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Agricultural Human Resource Development

The Education Division undertakes planning, development, co-ordination, human resource development (HRD) and quality assurance in higher agricultural education in the country. The national agricultural education system presently has 52 units comprising State Agricultural Universities (SAUs), Deemed-to-be Universities (DUs), Central Agricultural University (CAU) and Central Universities (CUs) with agriculture faculty. The endeavours undertaken are mainly through a major Scheme entitled "*Strengthening and Development of Higher Agricultural Education in India*", divided into (i) Development and Strengthening of Agricultural Universities, Niche Area of Excellence, Experiential Learning and Library strengthening, (ii) Educational Quality and Reforms, (iii) HRD, and (iv) a new initiative, on Modernization of Agricultural University Farms. The National Academy of Agricultural Research Management (NAARM) constituent component of the Division facilitates capacity-building of the National Agricultural Research System (NARS). Further, time-bound special initiative, Indo-US Agricultural Knowledge Initiative (AKI) has also been steered for targeted capacity-building by the division.

Development and Strengthening Of Agricultural Universities

Major emphasis of the financial and professional support extended to SAUs, DUs and CU's was for making available new state-of-art equipments to support post-graduate (PG) research in basic and frontier areas, providing e-learning requisites, strengthening ICT facilities, establishment of central instrumentation laboratory, promoting novel and contemporary teaching methodologies, library strengthening, preparation of textbooks and practical manuals, developing multimedia learning resources, facilitating students' study tours and providing National Talent Scholarships. A development grant of Rs 361 crore including special grants of Rs 95 crores was extended during the year. The Special Grants comprised (i) Rs 45 crore instalment of the total grant of Rs 100 crore to PAU, Ludhiana, (ii) Rs 25 crores' instalment of Rs 50 crores total grant to the TNAU, Coimbatore, and (iii) Rs 25 crore instalment of Rs 50 crore total grant to the GBPUAT, Pantnagar.

CAPACITY BUILDING

Niche Area of Excellence: The new sub-programme started during the X Plan for building excellence in specific strategic areas in education and research continued. The programme elements include improving quality of human resource, providing adequate infrastructure, creating facilities for access to information, developing attitude and commitment of faculty/staff/students, facilitating interaction with peer groups in India and abroad and sharing vision and system of well-developed educational technology agencies. A total 28 niche areas of excellence continued to function during the year 2008-09.

Significant achievements include building excellence and establishing brand image of specific agricultural universities. Salient achievements specific to some universities are as follows:

At the Gobind Ballabh Pant University of Agriculture and Technology Pantnagar, under "Quality production of fin fishes for sustainable farming", early maturity of Indian major carps, improvement in gamete quality, improvements in fertilization rate (6-8%), percentage survival (10-12%) and growth of hatchings (11.4 %), and extending breeding season of Indian major carps and Chinese carps by providing balanced diet and intermittent doses of pituitary gland extract were achieved. Use of herbal solution of *Mirobolus indica* seed extract at 3-4 ppm controlled the

crushing of eggs during hatching due to various reasons. The technology for value-added products like fish cutlets and fish fingers was developed, and the products were marketed.

At Chaudhary Charan Singh Haryana Agricultural University (CCSHAU), Hisar, under "Farming system to enhance farmers' income and conservation technologies", the production of improved quality seeds, soil test-based fertilizer adjustment equation for targeted crop yields, need-based training contributed to the upliftment of rural as well as urban populace in the region. During 2008-09, 15 training programmes for teachers/scientists/extension specialists and 12 training programmes for non-teaching staff were conducted.

At the University of Agricultural Sciences (UAS), Dharwad, novel genes and promoters for fungal diseases and insect resistance, drought resistance were cloned and gene-based SSR markers were identified under "Biotechnology of Microbes'.

At the Anand Agricultural University (AAU), Anand, a high-tech microbiological laboratory was established under the "Functional Fermented Dairy Product". It led to development of *dahi*-based symbiotic products which are highly acceptable with satisfactory probiotic lactobacillus count.

At the Dr Yashwant Singh Parmar University of Horticulture and Forestry (YSPUHF), Solan, excellence in teaching along with recommendations of technologies for high productivity of apple were the main achievements.

