

## 15. Technology Assessment, Refinement and Transfer

The Indian Council of Agricultural Research through Krishi Vigyan Kendra assesses, refines and demonstrates technology/products developed by its institutions. The activities include on-farm testing to identify location specificity of agricultural technologies under various farming systems, frontline demonstrations to establish production potentials of improved agricultural technologies on the farmers' fields, and training of farmers and extension personnel to update their knowledge and skills. At present, there are 589 KVKs, which include 398 under the State Agricultural Universities (SAUs), 47 under the ICAR Institutes, 94 under the NGOs, 33 under the State Governments and the remaining 17 under various other organizations. Besides, there are 44 ATICs functioning under the SAUs, ICAR Institutes and Deemed-to-be Universities in the country.

### KRISHI VIGYAN KENDRA

#### Technology assessment and refinement

**Assessment:** During the year, 1,819 technological interventions were assessed in 4,501 locations by laying out 18,013 trials on the farmers' fields on various crops under different thematic areas, namely, Varietal evaluation, Integrated nutrient management, Integrated crop management, Integrated disease management, Integrated pest management, Resource conservation technologies, Weed management, Integrated farming systems, Post-harvest technology/value-addition, Improved tools and farm machinery, Seed and planting material production, Improved storage techniques and Quality improvement in the country.

In case of livestock, 238 technological interventions in 610 locations covering 5,759 trials under the thematic areas, namely Production and management, Feed and fodder management, Fertility management, Disease management, Breed improvement, Nutrition management and Value-addition were assessed.

**Refinement:** As many as 162 technological interventions were refined in 179 locations by laying out 1,101 trials on the farmers' fields under the thematic areas, namely, Integrated nutrient management, Integrated crop management, Integrated pest management, Integrated disease management, Resource conservation technologies, Weed management, Improved storage techniques, Integrated farming systems, Quality improvement, PHT/value-addition and Farm machinery and Seed production technique.

Besides, 22 technological interventions were also refined in 28 locations through 140 trials on animals under the thematic areas, namely, Feed and fodder management, Nutrition management, Disease

management, Fertility management and Production management.

**Women empowerment:** A total of 415 technological interventions and improved practices were assessed in 329 locations covering 2,303 women in the area of rural women empowerment under the thematic areas, namely, Health and nutrition and Entrepreneurship development. Nineteen technological interventions were refined by conducting 418 trials in 25 locations under Drudgery reduction, Health and nutrition and Entrepreneurship development.

#### Frontline demonstrations

During the year, 1.14 frontline demonstrations, covering an area of 28,200.25 ha, were organized on oilseeds, pulses, cotton, cereals and millets, commercial crops, fodder crops and horticultural crops, hybrids, livestock, fisheries and other enterprises, farm-implements and tools on farmers' fields.

**Oilseeds:** A total of 26,623 demonstrations were conducted covering about 6,544 ha on different oilseed crops, including groundnut, sesame, soybean, sunflower, *toria*, linseed, mustard, castor, niger, rapeseed and safflower. Increase in yield varied from 20% in *raya* to 68% in linseed, and on an average oilseed crops under improved technology demonstrations gave 32% more yield than farmers' practice. The increase in yield was primarily owing to suitable high-yielding varieties in the various agro-climatic zones and better adoption of Integrated Disease Management practices against major diseases like groundnut leaf spot, sesame phyllody, powdery mildew and *Alternaria* blight of sunflower. Oilseed farmers were encouraged for better adoption of Integrated Crop Management covering all the major technological aspects of crop husbandry.

**Pulses:** During the year, 20,128 demonstrations were conducted covering 5,687 ha on major pulse crops, including blackgram, chickpea, cowpea, fieldpea, Frenchbean, greengram, horsegram, lentil, mothbean, pigeonpea and *rajmah*. The percentage increase in yield varied about 20 in *rajmah* to 57 in horsegram, and on an average pulse crops under various technology demonstrations gave 36% more yield than farmers' practices. Growing of many high-yielding varieties of these pulses and promoting major technological interventions in the Integrated Crop Management Practices facilitated in realizing higher productivity.

