



# IAUA NEWS

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## CONTENTS

### Promising Technology

MAU, Parbhani

### New VCs

Dr M.P. Yadav: VC, SVBPUAT, Meerut

Prof. R.N. Sreenivas Gowda: VC, KVAFSU, Bidar

Dr H.P. Singh: VC, RAU, Pusa (Bihar)

Dr J.C. Katyal: VC, CCS HAU, Hisar

### Deemed University

NDRI, Karnal

### Universities

A profile: NDRI, Karnal

AAU, Anand

GBPUAT, Pantnagar

MPKV, Rahuri

MAU, Parbhani

MPUAT, Udaipur

NDUAT, Faizabad

PAU, Ludhiana

RAU, Bikaner

TNVSU, Chennai

UAS, Bangalore

### Awards and Recognition

DBSKKV, Dapoli

MPKV, Rahuri

MPUAT, Udaipur

PAU, Ludhiana

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## PROMISING TECHNOLOGY

### Development of bio-diesel processor

India is looking at renewable alternative resources to reduce its dependence on foreign oil. This can be met locally by trans-etherification of non-edible oilseed trees like jatropha, mahua, karanj, neem etc. Dr S.R. Kalbande of Agricultural Engineering College has made pioneering efforts to design and develop bio-diesel processor with a capacity of 15 litres. Farmers can easily prepare 75 litres bio-diesel per day on farm. Diesel engine of 5 H.P. can be successfully run on bio-diesel and diesel mix of B: 20, 40, 60, 80 and 100. Bio-diesel is non-toxic and bio-degradable and has proved environmental friendly.

(MARATHWADA AGRICULTURAL UNIVERSITY, PARBHANI)



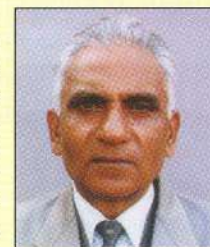
Bio-diesel processor

## NEW VCs

### Dr M.P. Yadav takes over as VC, SVBPUAT, Meerut

Dr Mahendra Pal Yadav, born on 2 June 1945, did BVSc & AH (Mathura), MVSc (Mathura) and Ph.D. (IVRI). He became Director cum Vice-Chancellor, Indian Veterinary Research Institute, Izatnagar in May, 2000. His field of specialization is Veterinary Microbiology. He received many Awards, viz. OIE International Meritorious Award, Special award by ICAR, Distinguished Award by IAAVR, Major (Mrs) Malika Trivedi IAAVR Award, Chancellor's Medal, Netaji Subhash Chandra Bose Birth Centenary Award, Dr P. Richard Masillamony Oration Award, Vocational Education and Development Award, Higher Education and Development International Award, Didactical Environment Education Doctrine Award, Swadeshi Vigyan Puruskar, Dr C.M. Singh Samman, World Intellectual Property Organization Geneva Award, NRDC Technology Award and Vigyan Gaurav Samman Fellowship. He is member of National Academy of Veterinary Sciences, Indian Association for the Advancement of Veterinary Research, National Academy of Agricultural Sciences, Indian Virology Society and Indian Society for Veterinary Biotechnology and Immunology. His major research highlights are: First report of an epidemic of equine influenza vaccine, killed goat-pox vaccine, attenuated live ILT vaccine, polyvalent *E. coli* vaccine, reported first time equine infectious anaemia virus, a number of research findings on molecular biology for equine infections, use of garlic as anti-*Coxiella burnetii* agent in chickens, and established frozen semen of stallion. He held important portfolios such as President, Indian Virological Society; President, IAVMI, Editorial member of journals or periodicals; Member of professional societies; Member and chairman of various government or university committees; guided 25 Doctoral and Masters students as Major advisor, Co-advisor and Member, Advisory committee. His publications include 148 research papers, 3 books, 15 chapters in books, 13 laboratory manuals, 7 review papers, 31 technical or popular papers, extension bulletins or manuals and 32 miscellaneous.

Dr M.P. Yadav took over as Vice-Chancellor, SVBPUAT, Meerut on 27 March 2006. He is the second Vice-Chancellor of this university.



