ICAR 2013 Review

ICAR Marches Ahead in Development of Farm Technologies

- 104 New Varieties Released
- Technologies to Deal with Climate Change Being Developed
- Soil Fertility Maps for 170 Districts Prepared
- 83 Patents Filed
- Supercomputing Hub – Ashoka – Established Exclusively for Agri-Sciences
- ICAR Gets ISO 9001 Certification

The Indian Council of Agriculture Research (ICAR) has developed a number of technologies covering entire spectrum of agriculture and allied sector. Some of these technologies relate to the latest developments such as genomic research because of which ICAR has been able to file a number of patents and to use supercomputers in agriculture research.

The following are the major developments during 2013

New cultivars for enhanced production

For productivity enhancement, the Indian Council of Agricultural Research (ICAR) released 104 new improved varieties/hybrids for different agro-climatic regions which include an early-maturing basmati rice variety, Pusa Punjab Basmati 1509 with moderate resistance to leaf blast and brown spot diseases; a late sowing wheat variety HD 3059; and the large seeded (>30g/100 seeds)kabuli chickpea variety, CSJK 6, moderately resistant to root rot and tolerant to wilt. During the year, 11,835 tonnes of breeder seeds, 14,984 tonnes of foundation seeds, 22,281 tonnes of certified seeds, 14,939 tonnes of truthfully labeled seeds and 5,237 tonnes of quality planting material were also produced for distribution among stakeholders. In horticultural crops, Arka Rakshak –a tomato variety resistant to bacterial wilt, TLC V and Alternaria (yielding over 90 tonnes/hectare) were released. First variety ofmakhana (Euryale ferox Salisb.) named Swarna Vaidehi (production potential of 2.8-3.0 tonnes/hectare) and a new red skinned advance potato hybrid 2001P-55 (potential yield of 300-350 quintals/hectare) moderately resistant to late blight suitable for Eastern plains of Bihar, West Bengal, Assam, Odisha and Jharkhand, were also released.

Advances in livestock genomic research

'Mahima', a female calf weighing 32 kg, was born on January 25, 2013 to 'Garima-II' a cloned buffalo, which had been produced by hand-guided cloning using embryonic stem cells (ESCs) as donor cells. This is the first calf in the world to be born to a cloned buffalo. Garima-II had attained early sexual maturity at 19 months of age (compared to her contemporaries at around 28 months) and was inseminated with frozen-thawed semen of a progeny tested bull on 27th March 2012, which resulted in conception and delivery of female calf 'Mahima'through normal parturition. The worlds first test tube yak calf was born at Nyukmadung farm of the National Research Centre on Yak, ICAR, Dirang, Arunachal Pradesh on 15th July 2013. The male yak calf, weighing 19 kg, has been named 밡orgayal? The calf is the result of transfer of cryopreserved yak embryo produced through in vitro fertilization of oocytes through ultrasound guided ovum pick up (OPU) technique from donor yak.

Climate variability and rain-fed agriculture

The monsoon-driven Indian agriculture witnessed 106% of long-term average rainfall during the cropping season 2013 that enabled 105 million hectare of total area sown during kharif 2013 as compared to about 100 million hectare during 2012. The first advance estimates target food-grain production of 259 million tonnes and a growth rate of over 5% for agriculture and allied sectors in 2013-14. Meanwhile, Uttarakhand, Odisha and Andhra Pradesh were struck by natural calamities of different, but severe intensities. The ICAR prepared doable and location-specific action plans of agriculture and allied sectors for rehabilitation and restoration of the affected areas through technological backstopping. The ICAR demonstrated climate resilient technologies in 100 most-vulnerable districts under NICRA. The ICAR has also prepared the climatic vulnerability atlas of the country and district level contingency plans to enable farmers to choose appropriate means and methods for mitigating the climatic variability in different agro-climatic regions.

