Mridula (guava), Arka Surya and Arka Prabhath (papaya), Arka Sahan (custard apple) have become popular among the farmers.
- In vegetable crops, improvement and production work is carried out in 30 different crops. So far 120 varieties have been released of which hybrids/varieties such as Arka Samrat and Arka Rakshak (tomato), Arka Anandh (brinjal), Arka Anamika (okra), Ark Kyathi and Arka Meghana (chilli), Arka Manik (water melon), Arka Suvidha, Arka Komal and Arka Anoop (French Bean), Garden Pea (Arka Ajit), Arka Garima (cowpea), Arka Jay and Arka Vijay (dolichos bean), Arka Kalyan and Arka Bheem (onion, Arka Bahar (bottle gourd), Arka Harit (bitter gourd) and Arka Sujat and Arka Sumeet (ridge gourd) are very popular among vegetable growers.
- A total of 94 hybrids/varieties in ornamental crops, 9 hybrids/varieties in medicinal plants and 3 varieties in aromatic crops have also been released. Among them the varieties, viz. Arka Prajwal (tube rose), Arka Bangara and Arka Agni (marigold), Violet

Cushions and Poornima (China aster) and Arka Alankar (crossandra) are popular among farmers.

Ex-situ Conservation

- The IIHR is a National Active Germplasm Sites (NAGs) for various horticultural crops of great significance.
- The ex-situ field gene bank has over 3000 collections including tree species.
- A pollen cryobank established in 1983 facilitates conservation of nuclear genetic diversity and caters to the needs of crop breeders.
- At present, nearly 645 collections of different horticultural crops are cryopreserved.

Farmer-Friendly Technologies

The institute has developed and commercialized several farmers-friendly technologies for enhancing the yield and quality of various horticultural crops.

- Process for the production of organic formulation of bio-pesticide bioagent (*Pseudomonas fluorescens*) developed.
- Methyl eugenol pheromone traps for mango and guava fruit fly developed.
- Cuelure pheromone trap for cucurbit fruit fly developed.
- Neem and Pongamia soap as repellents developed.
- Use of neem cake for the management of insect pests of vegetables recommended.
- Integrated Pest Management (IPM) modules for major pests of fruits, vegetables and flower crops developed.
- Integrated Disease Management (IDM) modules for major diseases of fruits, vegetables and flower crops developed.
- "Dogridge", a salt and drought tolerant rootstock for grapes developed and recommended.
- Crop specific micronutrient formulations (specials) for banana, citrus, mango and vegetables developed and commercialized.
- Nutrient feeding of banana bunches by delivering through nutrient blended cow dung developed.
- Arka microbial consortium for fruits and vegetable production developed.
- Arka cocopeat for nursery raising of fruits and vegetable seedlings developed.
- Seed pelleting of onion and tomato developed.
- Technologies for protected cultivation of tomato, capsicum, cucumber and lettuce have been standardized and transferred to State Agri/Hort. Departments of many states.
- Production of RTS beverages and flavoured wine from Muscat grapes to Coimbatore grape growers association, Coimbatore, Tamil Nadu developed.
- Long term preservation of raw mango slices for pickling developed.
- Short term preservation of vegetable baby corn developed.
- Production of osmotically dehydrated fruits like mango, pineapple, papaya and aonla and mango fruit bar.
- Preparation of beverages of mango, pineapple and aonla was transferred.
- Hot water treatment of mango for uniform ripening developed.
- Low temperature storage of pineapples for long distance transport developed.
- Ready to pluck (RTP) mushroom packs developed.

Technology Spread

- The institute has released a number of improved varieties/ hybrids and technologies for the farmers and agripreneurs for enhancing the income and livelihood support.
- In fruit crops, the varieties such as Dogridge rootstock (it occupies 80% area of the grape growing areas), guava varieties (152 ha), papaya varieties (512 ha) and custard apple variety Arka Sahan (>500ha) have spread across the country.
- There are more than 120 varieties/hybrids released from IIHR of which the varieties in okra (Arka Anamika), tomato (Arka Rakshak), watermelon (Arka Manik), French Bean (Arka Komal), Pumpkin (Arka Chandan and Arka Suryamuki) are very popular among farmers.