Dr M.P. Yadav

### Prof. R.N. Sreenivas Gowda, the first VC of KVAFSU, Bidar

Prof. R.N. Sreenivas Gowda did his graduation (1967), post-graduation (1969) and doctorate (1980) in Veterinary Sciences from University of Agricultural Sciences, Bangalore with distinction and Gold Medal. He has worked as a teacher, researcher and extension educator, and assumed offices of Assistant Professor, Associate Professor and Professor & Head, Faculty of Veterinary Sciences, UAS, Bangalore for more than three decades. He guided 5 Doctoral and 35 Masters scholars and also 150 students in post-graduate studies. He published 225 scientific and popular articles and 10 language articles.

Dr Gowda served as Director of Institute of Animals Health and Veterinary Biological, Bangalore. He visited Far East, Middle East, Europe, the UK and Australia. He was awarded 16 state as well as national level awards such as Manufacturers' Association Award, 2004 for his outstanding achievements and contributions to the livestock industry. He was also awarded the First Karuna Award, 2004 and Lifetime Achievement Award, 2003 by the Karnataka Veterinary Association.

Prof. R.N. Sreenivas Gowda took over as Vice-Chancellor, KVAFSU, Bidar on 1 September 2004. However, the university was inducted in IAUA on 26 December 2005.



Prof. R.N. Sreenivas

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### Dr H.P. Singh takes over as VC, RAU, Pusa

Dr H.P. Singh took over as VC, RAU, Pusa on 5 December 2005. He was born on 2 July 1950. A Fellow of National Academy of Agricultural Sciences, in a career spanning 32 years he is credited to have led horticultural development, heralding Golden Revolution, encompassing horticulture-based diversification of agriculture.

As Horticulture Commissioner, Government of India (1997-2003), Dr Singh provided a new dimension to development of horticulture, having Mission approach. Under his leadership India received Tree of Life Award from Asia and Pacific Coconut Community for the contributions to coconut. He provided leadership as Chairman of Asia and Pacific Coconut Community, represented by 14 countries. As Director, National Research Centre on Banana, Dr Singh not only established the Centre, but also with his visionary approach and dynamic leadership established effective linkages with national and international institutes. He released three cultivars in fruits and facilitated release of several superior cultivars. He developed production technologies of citrus, banana, pineapple, passion fruit and litchi, especially high-density planting, drip irrigation, nutrition management and flower regulation.

He received 2 international awards, 4 fellowships and 12 national awards. He organized 9 international and 72 national conferences, workshops and trainings, and published or edited more than 32 books, 24 technical bulletins and over 250 papers.

### Dr J. C. Katyal takes over as VC, CCS HAU, Hisar

Born on 4 March 1944, Dr Katyal did his B.Sc. (1964) from PAU; and M.Sc. (1966), and Ph.D. (1969) from IARI. He was Post-doctoral Fellow, International Rice Research Institute, Los Banos, Philippines.



Dr H.P. Singh

He held positions of eminence with Indian Council of Agricultural Research and International Agricultural Research Institute. He was Soil Scientist, AICRP, Hyderabad (1972-77); Project Coordinator, AICRP on Micronutrients, PAU, Ludhiana (1977-85); Visiting Soil Scientist, International Fertilizer Development Center, USA (1985-88); Head, Department of Soil Science and Agricultural Chemistry, IARI, New Delhi (1988-91); Director, Central Research Institute for Dryland Agriculture, Hyderabad (1991-97); Director, National Academy of Agricultural Research Management (1997-99); Senior Research Fellow, University of Bonn, Germany (1999-2000); Director, National Academy of Agricultural Research Management, (2000-02); and Deputy Director-General (Education), ICAR, New Delhi, (2002-05).

He received many awards for outstanding contributions to agricultural research and its management by several organizations or institutions, viz. FAI Excellence in Agricultural Research (1984); IFDC Best Visiting Scientist (1986); Borlaug Award (1995); APSEE Design and Development of Farm Machinery Award (1996); ICAR Best Institute Award (1996); Rafi Ahmed Award (1996); TNAU Best Soil Scientist Award (2002); Ranade Trust Lifetime Achievement Award (2002) and N.S. Randhawa Memorial Award by NAAS (2003).

Dr Katyal was Fellow, National Academy of Agricultural Sciences and Indian Society of Soil Science. He served as President, Indian Society of Dryland Agriculture; Vice-President, Indian Society of Plant Nutrition; Member, Executive Council and Editor, National Academy of Agricultural Sciences. He published 250 papers and edited or authored 10 books, manuals or proceedings. He holds patent for two inventions in Farm machinery.