The Chaudhary Sarwan Kumar Krishi Vishwavidyalaya (CSKHPKV), Palampur, under the "Organic farming", developed organic farm on 15 hectares. A consortium of the organic practices and inputs like composts, manures, sprays and inoculums were successfully developed at the farm.

Experiential Learning: A total of 183 experiential learning units in 45 AUs established with Rs 145.40 crore were made operative. These units greatly helped in skill development and attitude building in undergraduate students and in linking agricultural education with professionalism. This sub-programme helped in transcending the mere knowledge-imparting education with limited practical training to experience-based behavioural change through comprehensive practice sessions involving all aspects of an agricultural enterprise, from production to consumption. Salient achievements specific to some universities are as follows:

At the Gobind Ballabh Pant University of Agriculture and Technology (GBPUAT), Pantnagar, under the "Dietetics and Food Service Management", two laboratories of the department namely Catering Lab and Food Product Development Lab were renovated and modern facilities were created. These units were used for UG teaching particularly to run a six credit course of "Experiential Learning in Dietetics and Food Service Management (HFN 457)".

At the Chaudhary Charan Singh Haryana Agricultural University (CCSHAU), Hisar, Fruit Juice Processing and Filling Unit and a Cereal Processing and other Food Production Unit, for hands-on training were set-up. A scheme on Production and Processing Meat and Dairy Products is also operating. A model plant on production of meat and dairy products is being developed with state-of-the-machinery for processing meat and dairy products, to provide hands-on training to students.

At the Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri, the units on biotechnology, biocontrol, nursery management, microirrigation system, biofertilizer production, mushroom production, protected cultivation of gerbera, rose and capsicum, dairy byproduct technology were developed and utilized for skill development of UG students.

At the Uttar Banga Krishi Vishwavidyalaya (UBKV), *Cooch Behar*, facilities for hands-on training on Vermicompost Production, Production and Processing of Mushroom, Manufacturing of Farm Machinery and Equipment, Nursery Production and Management and Nursery Production through tissue culture for ornamental and horticultural crops, were created to equip the students with adequate knowledge, skill and experience. Micro-propagation of several important plants had been carried out. At UAS, Dharwad, the unit, "Biodiesel extraction and trans-esterification unit", was established.

At the Anand Agricultural University (AAU), Anand, learning programmes on High-Tech Floriculture, value-addition in *aonla*, mango, tomato and kagzi lime and training on cultivation, processing and marketing of Medicinal & Aromatic Plants were utilized for UG teaching and skill development.

At the Sri Venkateswara Veterinary University (SVVU), Tirupati, the diagnostic laboratory was modernized and facilities of small animal operation theatre, obstetrical ward, ophthalmology ward, were created for skill development in students.

At the Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST), Srinagar, two programmes—Model Meat and Poultry Products Processing Centre and Tissue Culture Laboratory, three months training programme was initiated for unemployed graduates in agriculture, veterinary and

fisheries sciences to enable them to develop entrepreneurship skills and establish their own units. Hands-on training in horticulture included grafting/budding and production of quality planting material of apple, pear, plum, quince, pomegranate, cherry, grape and apricot. In floriculture, scientific multiplication of lilium and gladiolus was initiated.

At the Dr Balasaheb Sawant Konkan Krishi Vidyapeeth (BSKKV), Depoli, the programmes have been started in Floriculture and Landscape Gardening, Post-Harvest Technology for Cashew Entrepreneurs, Mushroom Technology and Mechanization of Rice Farming.

At the Chaudhary Sarvan Kumar Krishi Vishwavidyalaya (CSKHPKV), Palampur, 136 students/unemployed youth were imparted training on all aspects of Bakery and Confectionery, 193 on various aspects of cultivation of White Button Mushroom, Oyster Mushroom, Milky Mushroom and Paddy Straw Mushroom, and 40 on different aspects of horticulture.

At Anand Agricultural University (AAU), Anand, e-learning programmes were sanctioned for High-Tech Floriculture, Value addition in *Aonla*, Mango, Tomato and Kagzi lime and trainings on cultivation, processing and marketing of Medicinal and Aromatic Plants were conducted.