Extension

- The institute realizing the importance of horticulture in livelihood security and diversification of crops, has worked relentlessly towards the research in extension as well as the transfer of technology through 'On Farm Trials-OFTs, Front Line Demonstrations (FLDs) and Lab to Land Programme and training for human resource development.
- The salient achievements includes 'Participatory Rural Appraisal' (PRA) for assessing the research needs in fruits, vegetables, flowers, medicinal and aromatic crops, seed science and technology, hybrid seed production in vegetable and ornamental crops, PHT, organic farming and marketing of horticultural crops.
- The activities such as 'Impact Analysis of IIHR Technologies', 'Farmer Participation Action Research Programme', Organic farming practices in validation process, Innovation Extension Methodology (mobile messaging, farmer field school, development of techno agents for promotion of sustainable horticultural activities, use of video conferencing for training and interaction with innovative farmers), Group and mass communication approaches (publications, field days, exhibitions, T.V. and Radio, mobilization mass media support for sharing agoinformation, development of information system for IIHR technologies) are also undertaken.

Quality Seed and Planting Material

- To meet the IIHR varieties seed and planting materials demand, the institute has a separate vegetable seed unit and one nursery unit each for fruits and ornamental crops.
- Besides, IIHR has also adopted the seed village concept for seed multiplication of IIHR released varieties, which solves the problem of isolation in case of cross-pollinated crops and maintenance of genetic purity.
- This also assures availability of seed materials in the local areas as well as other parts of the area. The planting materials of fruit crops such as mango, guava, jackfruit, annona, fig and citrus are multiplied and supplied to the needy farmers.
- On an average about 14-15 tonnes of certified seeds of different vegetable varieties hybrids 1-1.5 lakh grafts of fruit crops, 2-3 kg hybrids papaya seeds and about 2-3 lakhs numbers of planting materials in ornamental crops are sold annually to the needy farmers.

- **Improved varieties:** Steps taken to identify suitable varieties and standardization of production technologies. Thrust is given on developing/breeding improved varieties, hybrids, male sterile lines (for seed production) etc. that will contribute to enhanced production.
- **Genetic diversity:** Future productivity is closely linked to conservation of genetic diversity and utilization of wild species for biotic and abiotic resistance. Conservation of fruits and vegetable genotypes form a part of this platform on biodiversity conservation.
- **Protected cultivation:** Research on protected cultivation for nursery production, vegetable production is underway.
- **Micronutrient formulation:** Use of micronutrient formulation and development of crop-specific micronutrients in different fruits and vegetables production has been undertaken.
- **Refinement:** Refinement and validation of production and protection technologies are continuous process for improvement and to boost cultivation.
- **Planting material:** Multiplication of seed and planting material developed through public sector is carried out and quality seed and planting material is made available to the farmers. Distribution of seed and quality planting materials is a continuous process for enhanced productivity.
- **Crop Management technologies:** There is need to standardise crop production and crop protection technologies of varieties developed and to develop the package of practices for each and every crop.
- **Post harvest management:** Research is carried out on post harvest technology and value addition to reduce post harvest losses and bring produce under maximum utilization.
- **Technologies transfer/Commercialization/ MoUs:** There is need to transfer the technologies developed to the stakeholders including farmers. Also there is need to commercialise some of the technologies. In every sphere of technology development through PPP mode there is need to sign MoU.
- **Mobile apps and documentaries:** To transfer technologies and making aware of these technologies, development of Mobile apps and production of documentaries are prerequisite and are developed.
- **Custodian farmers:** To enhance the production of indigenous fruits and vegetables, conservation through custodian farmers, documentation and evaluation is undertaken regularly.
- **Scientists-farmers interface:** Regular scientists-farmers interface meeting is organized on different crops at different places to address farmers' problems that will ultimately contribute to enhanced cultivation of fruits and vegetables.
- **Human resource:** Today's human resource (HR) development will contribute to future science and enhance production of fruits and vegetables. Steps are taken to impart more post graduate teaching and research to more number of students by expanding the post graduate research access to different parts of the country, eg. at IIHR, Bengaluru.
- **Transfer of Technology:** technologies are disseminated to the farmers through AICRP/SAUs.

- **Extension:** Frontline extension programmes are carried out to reach to the farmers. Training and skill up-gradation of farmers and other extension officials on horticultural crops are also imparted.
- **TSP/NEH:** Besides, programmes under Tribal Sub plan (TSP) and programmes for North East Hills (NEH) are undertaken towards technology transfer and capacity building so that cultivation and production of fruits and vegetables in tribal regions and in NEH can be enhanced.