Dr J.C. Katyal took over as Vice-Chancellor, CCS HAU, Hisar on 3 February 2006.



Dr J.C. Katyal

## Focus on Universities - Achievements and Events

### DEEMED UNIVERSITY

#### NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL

##### Whey-based lassi-like beverage

The increased production of paneer, chhena and cheese has led to the generation of enormous quantities of whey. Enhanced environmental awareness and stringent legislations have led to the quest for alternative means to utilize effectively large quantities of this highly nutritious by-product. The conventional methods of its concentration, drying and membrane processing are energy and cost prohibitive. Incorporation of whey into a popular product like lassi would accrue the benefit of nutritional enrichment as well as maximum utilization.

Both cheese and paneer whey were tried for preparation of acceptable-quality, lassi-like beverage. Various ratios of sweet as well as acid whey with an admixture of buffalo milk showed that 65-75% whey could be utilized for the preparation of whey-based lassi-like beverage. The system was stabilized by using a combination of stabilizers such as pectin, CMC and trisodium citrate in predetermined ratios. The preparation was inoculated with a suitable lactic acid culture and incubated. The dahi (curd) thus obtained was converted into whey-based lassi by the standard method. To enhance its shelf-life, it was heat-treated using UHT process and packed under aseptic conditions in

tetra bricks. The samples were stored at different temperatures and subjected to physico-chemical and sensory analysis at regular intervals.

##### Bio-defensive properties of probiotic *Lactobacillus* sp.

For selection of probiotic *Lactobacillus* sp. exhibiting hypocholesterolemic, antioxidative and immuno-modulatory properties, 12 probiotic strains were screened for Radical Scavenging activity. The strain *Lactobacillus casei* NCDC19, showing maximum antioxidative activity under *in-vitro* conditions, was then used for preparation of fermented milk. The beneficial effect of probiotic culture and its fermented product was evaluated by carrying out *in vivo* studies. Total cholesterol, triglycerides, LDL-cholesterol and atherogenic index were reduced significantly in plasma of rats fed fermented milk and probiotic culture. Likewise, cholesterol and triglyceride levels in liver and aorta were reduced. The antioxidative enzymes, viz. catalase and glutathione peroxidase in RBC activity increased in probiotic culture and fermented milk-fed groups. Among liver antioxidative enzymes only catalase activity increased significantly. The levels of thiobarbituric acid-reactive substances, an index of oxidative stress, were decreased significantly in probiotic culture and fermented milk-fed groups.

### UNIVERSITIES

## A Profile

#### NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL

##### Historical perspective

National Dairy Research Institute, Karnal was originally started as Imperial Institute of Animal Husbandry and Dairying in 1923 at Bangalore. It was expanded and renamed Imperial Dairy Institute in 1936 and was known as National Dairy Research Institute

after Independence in 1947. Subsequently, in 1955, its headquarter was shifted to Karnal. Facilities at Bangalore were retained to function as a Regional Station to serve the southern states. In 1964 its Eastern Regional Station was established at Kalyani in West Bengal. Both these Regional Stations continue to provide region-specific R&D



Administrative Block



support for dairy development in these areas. In 1970 NDRI was brought under the wings of the ICAR to provide greater operational autonomy to the institute in research-management functions. The UGC conferred the institute with Deemed University status in March 1989.

The primary goal of the institute is to provide R&D support towards generation and dissemination of knowledge for development of national milch herd, milk-production enhancement and greater productivity of dairy industry and upliftment of dairy profession, leading to socio-economic and environmental benefits to the nation as well as development of manpower.

#### Mandate

1. To undertake basic and applied research in the area of Dairying, covering Production, Processing, Economics and Management.
2. To develop Dairy farming systems for different agro-climatic conditions and demonstrate models for transfer of technology.
3. To organise and conduct programmes at under-graduate and post-graduate levels in various branches of dairy science.
4. To organise short-term specialized training programmes and vocational courses.
5. To collaborate with national and international agencies for Dairy Research and Development.
6. To provide consultancy to Dairy-industry, Dairy farmers and other Dairy development agencies.
7. To act as a referral centre on Dairy research.