Emeritus Scientist Scheme: Under this sub-programme significant contributions include development of heterotic hybrids and molecular mapping of fertility restorer genes in wheat, drought and high temperature stress tolerance in chickpea, genetic improvement of *Bacillus thuringiensis* S6 for its bioefficacy for the control of *Spodoptera litura*, impact assessment of climate change on major pests of maize and mustard, tillage-cum-organics mediated rhizospheric modulation of winter-initiated sugarcane, hybridization of oyster mushroom for yield and quality, characterization and evaluation of elite walnut genotypes for commercial exploitation, effect of heat stress on reproduction-related hormones and amelioration by dietary manipulation in buffaloes etc.

Improving Teaching-Learning: At the TNAU Coimbatore, educational tours, CD shows and guest lectures were conducted for the benefit of students. Strengthening of libraries was carried out. A new mode of teaching and learning through e-learning was introduced for the first time in the country. Possession of laptops by all the students has been made mandatory. Wi-Fi connectivity is provided to all the hostels. The university is also implementing, e-Assignments and e-Communication for the UG students. e-Learning programme has been strengthened by creation of interactive multimedia course content for B.Sc.(Ag.) programme and hosting this content on the National server for sharing by all the agricultural universities. Further, online examination is also one of the features of educational system in the university.

A video conferencing unit has been set up for strengthening the distance learning programme and inter-campus e-Learning programme. About 125 CD shows were also organized during the year.

The Chaudhary Charan Singh Haryana Agricultural University (CCSHAU), Hisar has become global by developing inter-institutional linkages for education and research with the universities in USA and Europe.

At the Sri Venkateswara Veterinary University (SVVU), Tirupati, ICAR development grant was utilized in development of learning resources in endocrinology, internet-hubs for students, modernization of class-rooms and equipping them with ICTs, adoption of revised course curricula including practical content.

At the Kerala Agricultural University (KAU), Thrissur, modernization of the class rooms, laboratories, seminar halls, hostels in ten colleges of the University; development of good computer labs with 24-hour internet connectivity, library strengthening particularly on-line subscribing, and video-conferencing facilities to link agricultural college at Thiruvanthapuram, Thrissur and Padannakkad (Kasargod) were undertaken, and a science museum and herbarium at College of Forestry, Thrissur, were established.

At the Mahatma Phule Krishi Vidyapeeth (MPKV) Rahuri, modernization of laboratories with world class equipments/instruments and strengthening of libraries in respect of bar coding, digitization, CD Rom, internet and e-learning facilities were accomplished.

At the University of Agricultural Sciences Dharwad, classrooms with fixing latest audio-visual aids with LCD facility in Dharwad and Raichur campuses along with students' counseling, students' amenities, practical manuals and AV Aids were provided. Examination Cell was sufficiently strengthened to meet External Examinations in all the degree programmes.

At the Anand Agricultural University, Anand, Library was updated with e-facilities. At the Uttar Banga Krishi Vishwavidyalaya (UBKV), Cooch Behar, a number of class rooms have been equipped with audio-visual aids.

At Dr Yashwant Singh Parmar University of Horticulture and Forestry, Solan, the teaching facilities in the colleges were strengthened with electronic LCD display system and computers at KAU Thrissur, for high speed internet browsing for literature and data search and preparation of

At YSPUHF, computer with LAN and LCD projection facilities were provided

reports, computer facility with LAN, and the LCD projection facilities for handling hands-on training classes on computer based learning, were developed.

Rural Work Experience: At *GBPUAT, Pantnagar*, with the ICAR grant, hands- on-training units for training of undergraduate students in horticultural crops and value-addition and marketing of soybean products were established.

At Chaudhary Sarvan Kumar Krishi Vishwavidyalaya (CSKHPKV), Palampur, a total of 40 UG students (35 in College of Agriculture and 5 in College of Home Science) underwent RAWE/RHWE training programme.

Text Book writing: During the year, 14 proposals for textbook writing were approved. Bala Saheb Konkan Krishi Vishwavidyalaya, Dapoli published two text-books entitled "Cashew Processing and Export" and "Introduction to Agricultural Economics and Agribusiness Management" and YSPUHF, Solan, published a text book on "Agro-meteorology".

Promoting Gender Equity: Girls' hostels at Post Graduate Institute and constituent colleges of MPKV, Rahuri; One girls' hostel at UBKV, Cooch Behar; two girls' hostels at AAU, Anand; Girls' Hostel at Dapoli and Ratnagiri of BSKKV, Dapoli were completed; modernization and renovation of UG, PG and Girls' hostels at UAS, Dharwad and strengthening of facilities in the hostels of KAU, Thrissur was undertaken. Also, ladies' gymnasium was developed at Central Campus, Rahuri.