**Cereals and millets:** A total of 18,701 demonstrations in 6,581 ha in major cereals and millets were conducted during the year, achieving an average increase of about 12% in wheat to 82% in barnyard millet. The increase in productivity in paddy and wheat was mainly due to dissemination of high-yielding

varieties/hybrids and popularization of the latest technologies in farm mechanization and balanced nutrient management.

**Commercial crops:** In sugarcane, sugarbeet, tobacco and jute, a total of 368 demonstrations were conducted in an area of 123 ha. The yield increase was 20% in sugarcane, about 48% in sugarbeet and 21% in tobacco and jute 13% when compared with the local check in the respective crops.

**Cotton:** During the year, frontline demonstrations on cotton were conducted in 10 cotton-growing states on Production technology (4,501), Integrated pest management (2,713) and on Farm implements (1,069). Altogether 8,283 farmers participated in the demonstrations in an area of 6,262 ha, the increase in cotton lint yield owing to crop production technologies ranged from about 8% in Punjab to 41% in Odisha.

The IPM demonstrations (2,713) were implemented by seven states in an area of 1,834 ha. The maximum yield of 1,089 kg lint/ha was reported from Kutch (Rajasthan), and the lowest was 257 kg lint/ha from Amaravathi (Maharashtra). Farm mechanization was demonstrated in an area of 1,517 ha area in which 1,609 farmers participated. Use of plant-protection equipment was demonstrated in 236 ha covering 304 farmers.

**Fodder crops:** A total of 1,281 demonstrations on fodder crops were conducted, covering an area of 228 ha. The fodder yield increase ranged from 15% in fodder maize to 46% in marvel grass when compared with the local check.

**Horticultural crops:** In horticultural crops comprising vegetables, fruits, flowers, spices and condiments, tuber crops, plantation crops and medicinal crops, 11,595 demonstrations were conducted in 2,774 ha. The average yield increase recorded under field-line demonstration compared to farmers' practices was 26% in fruits, 30% in flowers, 32% in spices and condiments, 33% in tubers, 37% in vegetables and 45% in plantation crops.

The increase in yield in horticultural crops resulted due to manifold interventions like high-yielding varieties and hybrids in major vegetables and fruit crops, high density planting in banana, Integrated Pest and Disease Management, especially in vegetables like brinjal, okra and chillies and nutrient management in mango and jasmine.

**Hybrids:** During the year, 8,022 demonstrations on hybrids were conducted covering 2,672 ha area on oilseeds (groundnut, castor, linseed, mustard, sesame, soybean, sunflower and *toria*), pulses (blackgram, greengram, lentil and *rajmah*), cereals (rice, wheat, maize, and sorghum), millets (pearl millet), commercial crops (cotton, ginger, and turmeric), vegetables (bottlegourd, brinjal, cabbage, capsicum, chili, clusterbean, cucumber, okra, onion, pea, potato, tomato, watermelon, and pumpkin), and fruits (aonla, apple and banana).

The yield increase in sunflower hybrid ranged from 7% in PSH 569 to 86% in JSH 129. In pulses, the

yield increase ranged from 21% in *rajmah* hybrid Utkarsh (IIPR 96-4) to 58% in blackgram hybrid Pant U 19. In cereals and millets, the yield increase recorded varied from 8% in pearl millet hybrid Nodai 6364 to 155% in maize hybrid Pro 4212. The commercial crop hybrids recorded yield increase ranging from 6% in cotton hybrid RCH 2 to 44% in turmeric hybrid Megha. Similarly, in vegetable hybrids the yield increase ranged from 4% in cabbage hybrid Harirani to 84% in capsicum hybrid Divya Jyoti when compared with the local check.