#### Research divisions or sections

The activities of the institute are organized in several Divisions, including Dairy Cattle Breeding, Dairy Cattle Physiology, Dairy Cattle Nutrition, and Animal Biotechnology in the field of Dairy Production. In the area of Dairy Processing the divisions are: Dairy Technology, Dairy Microbiology, Dairy Chemistry, Animal Biochemistry and Dairy Engineering. Dairy Extension and Dairy Economics cater to the research inputs in Dairy Management Sciences. Various laboratories of the institute are equipped with latest sensitive analytical instruments for carrying out research in most advanced areas of Molecular Biology, Cell Culture, Fermentation Technology, Protein Chemistry, Nutritional Studies, Food Technology, Microbiology, Micro Element Analysis etc.

Support sections like Animal Farm, Fodder Farm, Animal Breeding Complex, Experimental Dairy, Model Dairy Plant, Krishi Vigyan Kendra, National Library in Dairying, Computer Centre and Agricultural Technology Information Centre have been developed to provide services and strengthen the capabilities to take up frontline R & D and extension activities in the area of Dairying.

#### Livestock farm

The institute possesses an elite herd of 1,600 dairy animals including cattle, buffaloes and goats, which caters to and other research activities. The highest peak yields of 44 and 46.5 kg have been recorded in Karan Swiss and Karan Fries cattle respectively. Through consistent selection, the indigenous cattle breeds Sahiwal and Tharparkar have been improved and the highest peak yields of 23 and 19.5 kg milk per day respectively have been obtained from them. In Murrah buffalo, peak milk yield of 22.5 kg a day has been achieved. A modern Milking Parlour System and a Shelter Management System set up recently at Livestock Farm serve as demonstration models for the progressive farmers and provide infrastructure for conducting research on various aspects of milk-production system, reproduction behaviour, growth profile and nutritional requirements for elite milch breeds.



Mahatma Gandhi at IIAHD, Bangalore (now SRS of NDRI) for 2 weeks in June 1927 to get acquainted with scientific dairy-farm practices

#### Model dairy plant

The Model Dairy Plant with the state-of-art equipment and process automation, and a processing capacity of 60,000 litres milk per day has been established with collaboration of NDDB to provide hands-on training facilities to the B. Tech. students of NDRI Deemed University, and for scientists to carry out scaling up of operations for products and processes developed in the research



Visit of Smt. Indira Gandhi at NDRI on 21 November 1970

laboratories. The plant recently acquired ISO 9002 and HACCP certifications.

#### Significant research achievements

1. Continued research efforts on genetic improvement of animals has resulted in development of superior strains of dairy cattle, viz. Karan Fries and Karan Swiss, which are suitable for Indian agroclimatic conditions both at organized farm as well as field level.
2. Through scientific breeding and progeny testing programme, Murrah buffalo bulls having superior milk-production ability have been produced.
3. Advanced genome techniques are used to identify animals with better production and reproduction attributes. Molecular interventions for augmenting reproduction, clean milk production and post-milking improvement of milk quality, development of suitable animal - shelter management systems, and environmental aspects of dairy development have helped work out well-defined packages of practices for different production categories of animals.
4. Faster multiplication of dairy animals using Embryo Transfer Technology made it possible to produce more than 10 calves from an elite female in one calendar year. NDRI has the distinction of producing first test-tube buffalo calf of the world, through a highly sophisticated technique of *in-vitro* fertilization and embryo transfer. The technology has now been extended to goats to develop it as a model animal for advanced research in transgenic animal production. The country's first *in-vitro* goat kid was born at NDRI.
5. Research on animal physiology has helped in detailed endocrine profiling of animals to ameliorate heat stress, better reproduction management and induce lactation, which essentially augments the production level of animals.
6. Through chemical and physical methods, significant improvement has been achieved in improving the nutritive value of poor-quality roughages and agro-industrial by-products as animal feed. Improved varieties of fodder crops and their cultivation methods have been developed at the institute. Research on balanced feed formulation for different categories of animals has resulted in development of complete and enriched feed or mineral blocks for sustaining production level in high-producing animals. Bypass protein technology has been developed for meeting the nutrient needs of high-yielding animals.
7. Technologies have been developed for the manufacture of a variety of indigenous dairy products, viz. khoa and khoa-based sweets, chhena and chhena-based sweets, srikhand, rabri, paneer etc.
8. Several innovative ready-to-reconstitute formulations were developed to manufacture khoa, gulabjamun, rasogolla, kulfi, rasmalai, basundi, kheer, dalia and paneer curry for adaptation at industrial scale.
9. The formulated foods evolved here include whey-based lassi and flavoured drink, weaning foods based on whey or skim milk, soy-butter milk, malted milk food, whey-based soups and low-fat spreads.
10. New functional dairy products such as probiotic cheese, probiotic dahi, sports drinks, low-cholesterol ghee, herbal ghee and ice cream and burfi for diabetes have also been developed with potential to improve human health.
11. A food-grade bacteriocin-based bio-preservative formulation has been developed for enhancing the shelf-life of paneer and khoa.
12. A kit developed for the detection of various adulterants in milk is very popular among dairymen across the country.
13. The institute maintains a National Collection of Dairy Cultures and supplies starter cultures to the industry and institutions across the country.
14. Equipments have been designed for both small-scale dairy operations and mechanized production, e.g. paneer, ghee, khoa and rasogolla.
15. In the areas of Dairy Management and Extension a composite management index has been developed for bovines as a determinant to improve milk production.
16. Economic feasibility report for dairy farms and milk plants, impact of developmental programmes, constraint analysis for dairy and crop production system have been evaluated.