MANPOWER DEVELOPMENT

All-India Entrance Examination for Admissions to UG: For admissions up to 15% seats in 11 subjects of UG Programmes, 13th All-India Entrance Examinations including award of National Talent Scholarships (NTS) were conducted. In this, 21,463 candidates appeared and 1,687 were admitted in 45 Universities through counselling. In order to promote national integration, all those candidates, who took admission in an university outside their state of domicile, were awarded National Talent Scholarship (NTS) of Rs 1,000 per month.

All-India Entrance Examination for Admissions to PG: Admissions to 25% seats in PG programmes at 47 Universities and 100% seats in ICAR-DUs, were made through an All-India Entrance Examination. A total of 11,684 candidates appeared in the examination, out of which 1,875 were admitted.

Junior Research Fellowships (JRFs): There are about 475 Fellowships in 19 subject groups (90 subjects). The amount is Rs 8,640/month for non-veterinary and Rs 12,000/month for veterinary students. Besides, a contingency grant of Rs 6,000/ year is payable to all awardees.

Internship Assistance: To develop professional skills, internship assistance is provided to all the final year students of B.V.Sc. and A.H. programmes during their internship including defraying the travel expenses for to and fro journey to the place of internship.

Merit-cum-Means Scholarship (MCM): This scholarship is granted to students of economically weaker sections of the society to undertake UG studies in agriculture and allied science subjects. Maximum 7% students from one University are awarded the scholarship.

All-India Entrance Examination for award of Senior Research Fellowship for Ph.D.: ICAR SRF examination was held for awarding 202 fellowships in 13 major subject groups and 56 sub-subjects. The amount of fellowships has been enhanced which now stands at Rs 12,000/month for first and second years and Rs 14,000/month for third year for all disciplines other than Veterinary sciences; for the latter the amount is Rs 14,000/month for first and second years and Rs 15,000/month for the third year.

Admissions of Foreign Students: Candidates (229) came from Afghanistan, Bangladesh, Bhutan, Canada, Cambodia, Cote d'Ivoire, Egypt, Ethiopia, Fiji, Gambia, Iran, Iraq, Mozambique, Namibia, Nepal, Sanegalese, South Africa, Sudan, Sri Lanka, Syria, Tanzania, Vietnam and Yemen. Maximum candidates (49) came from Ethiopia.

PROMOTION OF EXCELLENCE AND HRD

ICAR National Professor Scheme: Major achievements of six national professors are as follows.

- Development of 'Pant-ICAR Subsoiler-cum-Differential Rate Fertilizer Applicator' for subsoil structure modification and band placement of inorganic fertilizers at different depths up to 50 cm is a technological breakthrough. The machine is being patented. The subsoil applicator could enhance yield, conserve moisture and increase use-efficiency of nutrients particularly in sodic land as well as in rainfed farming in general. Other machines developed include Pant Zero-Till Ferti-Seed Drill and 'Pant-ICAR Deep Soil Volume Loosener-cum-Fertilizer Applicator', the latter is used extensively as 'Sugarcane Ratoon Manager' after harvesting of plant crop.

  Real-time nitrogen management in rice was achieved by monitoring leaf colour that works very well in achieving high nitrogen-use-efficiency and yield. A criterion for assessing whether wheat crop needs additional application of fertilizer nitrogen at maximum tillering stage has been developed. A combination of prescriptive nitrogen management for rice followed by corrective N management using Green Seeker optical sensor was found to lead to high yields and improved nitrogen-use efficiency as compared to blanket fertilizer N recommendations.
- Studies on (i) Global Food Crisis: Causes, Severity and Outlook, (ii) Fertilizer Growth, Imbalances and Subsidies: Trends and Implications, (iii) WTO Agricultural Negotiations and Regional Cooperation, (iv) Prospects of Achieving Four per cent Growth in Agriculture, (v) Livestock Sector Composition and Factors Affecting its Growth and (vi) Progress and Potential of Horticulture in India have been completed.
- Developed column-wise coordinate exchange algorithms for generating balanced and nearly balanced two-level factors Super Saturated Designs (SSD) useful for economizing resources while screening large number of factors. A monograph on Hadamard Matrices has been published.