**Livestock, fisheries and other enterprises:** Besides, 9,637 demonstrations on livestock and fisheries (dairy, duckery, piggery, poultry, sheep, goat and rabbitry) were conducted and 3,198 demonstrations on other enterprises (sericulture, mushroom, beekeeping, vermicompost, nutrition garden, kitchen garden, and lac production) were conducted during the year.

**Farm implements and tools:** A total of 6,414 demonstrations on farm implements were done in an area of 5,666 ha in which, 2,021 demonstrations were on tillage equipments and tools, followed by 1,239 on inter-tillage equipment, 806 on planting/sowing equipment, 795 on plant-protection equipment like different types of sprayers, 1,348 on harvesting and threshers and 205 on post-harvest technology and processing equipment.

### Training programmes

During the year, 59,426 training programmes including sponsored ones were organized with the participation of about 18 lakh farmers, farm-women, rural-youth, and extension personnel.

**Farmers:** A total of 40,973 training programmes both on-campus and off-campus were organized for the benefit of 12 lakh farmers and farm-women on various technologies to update their knowledge and skills in respect of crop production, plant protection, production of inputs at site, household nutritional security, animal production and management, soil-health and fertility management, commercial production of vegetables, processing and value-addition, capacity building and group dynamics, integrated farming system, orchard management, entrepreneurial development, farm machinery, tools and implements, resource conservation technologies, animal nutrition, fisheries, water management, animal health, production and value-addition, ornamental plants, fruit crops, tuber crops, agroforestry, plantation crops, spice crops, economic empowerment of women. Of these, 38% were on-campus and 62% were off-campus programmes. The beneficiaries include about 9 lakh farmers and 3 lakh farm-women.

**Rural youth training:** The training programmes for rural youth were organized for imparting skill-oriented trainings on nursery management of horticultural crops, protected cultivation of vegetables, commercial fruit production, orchard management, production of organic inputs, integrated farming, vermiculture, mushroom production, sericulture, repair and maintenance of farm machinery, production and

value-addition, small-scale processing, tailoring and stitching, rural crafts, production of quality animal products, dairying, sheep and goat rearing, piggery, rabbit farming, poultry production, ornamental fisheries, composite fish culture, freshwater prawn culture, shrimp farming, pearl culture, cold water fisheries, fish harvest and processing technology, fry and fingerlings rearing etc. As many as 6,334 skill-oriented training programmes were organized both on-campus and off-campus for 145,000 rural youth of which 37% were female.

**Extension personnel training:** A total of 3,837 training programmes both on-campus and off-campus were conducted covering about 1 lakh participants. These programmes were organized for extension functionaries working in government and non-governmental organizations related directly or indirectly with the development of agriculture in their respective districts. The training was imparted in frontier areas of agriculture technologies related to increasing productivity of crops, IPM, INM, rejuvenation of old orchards, protected cultivation technology, production of organic input at site, care and maintenance of farm machinery and implements, gender main streaming through SHGs, group dynamics and farmers organizations, women and child care, low cost and nutrient efficient diet designing, group dynamics and farmers organization, information networking among farmers, capacity building for ICT application, formation and management of self-help group, management in farm animals, livestock feed and fodder production, household food security and others. In these programmes, nearly 24% participants were female extension personnel.

**Sponsored training:** Out of 40,973 training programmes conducted for the farmers and farm-women, rural youth, and in-service extension personnel, 6,162 were conducted on sponsorship by various organizations covering 276,000 participants. The training was imparted to upgrade their knowledge and skills in crop production and management, post-harvest technology and value-addition, farm machinery, livestock and fisheries, home science and agriculture extension. In these programmes, nearly 25% representation was given to SC/ST (farmers, farm-women, rural youth, and extension personnel).

**Vocational training:** During the year, 2,120 training programmes were conducted for 47,810 rural youth, specifically on various vocations including crop production and management, post-harvest technology and value-addition, livestock and fisheries, income-generation activities, and capacity building and group dynamics (39).