Breeding successes in livestock, poultry and fish

The livestock sector plays an important role in providing livelihood to small farmers with over 87% of the livestock owned by small and marginal farmers. At Hisar based Central Institute for Research on Buffaloes 63,857 frozen semen doses of Murrahbulls were produced as farmers from all over India are evincing keen interest in Murrahbreed improvement. Physical identification using injectable subcutaneous microchips was done in all female buffalo progeny under the project to help in future milk recordings. Under the Mega Sheep Seed Project, flocks of Chottanagpuri, Mandya,Mecheri and Sonadi were built up for production of superior seed. Crossbred pig (Hampshire and Ghungroo) was found suitable for farmers because of adaptive nature and fast growth (weight of over 75 kg in 8 months) and good carcass characteristics. A dual purpose poultry variety,Srinidhi was developed for rural areas which lays 140-150 eggs per year under backyard conditions and males attain a body weight of over 650 grams in 6 weeks. Shining barb, a new variety of ornamental fish, developed by selective breeding of rosy barb, Pethia conchonius was released for field trial on experimental basis to entrepreneurs. The glittering gold coloured females and shining pink red coloured males of shining barb appear more attractive compared to the rosy barb variety. They are amenable to varied culture conditions.

Advances in mariculture

The seed production technology of silver pompano (Trachinotus blochii), a fast growing sea fish with high market demand, was scaled up for bulk production of seed and transportation. Off-season breeding of climbing perch has paved way for round-the-year production. Spawning of marine fish Cobia Rachycentron canadam in recirculation aquaculture systems ensured high survival rates (> 86.7%) ensuring availability of quality seed for culture. Farm made feed enhanced production of Sea bass (> 2.7 tonnes/ hectare in 325 days). An all-time record marine fish catch of 3.94 million metric tonnes was reported during 2012-13 with annual growth rate of 3.37%. Open sea cage farming for lobster, India's largest commercial sea cage farm, launched off the Somnath coast in Gujarat is a joint venture of Siddi tribe and ICAR. Over 20 Siddi families had formed a society and work in the farm as partners/owners. 20 cages each with 5m diameter were installed and stocked with lobster seeds of about 50-80g. After 110 days of rearing the community harvested in April about 2.5 tons of lobsters generating an income of Rs. 26 lakh. A second crop of lobster can be raised after September and an equal production and revenue can be obtained. The tribals who mainly worked as labours are now empowered with a permanent source of livelihood.

Plant genomic research

Blast resistance gene Pi 54 incorporated into major rice varieties viz., Pusa Basmati-1, Swarna and BPT 5204. ICAR scientists decoded the genomes of the cultivated tomato (Solanum lycopersicon) and its closest wild relative,Solanum pimpinellifolium, in the International Consortium. Genetic resources are of unique significance, as they provide valuable traits with potential for breeding new varieties/hybrids/animal strains/breeds. In this endeavour, thirty-three explorations were undertaken in 16 states and 1,722 accessions collected, including 322 of wild species. In the National Gene Bank 5,414 accessions of orthodox seed species and 112 of non-orthodox species were cryo-stored, and eight accessions were added to in-vitro Gene Bank for long-term storage. Over 44,000 accessions from 42 countries were imported including promising accessions of wheat, paddy, safflower etc..

Natural Resource Management

GIS based soil fertility maps (macro, secondary and micronutrients) were prepared for 20 districts during 2013 totalling 170 districts in 21 states to ensure site specific balance fertilization and thereby improving soil health and crop productivity in the country. Atlas on Vulnerability of Indian Agriculture to Climate Change and established Model Climate Smart Village in 100 most vulnerable districts was also developed. Prepared District Contingent Plans (50 districts during 2013 totalling 450 districts out of 572 districts targeted) for agricultural and allied sectors to cope up with climatic aberrations. Use of over-aged seedlings, salt resistant rice varieties and flash flood tolerant rice varieties such as 'Swarna sub-1' and practice of zero tillage with sunflower, okra, bittergourd and sweet potato, which will increase water use efficiency from 35% to 62%, were identified as contingency measures for post-flood situations in the coastal districts of Odisha. Identified a sodicity tolerant high yielding genotype BTP1-A of Jatropha curcas.

Extension initiatives

In an endeavour to reach out to farmers, the ICAR made 2,174 technological interventions in 4,159 locations in cropping systems, drudgery reduction, farm machineries and other areas. Over 1.40 lakh extension programmes through electronic and print media were conducted across the country. The Council also approved four new KVKs, two in Jammu & Kashmir and one each in Andhra Pradesh and West Bengal for technological empowerment of farmers and knowledge sharing. The Council launched social media initiatives to develop a dialogue and share the vast knowledge resources of ICAR with youth.

Intellectual Property Management

Eighty-three patents were filed through 26 ICAR institutes. 6 patents (including two abroad) granted. Indian Patent Office granted 161 patents from 25 institutes. Protection of Plant Varieties and Farmers' Right Authority considered applications and granted registration certificates for 138 varieties. 340 partnerships with 193 public and private organizations were undertaken through 42 ICAR institutes. 79 training and capacity building programmes organized on IPR and related issues through 33 ICAR institutes were received by 5379 participants. Commercialized 82 technologies/products; transferred 58 technologies to private entrepreneurs with a license fee of over Rs. 3.2 crore.