ICAR National Fellow Scheme: The areas of identified priority covered by National Fellows include, developing regional plans for managing poor quality irrigation waters, quantitative trait loci and marker assisted selection in indigenous breeds of cattle and buffaloes, development of Elisa-based immuno-diagnostics for classical swine fever, exploitation of metabolic diversity for isolation of genes involved in lipid biosynthesis, sustainability of watersheds in rainfed regions of peninsular India using GIS and remote sensing, senescence: mechanism in crops in relation to abiotic stresses, sink strength and their interaction, molecular characterization of Indian maize landraces and allele mining for agronomically important traits, improvement of strain of *Chaetomium globosum*, a potential antagonist of fungal plant pathogens and developing molecular markers for its identification, textile articles through processing of wool with silk waste and cotton to create entrepreneurial skills in rural women, Genome analysis of indigenous breeds of cattle, buffalo and goats, study of gene interactions in developing *Drosophila* embryo, identification and quantification of phosphatase hydrolysable organic Phosphorus sources for plant nutrition and refinement of a non-destructive technique for phosphatase estimation, decontamination of pesticide residues from edible commodities, assessing soil quality key indicators for development of soil quality index using latest approaches under predominant management practices in rainfed agro-ecology, development of technology of seed production and culture of feather back, *Notoprerus chitala* and two medium carps, *Labeo gonious and* L. *fimbriatus* for diversification of freshwater aquaculture, and efficient design of experiments for quality agricultural research. Some of the salient achievements are the following:

- A method for Farnesene, which induces repellency to aphids, in mustard (*Brassica Juncea*) by GC/MS/MS was developed.

A set of 43 accessions, including some unique maize landraces collected from the North-Eastern Himalayan region were deposited in NBPGR (IC 565865 to IC 565907). A set of **133 accessions** from NEH and other regions in India were characterized at phenotypic and molecular levels.

- **Genetic polymorphisms** was studied on leptin, DGAT (DGAT1, DGAT2 and MOGAT2) and butyrophilin candidate genes in Murrah, Surti and Bhadawari buffaloes revealing polymorphism, SNPs, allelic variants sequences' identification, taxonomic relations etc. Information has been generated to identify genetic polymorphism in alleles of milk and fat genes.
- Eight micro-watersheds were surveyed and evaluated for sustainability aspects. For evaluating *Livelihood Security, economic viability, agricultural productivity and social acceptability,* the most critical indicators were identified.
- Developed an *in situ* resin-bag-technique to measure relative efficiencies of P in different crops under arid agro-ecosystem where P mineralization rates are exceptionally low.

Strongly basic anion exchange resin in chloride form was found best under arid conditions. The amount of saponin accumulated in safed musli tubers (*Chlorophytum borivilianum*) was found to increase with growth. Mycorrhizal inoculated plants resulted up to 25 fold improvement in saponin content at 45 days growth stage and up to four fold improvement at crop harvest. There is a possibility to increase saponin content of safed musli by mycorrhizal fungi. Phytase (IP_6) degradation studied in cowpea, horsegram, mothbean, mung-bean, soybean and pearl millet seeds demonstrated that solubility of minerals was higher in soaking and germination than in boiling.

- Design Resources Server was developed to disseminate research in design of experiments among experimenters in agricultural and allied sciences and industry in planning and designing experiments.
- A genomic sequence encoding complete gene of lysophosphatidic acid acyl transferase gene of 1288 base pair was PCR amplified cloned and characterized from *Brassica juncea*. It is designated as BJLPAATG. A cDNA sequence of *LPAAT* gene was isolated, cloned and characterized from *B.juncea*.
- Studies on *in vitro* heat tolerance of antioxidant defense enzymes from leaf and inflorescence revealed differential sensitivity of the enzymes. It was observed that there was a faster rate of senescence under heat-stress environment (HSE) than non-stress environment (NSE) in Hindi62 (heat tolerant) and PBW343 (heat susceptible) wheat, which were allowed to suffer maximum heat stress under late sown conditions. Heat tolerant Hindi62 exhibited a slower rate of senescence than heat susceptible PBW343 during HSE. Presence of multiple and heat stable isoforms of antioxidant defense enzymes in the leaves and inflorescence of *C. album* may help to ameliorate oxidative stress due to high temperature stress induced senescence.