### Extension programmes

During the year, 290,323 extension programmes were organized covering 106.27 lakh farmers and extension personnel, to create awareness about improved agricultural technologies. The activities included advisory services, diagnostic visits, field-days, group



discussions, *kisan goshti*, film shows, self-help group conveners' meetings, *kisan melas*, exhibitions, scientists' visit to farmers' fields, farmers' visit to Krishi Vigyan Kendras, plant/animal health camps, farm science club, ex-trainees *sammelan*, farmers' seminar/workshop, method demonstrations, celebration of important days, special day celebration, exposure visits etc.

Besides, 158,464 programmes were carried out through electronic and print media to have wider coverage in the districts. These included electronic media, extension literature, newsletters, newspaper coverage, technical articles, technical bulletins, technical reports, radio talks, TV talks, animals treated in animal health camps, popular articles, technical books, leaflets and folders and lecture delivered.

### Production of technological products

The technological products like seeds, planting materials, bio-products, livestock, poultry and fisheries materials were produced at various places benefiting 18 lakh farmers in the country.

**Seeds:** During the year, 173,982 quintals of quality seeds of cereals, oilseeds, pulses, commercial crops, vegetables, flowers, fruits, spices, fodder, forest species, medicinal plants and fibre crops, were produced and provided to 2 lakh farmers.

**Planting materials:** The 140 lakh quality planting materials of commercial crops, vegetables, fruits, ornamental, medicinal and aromatic crops, plantation crops, spices, tuber crops, fodder and forest species were produced and provided to 1.83 lakh farmers.

**Bio-products:** Bio-products, namely, bio-agents and bio-fertilizers, bio-food and bio-pesticides to the extent of 13,944 q were produced benefiting 14 lakh farmers.

**Livestock, poultry and fish fingerlings:** Cows, sheep, goats, buffaloes and breeding bulls were supplied to 1,573 farmers. Various strains/breeds/eggs of poultry birds (chicken, quails, ducks and turkey) were supplied to 20,229 farmers. In piggery, piglets were provided to 294 farmers. Through the production of 360 lakh fish fingerlings benefited 3,464 farmers.

**Soil, water and plant analysis:** A total of 229,469 samples of soil, water, plant materials, manures and others were analyzed.

**Rainwater harvesting with micro-irrigation system:** With the establishment of demonstration unit on rainwater harvesting with micro-irrigation system in 100 KVKs across the country, 477 training programmes and 1,034 crop demonstrations were conducted, benefiting 30,515 farmers and 1,403 extension personnel. The facility was also utilized for the production of 279,602 planting materials.

#### Technology week

Technology week, under public-public and public-private partnership mode, was organized by 297 Krishi Vigyan Kendras, benefiting 9.46 lakh farmers, farm-women, extension personnel, rural youths and members of self-help group in which a series of activities such as seminars, skill demonstrations, field visits on result demonstrations, exhibitions and scientists-extension personnel-farmer interactive sessions were effectively conducted.

#### Kisan Mobile Advisory

Kisan Mobile Advisory is a new initiative in using Information and Communication Technology for dissemination of need-based and timely information to the farmers. Mobile advisory services through 300 KVKs were launched. Regular mobile advisory services with regard to information on weather, market and farm operations are provided to farmers in 300 districts located in eight zones of the country. The Kisan Mobile Advisory has made access to the information easier and cost effective to the farmers. During the year, about 64,108 registered farmers have sent 20,307 messages on various aspects of agriculture, horticulture and animal husbandry, besides weather forecast, and pest and disease control.



#### E-connectivity

Internet connectivity has been provided to 192 KVKs and all 8 Zonal Project Directorates for access to e-content on agriculture and also online reporting and monitoring system for management of KVKs and Zonal Project Directorates. Besides, online reporting system



named “Any Time KVK” (ATK) was prepared as part of Wagon Wheel Windows portal. It would facilitate hassle-free entry of data, planning and execution of various activities and generation of reports. Further, KVK staffs are regularly apprised of the latest technologies in agriculture and allied areas through online guest lectures by eminent scientists in their respective subject matter areas through e-connectivity specifically two-way audio and one-way video conferencing.