Declaration of Deemed University status by Shri Bhajan Lal, Union Minister of Agriculture, in 1989



17. Benchmark survey and cost studies using various knowledge and management information systems have been conducted for estimation of cost of milk production and the behaviour of milk producers and consumers.

#### Extension activities

1. The institute through its various programmes such as KVK, IVLP, Network Project on Buffaloes and Extension Division has adopted 35 villages for assessment and refinement of the technologies developed in Artificial insemination, Nutrition, Physiology and Management under field conditions.
2. It provides superior germplasm; artificial insemination facilities, necessary health cover, and technical inputs in terms of nutritional and reproduction technologies. Such interventions have made positive impact in improving the livestock productivity, rural employment and better family income for dairy-farming systems.
3. NDRI using farming-system research approach in adopted villages has made significant contributions to the economic prosperity of the farming community. New scientific know-hows on animal husbandry, milk and crop production have been transferred through Grameen Dairy Melas, Calf rallies, Veterinary camps, Women Agriculture Days, Field days and various On-farm demonstrations. More than 10,000 milk-producing households under various farm-level programmes have been benefited through these continuing activities.
4. A major pilot project on Technology Assessment and Refinement through Institution - Village Linkage Programme (IVLP) has also been completed to identify available resources, production systems, problems in agriculture and animal husbandry, and gender-related issues affecting rural development.
5. Krishi Vigyan Kendra (KVK) and Dairy Training Centre at NDRI conduct regular training programmes for farmers and rural women. Since its inception in 1976, through 3,900 training programmes it has benefited various categories of end users, 58,000 rural youths, school drop-outs, farm women, farmers and ex-servicemen.
6. Its Dairy Extension Division has developed ICT information packages in the form of video films and multimedia packages, based on clean milk production, hygienic milk processing and packaging, and scientific calf rearing.



Agriculture Minister Shri Chaturanand Mishra presenting ICAR's Best Institution report Award to Director, NDRI

#### Technologies, innovations or research findings transferred to users

The Dairy-Processing research conducted at the institute helped the industry in diversified uses of surplus milk and substandard milk, value addition to milk, utilization of whey, products with improved shelf-life and nutritional value, energy saving and cost effectiveness in product manufacture, development or standardization of analytical methods for quality evaluation of milk and milk products for dairy industry, evaluation of plant performance, development of plant design and lay-out, auditing of the energy requirement of dairy plant and application of non-conventional energy in dairies.

Among the major gains to the industry from dairy production the development of sire-evaluation methodology helped various developmental agencies. Cross-breeding researches helped in transfer of this technology to various parts of the country by the developmental agencies. The research finding that there was no advantage of having three-breed or four-breed crosses led the developmental agencies to restrict the breeding programmes to two-breed crosses. The research efforts focused on chromosomes helped in identification of animals with chromosomal abnormalities and their culling from the breeding herd. Development of Hansa test helped the Market Milk Industry in detection and differentiation of buffalo milk from cow milk. Individual farmers, cattle-feed industry and Bureau of Indian Standards utilized the formulations based on agro-industrial by-products, which need continuous improvement. The formulated and tested urea molasses block lick is now marketed by NDDB and cattle-feed industry. BIS has utilized this information in the standard for lick making. Technology developed for compaction of straw as block is being considered for export by save firms in India.