Further, these Institutes/Directorates/NRCs and AICRPs of ICAR under Horticultural Science Division take following steps to promote horticulture cultivation in the country:

- Organize Scientist – farmer interface meetings, farmer’s mela, exhibitions, advisory services etc.
- Reach out to farming community through diverse ICT Platforms i.e Mobile Apps, Social media,
- The institute websites have “Farmer’s corner” exclusively for the farming community and Crop specific advisory services.
- Provide weekly status report on insect pest and diseases of various crops.
- Extension pamphlets in English, Hindi and other local languages, extension bulletins, Farmers advisory services, planting material availability, guide on nutritional disorders etc. are also available.
- Some Institutes have Facebook which are also utilized by many farmers for getting quick information about their queries regarding released varieties, planting material availability and pest and diseases of crops.
- **SMS service:** SMS service is also available to alert the farmers for any impending disasters or pest and disease out breaks.

IMPACT OF RESEARCH DURING THE LAST THREE YEARS

1. Varieties of Fruit Crops:

- **Rootstock, Canopy management and crop regulation of grapes**
Dogridge rootstock was identified and introduced in 1997 and it is now adopted in > 90 per cent of the total grape cultivation i.e., in nearly 1,00,000 ha with the total benefit of Rs 6250 crores annually.
- **In Guava**, a pink flesh guava **Arka Kiran** was introduced and now spread in around 887.5 acres. The variety has been adopted in 10 states of Tamil Nadu, Andhra Pradesh, Telangana, Karnataka, Maharashtra, Madhya Pradesh, Chhattisgarh, Pondicherry, Uttarakhand, Odisha and Kerala. Arka Kiran has also been licensed to 9 nurseries and KVKs on non- exclusive basis for further commercialization and generated a total of Rs. 7,08,000 lakhs to ICAR- IIHR, Bengaluru. Generated an estimated income of Rs. 14.2 crores from 320 ha from the yielding orchard (since inception) in the country. Considering the total area covered by the variety, an estimated income of Rs 354 crores in the country per annum was generated during the last 5 years.

2. Varieties of Vegetable crops:

- **In Tomato**, a triple disease resistant (ToLCV+BW+EB) tomato F₁ hybrid **Arka Rakshak** was introduced in 2010 and adopted in 26 states with a spread of nearly 7720 ha and the total benefit of this hybrid is about Rs. 661.5 crores per year. The income benefit of this hybrid is more than 35 per cent over other hybrids under similar situations. The parental Lines were licensed to 11 Private & public sector organizations/ companies.
- **Male sterile lines in Okra and Chilli:** IIHR is globally the only institute to develop GMS lines in Okra and licensed to over 25 companies generating 50 lakh rupees, covering a cropped area of around 1 lakh hectares by private sector hybrids developed using this source. Similarly, CGMS lines of chilli developed at IIHR and licensed to 11 companies and the hybrids using these lines are widely cultivated.

3. Varieties of flower crops

- **In Tuberose**, ICAR-IIHR variety **Arka Prajawal**, which was introduced in 2009, has spread in more than 38 per cent of tuberose area (nearly in 2805 ha) of India and at present benefiting Rs 280.50 crores to the economy annually.
- **Marigold Hybrid – Arka Bangara-2** has been accepted well across the country in the segment of Gold yellow colour and big flowers. ICAR-IIHR has also licensed the hybrid to nurserymen of Maharashtra and Karnataka for mass multiplication.

4. Biofertilizers and Bio pesticides:

- **Arka Microbial Consortium (AMC)**, a product of ICAR-IIHR, Bengaluru was introduced in 2014 and now applied in 46000 acres in various horticultural crops

including pepper has helped for plant health management and benefit to these crops to the extent of Rs 138 crores.

5. IPM and INM Technologies:

- Crop Specific Foliar Nutrient Formulations like Banana Special, Mango special, Vegetable special were developed and licensed to 12 companies and 38 KVKs with gross realizations of Rs720 crores. These are expected to increase 15 per cent yield and 24 per cent income per ha as per experimental data.
- Mango fruit fly Pheromone trap and Light-based trap for Tuta of tomato were developed at IIHR and these technologies are widely used in over 3 lakh ha in Mango belts of Chittor and Krishnagiri and tomato belt of Kolar helping to realise 15 to 20 % higher returns. The total benefit from these technologies is estimated to be 360 crores over last 10 years.