#### Interventions in mitigating drought

During 2009–10, as a part of the drought-mitigation efforts, weather advisory services were provided in association with the SAUs and the Indian Meteorological Department (IMD) and they are being updated on daily basis through electronic and print media, organization of technology demonstrations and trainings, technology weeks, camps, etc. About 2,301 extension programmes comprising meetings, field days, *goshthis*, farmers fairs, exhibitions and film shows were organized on drought-mitigation strategies with the participation of about 9 lakh farmers of states that encountered drought.

During the year, seeds of short-duration and drought-tolerant varieties of crops were provided to the extent of 3,969 q sufficient to cover an area of 18,385 ha in the country, benefiting 13,510 farmers in the drought-affected districts of 10 states in the country. Further, alternate crops/varieties in about 2,560 ha were introduced to overcome ill-effects of drought, benefiting 8,593 farmers in the country.

Besides, large-scale demonstrations on resource-conservation technologies were conducted in about 9 lakh ha, benefiting 264,000 farmers in the drought-affected districts of Bihar, Jharkhand, Assam, Nagaland, Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh and Chhattisgarh.

To save livestock during the drought situations, about 168 farmers-scientists interactions were organized on various aspects of livestock management with the participation of 4,997 farmers during the year.

**Technology backstopping:** During the year, 43 Directorates of Extension under the SAUs/CAU conducted 188 Human Resource Development programmes involving 3,391 KVK staff on orientation

## SUCCESS STORIES/CASE STUDIES

### Paddy Task Force — a solution to farm-labour shortage

Paddy Task Force, a team of trained paddy field workers in uniform and equipped with modern machineries at Pariyaram in Kannur, is hailed as the ideal solution for revival of paddy cultivation in Kerala. Conceived and developed by the Krishi Vigyan Kendra, Kannur, under Kerala Agricultural University with the support of State Planning Board in 2007, Paddy Task Force provides labour to farmers. A paddy field owner needs to just call or send SMS to the task force to avail of the services. The Paddy Task Force formed by this KVK is bringing revolution in paddy farming as a success model for revival of paddy cultivation in Kerala. It has introduced a new work culture in farming sector and provides an example for women empowerment through mechanized paddy cultivation.

### Quality protein maize

KVK, Ri Bhoi, Meghalaya, introduced Quality Protein Maize (var. HQPM 1) in farmers' fields through various interventions. The feeding cost of pig and poultry could be reduced with the cultivation of this variety, and it immensely benefited the growth and performance of pigs and poultry birds. The number of farmers adopting the same and the area of adoption increased considerably to 4.80 ha during 2 years. The farmers obtained an average yield of 40.50 q/ha, an increase of 37.20% in yield over local check (29.50 q/ha). The farmers saved almost 50% of feed cost for their pigs and poultry birds. Farmers of neighbouring areas who attended the field day showed keen interest to cultivate the variety in their fields also. Introduction of QPM in the villages has really created a good impact on them and showed its high potentiality for its cultivation in the coming years.

### Innovative approach in sericulture

The KVK, Mysore, started two model Chawki Rearing Centres (CRCs) through farmer group initiatives, i.e. through SHGs in Indavalu village of T. Narasipur taluk of Mysore district and Kuderu village of Chamarajanagar district. In a short span of just three months, two CRCs have earned an income of ₹ 98,761 with profit of ₹ 36,596. Besides serving sericulture farmers of the surrounding villages in supply of quality chawki worms, the group of farmers have started supplying critical inputs like lime powder, wherein group farmers procured lime stone from local vender-powdered, packed and starting selling through Chawki Rearing Centres. As a result of these efforts, the SHG group farmer could earn ₹ 1,500 to ₹ 2,000/month.

