

**DEPARTMENT OF AGRICULTURAL RESEARCH AND EDUCATION
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)**

BACKGROUND NOTE FOR ECONOMIC EDITORS CONFERENCE

3RD-4TH Nov., 2009

Indian Council of Agricultural Research (ICAR) is an apex scientific organization at national level with very strong agricultural research system for planning, promotion, execution and coordination of agricultural research and education to meet emerging challenges in the country. ICAR has a wide network of Institutes spread throughout the country comprising of 45 Research Institutes, 4 Deemed Universities, 6 National Bureaux , 17 National Research Centres, 25 Directorates/ Project Directorates, 61 All India Coordinated Research Projects and 17 Network Projects, 45 State Agricultural Universities (including one with Deemed University status), one Central Agricultural University and 569 Krishi Vigyan Kendras (KVKs).

Indian Council of Agricultural Research in its 80 years of existence has significantly contributed to the overall growth of agriculture and allied sectors. Over the years the food grain production has increased by 4 times horticultural crops and milk by 6 times, fish by 9 times and eggs by 27 times since 1950-51. During the year 2008-09, the country harvested a record 230 million tonnes of food grains, produced 6.87 million tonnes of fish and more than 100 million tonnes of milk.

Research activities of the Council are multi-institutional, multi disciplinary and multi-locational to cover the entire gamut of various agro-ecological situations and conditions in the country. ICAR is one of the largest leading agricultural research and development systems in the world.

In the **crop science sector** the major achievements are development of 96 varieties/hybrids of crops including a Bt gene containing cotton variety Bikaneri Narma for resistance to boll worm and a record production of more than 0.85 lakh tonnes of quality seed of field crops and 9950.5 tonnes of breeder seed of different field crops.

In the **Horticulture sector** the most significant contributions are release of 3 location specific coconut varieties/hybrids and 3 new potato varieties viz. Kufri Sadabahar, Kufri

Khayali and Kufri Giridhari and an unique fungal resistant grape variety Pusa Navrang with red pigmentation in both peel and pulp for juice making.

In the **Animal Science sector**, ICAR has the unique distinction of producing first cloned buffalo calf using somatic cells and first mithun calf through artificial insemination.

In **Fisheries sector**, major achievements are early breeding of catla and rohu for year round availability of their seed, gene banking of the critically endangered Indian catfish and culture of shrimp in inland saline waters.

In **Natural Resource Management**, the significant achievements have been development of cost effective amelioration technologies for waterlogged, salt affected and acid soils. In order to address the issues of impact of climate change on agriculture, a **National Institute of Abiotic Stress Management** has been established at Baramati, Maharashtra.

In the area of **Agricultural Engineering** the major contribution has been development of over 150 agricultural tools/implements and machines for timely farm operations, drudgery reduction and efficient input use for various field and horticultural crops

The important achievements of **Agriculture Extension** is the establishment of 8 new Krishi Vigyan Kendras during 2008-09 in the rural districts of the country for assessment, refinement and demonstration of technology / products. With this the total number of KVKs has gone up to 569. Provision has been made for e-linking of KVKs and for establishment of facilities like mobile diagnostic-cum-exhibition units, soil and water testing labs, rain water harvesting, etc.

The major achievement of **Agriculture Education** is the setting up of comprehensive Accreditation system to ensure quality of education, strengthening of infrastructure and faculty improvement in Agricultural Universities, introduction of new courses on skill and entrepreneurship development and introduction of international fellowships to develop competent human resource and showcasing the strength of Indian ICAR-AU System.

New Initiatives in XI Plan

To address the issues of climate change on agriculture production the following new programmes have been initiated:

- Established an National Institute of Abiotic Stress Management at Baramati, Maharashtra to assess and quantify the effects of major abiotic stresses on agriculture and develop a repository of information on abiotic stress management.
- Proposals for establishing of two new institutes viz. National Institute of Biotic Stress Management to utilise cutting edge knowledge available in relevant frontier scientific areas of current times and seek solutions to address the emerging plant protection issues, biotic stress management etc. and 'Indian Institute of Agricultural Biotechnology' to serve as a national centre of excellence for undertaking cutting edge research and excellence in education and training are under process.
- Research programmes in network mode covering different agro-eco-regions have been initiated on:
 - Adaptation to climate change through shelter management
 - Methane mitigation strategies
 - Bioprospecting and allele mining for abiotic stresses
 - Development of molecular markers like HSPs to withstand thermal stress.

Financial Outlay

For the XIth Plan period, the Planning Commission had communicated a total outlay of Rs.12023 crore. During 2008-09 against the projected demand of Rs.2646.78 core, the allocation was Rs. 1760 crore. During 2009-2010 against the projected demand of Rs.4000 crore the allocation was retained at the same level of 2008-09 i.e. Rs.1760 crore. We have asked for enhancement of the budget at RE stage of 2009-10.