QUALITY ASSURANCE AND REFORMS

Accreditation: The Board in its IX meeting that was held on 29 July 2008 granted accreditation to the additional eight State Agricultural Universities (SAUs)/Deemed-to-be Universities (DUs) and their programmes. Accreditation to two ICAR-DUs (IARI New Delhi and NDRI Karnal) and four SAUs (OUAT Bhubaneswar, MAU Parbhani, PDKV Akola and MPKV Rahuri) was granted for five years and it was for one year to the CSAU&T Kanpur and for two years to the RAU Bikaner. Accreditation of the five SAUs, DUs, namely ANGRAU Hyderabad, CCSHAU Hisar, TNAU Coimbatore, TANUVAS Chennai and CIFE Mumbai has been extended for five years from the date of expiry of their earlier accreditation. The accreditation pertains to specific colleges and programmes and has been granted with suggestions on which the Universities should complete action and submit the report to the Council on annual basis. Also, a one day workshop was organized on September 20, 2008 at Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar to sensitize the senior officers of the four state agricultural universities of Gujarat about the accreditation process. Accreditation of some other agricultural universities of the country is in process.

Revision of ICAR Model Act for Agricultural Universities: For enhancing the uniformity of structure, governance and efficiency of the agricultural universities in the context of emerging challenges, the ICAR revised Model Act for Agricultural Universities in India through a Committee. In the revised Model Act, the provisions of all chapters including definitions, territorial jurisdiction, admissions to the universities, powers and functions of the university, its councils/bodies and officers have been rationalized; composition of the Board of Management modified; in the three member Search Committee for Vice Chancellor, one nominee of the Government included replacing Chairman, UGC or his nominee. Similarly, Academic, Research

New AUs Accreditated

National Dairy Research Institute (NDRI), Karnal	Granted accreditation for five years
Indian Agricultural Research Institute (IARI), New Delhi	Granted accreditation for five years
Chandra Shekhar Azad University of Agriculture & Technology (CSAUA&T), Kanpur	Granted accreditation for one year
Orissa University of Agriculture and Technology (OUAT), Bhubaneshwar	Granted accreditation for five years
Rajasthan Agricultural University (RAU), Bikaner	Granted accreditation for two years
Marathwada Agricultural University (MAU), Parbhani	Granted accreditation for five years
Dr. Panjabrao Deshmukh Krishi Vidyapeeth (PDKV), Akola	Granted accreditation for five years
Mahatma Phule Krishi Vidyapith (MPKV), Rahuri	Granted accreditation for five years

and Extension Councils have been modified and the Registrar and Comptroller included as permanent invitee; integration of education, research and extension emphasized and the composition and objectives of State Coordination Committee/ Council for higher Agricultural Education in the States having more than one AU have been redefined.

Restructuring Post-graduate Course Curricula and Syllabi: In the Meetings of the National Core Group, Broad Subject Matter Area Committees (BSMACs), separately as well as together, and the workshops of the BSMACs with all stakeholders including the private sector and industry, the extensive discussions were held, and the common academic regulations and the curricula and syllabi for different M.Sc. and Ph.D. programmes were revised/developed for improving standards, quality and relevance of education.

Modernization of Agricultural Universities Farms: It is a new activity to provide a one-time grant to all the State Agricultural Universities and Central Universities with Agriculture Faculty for renovation and modernization of farm infrastructure and facilities. Revitalization/modernization of the laboratories and infrastructure of AU farms will enhance their capacity for undertaking globally competitive research and education activities.

INDO-US AGRICULTURAL KNOWLEDGE INITIATIVE (AKI)

The Sixth Meeting of Indo-US AKI Board was held in New Delhi on 15-16 April, 2008 in which the progress was reviewed and joint deliverables identified.

Fifteen scientists of NARS were selected for training in USA during 2008-09 under the Indo-US Borlaug Fellowship Programme and a joint workshop on sanitary and phyto-sanitary (SPS) Regulation was organized in New Delhi. Salient achievements of the ongoing projects are as follows.

Pigeonpea Genomics Initiative: More than 16,000 Expressed Sequence Taggs (ESTs) developed, mapping population are being screened for DNA polymorphism, and about 80,000 BAC-end sequences have been generated.