6. Vegetable Seed Villages

- A total of 41.733 tonnes of breeder seeds of 85 open pollinated varieties and 12 F₁ Hybrids from 21 vegetable crops have been distributed to farmers and other stake holders covering an area of 14,000 ha (OP) and 8000 ha (F₁ Hybrids), respectively during the last three years.

7. Protocols developed:

- ICAR-IIHR has been involved in preparation and notification of DUS guidelines of PPVFRA in 31 horticultural crops. During the last 5 years DUS test has been conducted for 571 entries of these crops, for grant of PPVFRA registration.

8. Seed Portal:

- An online Seed portal for purchasing seed of IIHR varieties from any part of the country has been created (<https://seed.ihr.res.in/>). A total of 5600 transactions valued at 47 lakh rupees was carried out during the last 6 months.

9. Improvement in productivity, Quality of Produce with safety and Stakeholders 'relevance

- The Institute has established a Food Safety Referral Laboratory (FSRL) in the year 2017 with funding by ICAR. The laboratory has been accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) as per ISO/IEC 17025: 2017 for testing of pesticide residues, heavy metals, Sudan dyes and microbial pathogens in horticultural produce and in water. It is a multidisciplinary facility for testing of food for chemical as well as biological contaminants. 176 samples have been tested during the last 3 years. This is helping farmers export their produce.

10. Expected Increase in income of stakeholders:

- **Promotion of IIHR varieties and technologies in North Eastern India increased net income of farmers**

Under NEH programme of the institute, many new varieties and hybrids along with improved production technologies and technological products were disseminated in all 8 states of NEH region. During 2018-19 and 2019-20 a total number of 43 KVKs and 8 developmental departments (Horticulture and Agriculture) and 5 SAU's of these 8 states were covered with 2768 front line demonstrations in 28 crops with 40 varieties / hybrids and 8 technological products in area of 667.79 acres.

The impact of these programmes was clearly visible in all states in terms of increased yield (65 – 230% in > 20 varieties), improved quality (>40 -65%), increased availability of

fresh vegetables (>8 moths/year), increased net- income (Rs.1.20 lakhs to Rs.4.80 lakhs per acre) with increased B:C ratio (1.65:1 to 4.51:1) in different varieties of vegetable crops.

11. Contribution to Export Earnings

- Grape is one of the important export-oriented fruit crops of India and the direct total economic surplus/benefits since adoption of Dogridge rootstock along with canopy management and crop regulation for raising grape crops from 1996-97 was Rs 15,212 crores (23 years) at 2018 prices. Exports of fresh grapes earned a foreign exchange of US \$ 334.91 million (Rs 2,335 crores) while exports of raisins earned US \$ 26.217 million during 2018. Nearly 90 per cent of these exports are based on the fruits obtained from grapes cultivated on Dogridge rootstock.
- Rose onion variety Arka Bindu developed by IIHR is being cultivated in an area of 4000 ha in Chikkaballapur district of Karnataka which is being exclusively exported earning foreign exchange worth Rs.320 lakhs annually.
- A total of 100 tonnes of tomato (Arka Rakshak) fruits are being exported annually to Bangladesh and Middle East @ Rs.60/- per kg which is equivalent to Rs.600 lakhs.

12. Entrepreneurship and Employment generation

- A total of 15 start-ups have been incubated at IIHR during the last three years providing employment to 59 persons.

13. Ecosystem services

- Established a 500-micron hdpe lined water harvesting tank (25.00 Lakhs litre capacity) from the 0.80 ha polyhouse area **as a model for water harvesting**. IIHR provided technical specifications for such farm pond lining to Karnataka State Horticulture Department to prepare subsidy schemes. This technology has spread to over 1.18lakh ponds in Karnataka with support of subsidy by State govt especially to horticultural farmers.

14. Research Publications: A total of 876 research papers, 142 technical bulletins, 172 book chapters, 164 popular articles, 53 pamphlets were published during the last five years by IIHR.

15. Service functions: Advisory services to stakeholders/online services developed and provided regularly.