#### Dairy education

The institute provides high-quality education in the field of dairying. It has produced more than 2,000 Diploma holders, 1,084 Dairy

graduates, 1,705 post-graduates with specialization at Masters level and 745 post-graduates at Doctorate level in different areas of dairying. The programmes of NDRI Deemed University are constantly reviewed and updated to impart requisite knowledge levels to the graduates so that they are academically proficient in meeting the newly emerging global changes. The outstanding feature of the B.Tech. (Dairy Technology) degree of this institute is the in-plant training to supplement class-room teaching. A Placement Cell has been constituted at NDRI for providing career guidance, training and placement services to the students of the institute.

Educational and training opportunities are provided to visiting scholars from various countries. In the past the trainees from Nepal, Bangladesh, Afghanistan, Iran, Iraq, Myanmar (erstwhile Burma), Mauritius, Sri Lanka, Vietnam, Ethiopia, Holland, Egypt etc. have been benefited. In-plant training facilities are also imparted to the students from sister institutions and SAUs. Advanced training imparted to the faculty members under various collaborative programmes has immensely helped in improving the quality of research, teaching and consultancy.



Visit of Nobel Laureate Dr N.E. Borlaug at NDRI on 11 March 2001



Dr Sushil Kumar, Director, presenting institute's achievements during 6th Convocation

#### Student output during different 5-year plans

Five-Year Plan	B.Sc./B.Tech.	M.Sc.	Ph.D.	Total
Third	149	106	05	260
Fourth	132	117	38	287
Fifth	228	247	86	561
Sixth	211	425	198	834
Seventh	149	188	106	443
Eighth	85	160	98	343
Ninth	110	203	101	414
Total	1,064	1,447	632	3,142

#### International collaborations

The scientific achievements and excellent past performance of the institute in various research programmes have attracted funds from various national and international organizations or agencies. To exchange information and acquire current and advanced knowledge in basic and applied fields of Dairy Science, the institute maintains close liaison with various ICAR and CSIR institutes, Department of Biotechnology, Department of Science and Technology, NDDB, SAUs and various State Government Agencies at national level, several international organizations such as World Bank, IAEA, UNDP, IDf, DAAD and many leading institutions in the UK, the USA, Canada, Germany, Netherlands and Australia.

#### New initiatives

A new state-of-the-art research facility for Animal Biotechnology activities at NDRI has been created with a budgetary outlay of Rs 435 lakhs and 60,000 square feet laboratory space. To give further fillip to research in Biotechnology, Ph.D. in Animal Biotechnology has been started at NDRI from 2003-04. The academic programmes are also being reoriented towards employment generation (fulfilling



Award of degree certificates by Chief Guest, Shri. Sharad Pawar

the needs of the industry) and development of entrepreneurship. In this context, Diploma in Dairy Engineering has been started recently at the Southern Regional Station of the institute. Research initiatives are being undertaken for faster multiplication of superior germplasm, molecular interventions for augmenting reproduction, clean milk production and post-milking improvement of milk quality, development of suitable animal shelter-management systems, and environmental



aspects of dairy development. Biotechnological interventions for product and process development of functional foods, rapid methods for testing milk and milk products, development of equipments, processes and packaging for upgradation of technologies to manufacture traditional milk products, nutritional and therapeutic aspects of milk and milk products are some of the priority areas of research. The success of these programmes would prepare India's dairy industry to the newer challenges of global competitiveness. It would permit greater value addition to processed products, to ensure higher returns to the farmer and offer scope for improving the nutritional and therapeutic attributes of modified milk products. Likewise, in Dairy Management, thrust is being given to development of databases for strategic planning at national and international levels. Mechanisms for transforming the output of R&D into viable technologies are being further strengthened by establishing National Demonstration Centres, utilizing the available infrastructure of the institute and model villages for integrated rural development with special emphasis on Dairying. Bold policy initiatives are being undertaken to provide interface between industry and research institutes of the ICAR. Social and anthropological aspects with particular reference to regional and agro-climatic variations are gaining further emphasis in making transfer of technology more meaningful.