New Implements in Farm Mechanisation

To enhance land and labour productivity, tractor operated five-row seed-cum-fertilizer-drill was developed which is capable of placing seeds at 50 mm and fertilizer at 100-150 mm depth and covers 0.2-0.35 hectare/hour. A multi-millet thresher operated by 1.5 kw motor with 95% efficiency reduces drudgery and minimizes post-harvest losses. Machines for roasting and popping of makhana and extraction of pulp from custard apple were developed. For improvement in quality of ground spices powder, a cryogenic grinder was developed. Foldable Plastic Boxes for packaging and transportation of fruits, Millet Thresher-cum-Pearler, Bullock- drawn wedge- and wing- plough and Biomass -based decentralized power plant for agro- enterprises were also new technologies introduced.

National Agricultural Innovation Project

The National Agricultural Innovation Project (NAIP), made satisfactory progress in enhancing the competence of NARS towards steering the agriculture R&D and introducing pragmatic pluralism. 91 public-private partnerships were established in 203 NAIP supported sub-projects, including three with GEF support. New 51 rural industries were piloted and over 3,800 hectare area of farmers' agricultural land brought under sustainable land management practices.

AgrInnovate India Ltd.

AgrInnovate India Ltd., the registered company owned by DARE/ICAR is working towards promotion and commercialization of ICAR technologies, and licensed the technology of tissue culture of oilpalm and related knowhow for commercialization. To augment the availability of FMD vaccine, Agrinnovate has initiated the establishment of a modern vaccine production plant (capacity 100- 150 million doses) in PPP mode at Bengaluru campus of Indian Veterinary Research Institute, Izatnagar. The company is also assisting DARE on projects related to establishment of facilities for soil, water and tissue testing, seed production and demonstration.

Quality Assessment and Management Systems

DARE and ICAR became one of the first Departments in having the recognition of ISO 9001:2008 certification by implementing Quality Management System. This is also the success indicator of all the Government Departments, and testifies the commitment towards assuring quality services to its customers with continual improvement of its delivery system. DARE/ICAR also achieved 97.6% composite Score of RFD for the year 2012-13.

Advances in Agricultural Statsitics

The first Supercomputing Hub for Indian Agriculture- ASHOKA (Advanced supercomputing Hub for OMICS Knowledge in Agriculture) has been established at Centre of Agricultural Bioinformatics, IASRI. This supercomputing environment is being developed for high performance computing in the field of agricultural bioinformatics and computational biology under a sub-project "Establishment of National Agricultural Bioinformatics Grid (NABG) in ICAR" of NAIP. The facility is set up in a state-of-art data centre and two super-computers of this hub are listed at rank 11 and 24 in the list of top super-computers of India. This super-computing hub consists of hybrid architecture of high performance computing.

Accomplishments in Agricultural Education

Globalization of agricultural education by attracting foreign nationals from 42 countries was made possible due to quality assurance, enhanced student amenities including international student's hostels and access of e-learning in agricultural universities. Niche Areas of Excellence were launched with the objective of achieving excellence in teaching, research, consultancy and other services and has enabled up-scaling of research capabilities and technology empowerment in specific cutting edge areas. During the year, 23 NAE centres were supported. Capacity building through customised trainings and workshops has made high impact across the universities in the chosen niche areas. Provided much needed entrepreneurship skills and confidence through hands on training at UG level through 375 Experiential Learning modules. Capacity building of about 2000 faculty in cutting-edge-areas was achieved through Centers of Advanced Faculty Training (CAFT)/Summer-Winter Schools (SWS).

Endeavours in the pipelines

The demand for food is continuously increasing with rising population amidst the production constraints such as shrinking natural resources and increasing farm operation costs. The present food production has been achieved through productivity enhancement, striking a balance between environmental and agricultural sustainability, wherein research innovations are essential ingredients. Further to corroborate 'science-led growth,' as indicated by the Scientific Advisory Council to the Prime Minister, the ICAR is contemplating initiatives such as Farmer FIRST, Student READY, National Agricultural Innovation Foundation, Agricultural Technology Foresight Centre and Consortia Research Platforms to enrich agricultural research and education through innovation and integration.

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