BRIEF ACHIEVEMENTS

Crop Science

- Developed single cross hybrids of quality protein maize (QPM) having high nutritional value and yield and high yielding baby corn.
- Developed and implemented the guidelines for Intellectual Property Management and Technology Transfer/Commercialization of Technologies to address the emerging Intellectual Property Right scenario – 7 patents granted to ICAR and 53 patent applications filed by 16 ICAR institutes.
- A World Congress on Conservation Agriculture was organised in February 2009 at New Delhi to address the issues of resource efficiency, equity and environment.
- Achieved first ever map based cloning and characterization of the gene Pi-kh in the country. This gene confers resistance to blast disease in rice and the gene integration was validated in transgenic rice.
- Conserved over 0.36 million germplasm accessions of crops and their wild relatives at National Gene Bank, National Bureau of Plant Genetic Resources, New Delhi and 2517 microbial cultures at National Bureau of Agriculturally Important Microorganisms, Mau.
- Created digitised database of over 175000 insect species and fauna of British India volumes at IARI, New Delhi.
- India is in the forefront of global efforts to contain stem rust race Ug99. Seven wheat varieties resistant to Ug99 are identified.
- Developed a new wheat variety Pusa Baker(HS 490) with a seed potential upto 5 t/ha and durum wheat variety 'Malva Kranti; (HI 8638) for rainfed and limited irrigation conditions of Madhya Pradesh.
- Developed/notified and released an early maturing high sugar variety sugarcane, CoLK 94184 (Birendra) for North Central Zone.
- 117 new varieties of various field crops released(notified) or identified for release for different agro-climatic zones of the country in 2008-09.
- A total of 13850 accessions of germplasm seed samples were processed and added to the National Genebank.
- Two 'first products' of biotechnology have been released in rice. These included two varieties, namely Improved Pusa Basmati (IET 18990) and Improved Samba Mahsuri (IET 19046).
- Sorghum transgenics with Cry 1B gene that can control stem borer have been produced and tested till four generations under controlled conditions with artificially reared borer larvae.
- A rare putative intergeneric hybrid between durum wheat (MACS 2846) and maize (Madhuri – sweet corn) has been achieved for the first time.
- Technology for nutritive biscuits from finger millet blended with wheat flour and gluten has been developed and transferred to small scale industry which has high dietary fibre and micro nutrients.

Horticulture

- Developed high coconut and arecanut based multispecies cropping systems involving spice crop for enhancing productivity and profitability.
- Developed unique grape variety Pusa Navrang with red pigmentation in both peel and pulp for juice making. The variety is resistant to fungal disease.
- Established a system of traceability and monitoring of pesticides residues in grapes leading to significant export promotion.
- In mango, hot water treatment of fruits at 48°C for 1 hour controlled all stages of fruit fly, *Bactrocera zonata* in Dashehari, Langra, Chausa, Amrapali and Malika. At Gandevi for sapota a trap named 'NAUROH-STONEHOUSE FRUIT FLY TRAP' was designed and produced commercially for orchardists.
- A process was standardised to make osmotically dehydrated slices from papaya variety Taiwan Red lady
- Bittergourd chips were prepared and popularized among rural and urban areas as snack foods.
- A solar PV mobile unit was designed and developed to provide a complete self sustained mobile power unit for domestic, small agricultural and other rural applications in isolated cluster of houses(dhanis) or arid region.

Animal Science

- Developed an early maturing poultry strain, CARI-Nirbhik, producing 223 eggs by 72 weeks for promoting backyard poultry.
- Established serum bank facility, first of its kind in India, maintaining over 170000 serum samples for long term, national surveys in infectious bovine rhinotrachitis, brucellosis, rinderpest and bluetongue.
- Developed number of indigenous milk products like Channa, Basundi, Mango Lassi, Herbal Ghee, Kunda, Peda, Diabetic Burfi.
- Project on buffalo genomics launched
- Banks for long term storage of DNA, semen, embryo, sera, rumen/dairy microbes and veterinary type cultures established.
- Molecular kit for identification of sex and species of the animal in the meat developed.
- Protocols developed for cryo-preservation of semen and enhancing semen quality for improving overall reproductive efficiency in livestock
- Developed forecasting model – FORGIN for simulating interaction of different stages of *Haemonchus contortus* with climate and pasture.
- An indigenous VP 7 gene recombinant antigen based indirect ELISA diagnostic kit (comparable with imported kits) developed for group specific diagnosis of Blue Tongue disease.
- Developed Biofilm vaccine against pasteurellosis.
- Buffalo genome mapping initiated.
- Mega seed project for multiplication for high quality germplasm of poultry, pig, sheep and goats launched.