#### Future perspective planning till 2020

Development of breeding plans or strategies for genetic improvement of dairy animals for different production systems under various ecologies continues among the key areas of research. Future programmes of the production disciplines include identification and characterization of molecular genetic markers, and the structural and functional genomics related to growth, production and reproduction traits in farm animals; faster multiplication of superior germplasm through advanced reproductive techniques, including embryo-transfer technique; understanding the genetic control of fertility in male and female animals and transgenic animal production for enhanced livestock productivity; and the production of human proteins of pharmaceutical value.

Biotechnological applications in dairy processing occupy key position in the future perspective for both basic and strategic research. Genetic manipulation of dairy starters and construction of strains for health foods as also the creation of gene bank of lactic acid bacteria for future industrial applications are major programmes in this area. Biosensors for monitoring adulterants, pesticide residues, antibiotics, toxins and food pathogens, and RT-PCR kits for high-risk pathogen detection in milk and dairy products are other biotechnological programmes for the future. Quality-related research will also focus on rapid methods and kits for pathogenic organisms, toxins and xenobiotics. Novel bacteriocins as food-grade bio-preservatives and DNA technology for their production aimed at reducing the spoilage of milk products would have considerable economic implications for the dairy industry.

Health foods have considerable future for the dairy industry. Characterization and application of bioactive components of milk origin, e.g. osteopontin, fortification of milk and milk products with nutrients such as iron, calcium as well as dietary fibre and bioactive fermented foods are important areas of current research to be extended into the future. Sugar substitutes in sweetened milk products, cereal and fruit-based dairy food formulations, newer cheese varieties and ready-to-serve or ready-to-reconstitute indigenous milk products will help the dairy industry in diversifying its product lines.

Newer technologies such as Ohmic heating and high-pressure processing in addition to UHT and membrane processing will usher in ways of extending the shelf-life of dairy products with typical physical structure and add functionality to some conventional products. At the same time research on mechanization and automation for large-scale production of traditional dairy products will be extended to cover more and more items of commercial significance, with special emphasis on energy-saving and improved quality. Packaging systems to suit Indian milk products and biodegradable materials for

environment-friendly packaging will be the other areas of research oriented to take care of the practical needs.

Likewise, in the area of Dairy management, due emphasis will be laid on the development of management information system for livestock species; development of packages of management practices for institutional, commercial and small-farm dairy-production systems, and development of sustainable milk production and suitable shelter systems for dairy animals under different agro-ecological regions.

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### ANAND AGRICULTURAL UNIVERSITY, ANAND

#### Special convocation for erstwhile GAU students

A special convocation for the students of erstwhile GAU was organized by AAU, Anand on 11 January 2006. Hon'ble the Chancellor and H.E. the Governor of Gujarat, Shri Nawal Kishore Sharma, presided over the function. Chief Minister of Gujarat Shri Narendrabhai Modi delivered the Convocation address; Minister for Agriculture, Gujarat State, Shri Bhupendrasinh Chudasma was the Guest of Honour; and Shri Sundarsinh Chauhan, Minister for Socially and Economic Backward Classes, graced the occasion.

Delivering the convocation address, Shri Modi said that agriculture is the basis of human culture and it has made the civilization possible. He spelt out the vision of the state government to foster stability, sustainability and growth in agriculture.

Total 217 graduate and post-graduate students of erstwhile GAU received their degrees. The VCs' gold medals were awarded to Patel Pareshkumar Kalyanbhai in the Faculty of Agriculture, Nagpal Ashok Kumar in the Faculty of Veterinary Science and Animal Husbandry, and Ms Medha Kunj Pandya in the Faculty of Dairy Science.

Total 28 gold medals were awarded to various students of different faculties. Ms Nidhi Bansal, a student of M.C. College of Dairy Science, received 10 gold-plated silver medals and Shri Ashok Kumar Nagpal, a student of Veterinary Science College, Anand received seven gold medals.

The VC, Prof. M.C. Varshneya, delivering the address informed that a project of Rs 3 crores has been started by the university, wherein an experimental plant for production of bio-diesel from *Jatropha* has been established. Besides, Embryo Transfer Technology Centre, Centre of Excellence in Biotechnology and Centre of Organic Farming have also been established.

### G.B. PANT UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, PANTNAGAR

#### Shri Sharad Pawar inaugurates VCs' Conference

The Union Agriculture Minister, Shri Sharad Pawar, inaugurated the conference of Vice-Chancellors of Agricultural Universities at Pantnagar on 5 February 2006. He laid emphasis on making agricultural education entrepreneurship centred and on developing professionals and not merely degree-holders. Shri Pawar cautioned the Vice-Chancellors about stagnation in agricultural productivity and to be prepared to the increasing pressures of WTO and its impact on Indian agriculture.