### Sweet potato-based feeding system for pig

In Ri-Bhoi district, concentrate feed up to 50 to 60% of pig ration is being replaced by sweet potato without hampering production performance. A total of 55 pig farmers are now practising sweet potato feeding system for pigs ration. The feeding of sweet potato to swine reduced almost 75% cost of concentrate feed (₹ 8.50/kg feed). The production performance of pigs under this system was also encouraging and average body weight recorded at 6 months age was 32.5 kg against 18 kg body weight gain under local feeding practices. The new varieties, namely ST 14 and Kokrajhar Red, have been grown widely in 10 operational villages covering an area of 9 ha. It is expected that within a short span of time the entire district will be covered by these new varieties of sweet potato, which has already become a boon to small and marginal farmers.



### Protected cultivation of vegetables in net-house

Self-employment through net-house farming is one of the profitable enterprises for rural-youth and innovative farmers. The KVK, Ropar, emphasized adoption of net-house technology for cultivation of capsicum crop. The average yield of capsicum crop was 510 q/ha through the net-house technology, while it was 315 q/ha with traditional open raising method as per farmer's practice. There was 61.7% increase in yield of capsicum crop in net-house over the farmer's practice. Exposure visits of the farmers and interaction with successful farmers helped to adopt this technology. During crop season in 2008–09, the average yield of capsicum crop was 24.71 q and the average total profit was ₹ 26,742/ from net-house of 500 m<sup>2</sup> area. Sh. Gurdit Singh of village Rasidpur got the maximum yield of 30 quintal and the total profit was ₹ 33,900. Other farmers of nearby villages who have seen the utility of the practice have started net-house cultivation as an enterprise. Presently about 15 net-houses have been established in the district and large number of farmers are showing interest in this technology.

training of newly recruited KVK staff on integrated farming systems, improved production technologies of various crops and enterprises, advanced aspects of IPM, INM, IDM and soil and water conservation, processing and value-addition, entrepreneurship development, impact analysis, PRA etc.

Similarly, the Zonal Project Directorates also organized 39 HRD activities, benefiting 2,115 KVK staff, on sensitization of newly recruited KVK staff, agri-business management, capacity building on FLDs etc.

The Directorates of Extension also organized workshops and meetings (83) and conducted 11,311 visits to KVKs to facilitate effective monitoring and review of activities of KVKs under the operational jurisdiction of respective directorates.

National as well as regional KVK interface meetings were held as confidence building measure. The activities of KVKs were reviewed and an action plan for strengthening of KVK has been prepared.

### AGRICULTURAL TECHNOLOGY INFORMATION CENTRE

Agricultural Technology Information Centre (ATIC) serves as a Single Window System in delivering Technology Information, Technology Service and Technology Inputs to farmers. Land-to-Lab concept is taken care of by the ATICs wherein 860,000 farmers visited ATICs and benefited in the technological forefront. Technological Information was provided to about 16 lakh farmers through both electronic and print media including trainings. Technological inputs like seeds, planting materials, bio-products, and value-added products were provided to farmers through Agricultural Technology Information Centres that fetched better fiscal returns.

The ATIC interface was organized at the national

level as part of the confidence building measure upon ATIC managers and for effective functionality of the ATIC. The activities of the ATICs were reviewed and action plan to strengthen them has been prepared.

ATIC interface was also organized at national level to strengthen activities of ATICs.

### OBAMA'S VISIT

On 6 November 2010, Hon'ble President of United States of America, Mr Barack Obama visited the Agricultural Expo, jointly organized by CII and USAD in Mumbai on the theme, 'Tool and implements for drudgery reduction of farm women workers. He took



keen interest in women-friendly tools and implements developed by one of the ICAR Institutes for reducing the drudgery of farm women in agricultural operations. He operated some of the tools such as maize sheller and groundnut decorticator and opined that such devices would go a long way in facilitating farm women to carry out the agricultural operations more efficiently. □