Fisheries

- Captive breeding and spawn rearing of *Ompok pabda*, the prized freshwater cat fish.
- Culture of shrimp in inland saline waters opening up opportunities for utilising the vast tracts of degraded land in the country.
- Development of shrimp feed containing low fish meal to make shrimp farming more cost effective and eco-friendly.
- Fabrication of a low cost and environment friendly fishing canoe using coconut wood for fishing in coastal waters
- Developed diagnostic kits for white spot syndrome virus in shrimp; white muscle disease in freshwater prawn and aeromoniasis in carps.
- Demonstrated the best growth rate of the fish fed on 60% fish meal based diet.
- Development of improved lobster traps and their distribution among fishers of Tamil Nadu.
- Development of new fish products such as maricream and fish enriched noodles.

Natural Resource Management

- A project on 'More crop and income per drop of water' in farmers' participatory mode is presently in operation in collaboration with Ministry of Water Resources for the conservation and better utilization of water in both irrigated and rainfed areas.
- A project on integrated system research combining all the components of crops, horticulture, livestock, fisheries, agroforestry and host of agri-enterprises has been taken up in collaboration with various SAUs/institutes at the country level for higher productivity and livelihood generation.
- Developed soil resource, degradation and fertility maps of different agro ecological regions.
- Operationalised web-based agro-advisory services
- Prepared soil erosion maps for some states for resources conservation planning.

Agricultural Engineering

- Conducted ergonomics and safety studies leading to reduced drudgery and improved safety of farm machines, particularly to suit farm women.
- Developed renewable energy source based devices and gadgets such as solar refrigerator, low cost solar cookers and water heaters, solar concentrators for solar photovoltaic (SPV) panels, solar cocoon stiffer, improved biogas plants and dewatering systems for biogas slurry.
- Developed equipment for soybean processing and utilisation(soybean dehuller, extrusion expelling pilot plant, soyflaking machine, soy snack extruder, cottage level soypaneer plant, okara fortified soy cereals snacks).
- Developed processes for microbial production of nano particles for fabric finishing, extraction of natural dyes, resins and gums from plant based biomass, value added products from coir in combination with other natural fibres.
- Developed a water and termite resistant jute fibreglass reinforced shellac sheet.
- Developed a new enzymatic process to produce soy milk and other dairy analogs.
- About one dozen low cost walk in type solar tunnel dryer for bulk drying of various agro products installed at selected users site in Rajasthan & Tamil Nadu states.
- Developed a pedal operated sugarcane bud chipping equipment which can chip 550 buds per hour.

Agriculture Extension

- Assessed / validated /refined and demonstrated technologies related to field / horticultural crops, livestock and fisheries under different farming systems, including frontline demonstrations on the farmers' field.
- Provided empowerment to more than one million farmers and extension personnel annually with need based knowledge and skill on improved agricultural practices through intensive training programmes.
- Engaged in awareness generation among 5 million farmers and other stakeholders annually about improved agricultural technologies through different extension programmes.
- Created a comprehensive resource base of Indigenous Technical Knowledge (ITK) through collection, classification and documentation of over 4000 ITKs and validation of several ITKs including geographical indications (GI) of related plant species.
- Created soil and water testing facilities, water conservation modules, facilities for processing and value addition for KVKs.
- Prepared soil resource maps at National, state and district levels.
- Conducted 41406 trainings; 15463 frontline demonstrations; 47375 Extension Activities
- Produced and distributed 31872 quintals of Seed and 328690 quintals of Planting Material.

Agriculture Education

- Provided financial and professional support to Agricultural Universities (AUs) for modernization and strengthening of academic facilities, infrastructure and faculty improvement.
- Established an accreditation Board for quality assurance in agricultural education and 27 SAUs/AUs have been accredited.
- Established 29 "Niche Area of Excellence" to augment strategic strength of AUs in specific areas including those in new and emerging cutting edge technologies in 29 Agricultural Universities.
- Initiated measures for quality upgradation, reduction and inbreeding and fostering national integration in higher agricultural education by admitting students up to 15% of total seats in Under Graduate and 25% seats in Post Graduate programmes including agricultural universities from other states.
- For enhancing the uniformity of structure, governance and efficiency of the agricultural universities in the context of emerging challenges, the ICAR has revised the Model Act for Agricultural Universities in India in 2009.
- 31 Centres of Advanced Studies (CAS) offer facilities for continuing capacity building of scientific faculty engaged in teaching at UG and PG levels.
- Two hundred and nineteen Experimental Learning units for skill oriented hands-on training to students were established in the AUs.