Teaching and Learning Excellence: A Capacity Building Model: Eleven scientists/faculty members from four AUs/Institute had an exposure in students centered teaching – learning practices, leadership development, career counseling including internships, and managing and institutionalizing transformational change to achieve professional excellence, at the Ohio State University, USA. One day workshops have been organized at Kanpur, Bhubaneswar and Ludhiana.

Water Harvesting for Ground Water Recharge and Bio-drainage for Salinity Control: Distance learning classrooms were established at UAS Bangalore, PAU Ludhiana and GBPUA&T Pant Nagar. Using this facility, a course each on Landscape Hydrology and Water Quality and Water Resource Economics were taught at PAU Ludhiana both by the US and Indian Faculty. Two US students completed three months training at CSSRI, Karnal.

Sustainable Water Resources Management: A detailed wetland construction, monitoring and implementation site plan for Mewat (Haryana) for remediation of poor quality surface water was prepared. Baseline soil survey and preparation of thematic maps of land use, geomorphology, soil and cropping pattern for the micro- watershed at Birmi, Ludhiana (Punjab) and Wargal, Medak (Andhra Pradesh) were carried out.

Students from USA at CSSRI, Karnal

Information and Communication Technologies for Efficient Water Management: US-India Collaborating Extension / Outreach and Distance Education: Finalized 39 Reusable Learning Objects (RLOs) on Water Management on different aspects like Drip Irrigation, rainwater harvesting, water quality, remediation of salt affected soils, water balance, irrigation scheduling, soil moisture measurement, watershed management etc. The RLO's have been posted on the "EcoLearnIT website" of the University of Florida, Gainesville. A website: http://www.gsgk.org.in in Hindi has been developed.

On farm water management for Rainfed Agriculture on Benchmark watersheds in diverse eco regions of India: Detailed benchmark survey on physio-chemical properties of soil, socio-economic, present agricultural practices, constraints (bio-physical) and socio- economic aspects completed in two watersheds in village – Bandha, Jabalpur and one in Kandi, Punjab and the Water User groups were formed.

Five new joint projects were initiated (i) Capacity building for Libarary professionals;

(ii) Genetic Engineering for abiotic stress tolerance in the crops on papaya, tomato, banana and potato; (iii) improving the capacity for Integrated Pest Management of insect-borne viral diseases in Indian vegetable production; (iv) Technology for plant and dairy ingredients based formulated and functional foods using extrusion technology, and (v) Development of vaccines and diagnostics for control of onion influenza in poultry.

NATIONAL ACADEMY OF AGRICULTURAL RESEARCH MANAGEMENT

Training: A total of 61 such programmes including training programmes, workshops and orientation meetings were organized with 1,766 participants.

Type of programme	Programmes
	(Nos.)
Foundation Course for Agricultural Research Service (FOCARS)	03
Refresher Courses/Summer /Winter Schools (21 days)	10
Senior Programmes	19
Workshops	13
Executive Development Programmes	02
Demand Driven Off Campus Programmes for CARI, Port Blair, IGFRI Jhansi, CRIDA, Hyderabad, ICAR Res. Complex, Goa and CIFE Mumbai	11
International Programmes	03
Total	61

Research and Consultancy: The Academy undertakes research studies on management problems faced by agricultural research and educational institutions in the NARS.

World Bank Supported Project: Under the aegis of the World Bank supported National Agricultural Innovation Project (NAIP), the Indian Council of Agricultural Research (ICAR) has awarded a major project on Learning and Capacity Building (L&CB), to a consortium led by the Academy, with a budgetary outlay of Rs 24.09 crore.

APAARI CLAN Executive Committee Meeting was attended by more than thirty APAARI member countries

NAARM-Now an academic unit as well: The Academy has embarked upon becoming an academic unit besides being a training unit. Two post-graduate diploma programmes on (i) information technology management, and (ii) IP-management have been commenced.

Support/Policy Support: The academy continued to provide policy support to NARS in general and ICAR in particular through its interactive policy dialogue meetings and workshops. Significant ones in this category included the APAARI CLAN Executive Committee Meeting on 8 October 2007. The Academy has established a Help Desk under the NAIP, which extends on-line help to all prospective institutions/ individuals preparing winning research proposals and in sensitizing potential partners.