Dr P.L. Gautam, VC with CM Shri N.D. Tiwari, Union Agriculture Minister Shri Sharad Pawar and Dr Mangla Rai, DG, ICAR and Secretary, DARE

Chief Minister of Uttaranchal, Shri N.D. Tiwari, said that special efforts should be made to collect knowledge-based evidences from other countries and try to apply them in our situations with appropriate modifications as and where necessary.

Earlier Dr Mangla Rai, Director-General, ICAR, informed that special budget provision of Rs 100 crores has been earmarked to provide support for agricultural universities in strengthening selected niche areas.

Dr S.S. Magar, Chairman, Indian Agricultural Universities Association, urged the Union Agriculture Minister to develop a comprehensive National Policy on Agriculture to meet the new challenges. Dr P.L. Gautam, VC, GBPUAT, Pantnagar, while proposing the vote of thanks urged Shri Pawar to provide special financial support for modernization of the university farm. Dr Mrithunjaya welcomed the guests and delegates.

Dr Mangla Rai also chaired the technical session. In his introductory remarks he appreciated the services of VCs of SAUs and Directors of ICAR-Deemed Universities. The recommendations of the conference are given below.



Award of merit certificates by Shri B.S. Hooda, CM



Union Minister Shri Sharad Pawar and Dr Mangla Rai, DG, ICAR, on a visit to NDRI cattle yard



1. There should be awareness down the line about the intricacies involved in dealing with biodiversity in future.
2. There is need to establish parallel vocational system for education and training to agricultural workers. Only need-based certificate courses are to be started on ODL or conventional mode, and it should be self-supporting. The universities may consider beginning of such certificate courses in the respective niche areas of excellence.
3. The recommendations of high-power committee on impact analysis of development grant in the context of overall development of SAUs and Central Universities in IX Plan may be kept in view while deciding the future programmes of the development and strengthening of higher agricultural education.
4. For National Eligibility Test (NET) and Agricultural Research Service (ARS), it was decided to restrict the number of desired current 69 subjects to 37 as detailed in the note for ARS examination as well as NET examination.
5. The agricultural universities were requested to settle the accounts of NATP latest by the end of February 2006. The project modalities already stand finalized, and it was decided to put the guidelines on web so that agricultural universities may download the information and start using these for preparation and participation in the project.
6. The fourth Deans' Committee on agricultural education and necessary reforms should submit it early for implementation in the next academic year. The report will also be useful in the formulation of IX Five-Year Plan.
7. For parity in fee structure in SAUs, the details regarding tuition fee, hostel charges etc. prevailing in different agricultural universities should be collected. In the mean time it was decided that the agricultural universities charging less than Rs 2,500 for B.Sc. or less than Rs 5,000 for M.Sc. per semester must increase the fee.
8. As awareness generation in IPR-related issues including bio-diversity access and management aspects is important, a core group of scientists' or academicians should be identified, taking potential personnel from different institutions, to form a think-tank which could help in meeting the new IPR-related challenges. To begin with, a brief note on Intellectual Property Portfolio Management may be prepared by ADG (IPR) and circulated to all agricultural universities and ICAR institutes for preparedness in this direction. It was also decided that each university would bring out a document on intellectual property.
9. It was felt necessary to establish quality analysis laboratories in different corners of the country so that it becomes easily accessible to the farmers for certifying their produce for quality parameters before selling into the market. It was decided that ICAR in NAIP, should consider strengthening this activity.
10. It was decided to strengthen placement cells, for which universities were advised to consider inter-university linkages. Also, the success story of HPKVV, Palampur and TNAU, Coimbatore may be considered by other SAUs for their efficient working.
11. The item of the IVRI for flexibility in the curriculum and opportunities for students to gain knowledge and skills to respond to the future needs through changes in veterinary medicine and biomedical sciences education. It was decided that non-degree programme could be taken up by the IVRI keeping in view the suggestions made under Agenda No. 4. The proposals on degree programme can be considered in case VCI is working in partnership with IV<sup>th</sup> Dean Committee.
12. About steps to check repetition of research work it was deliberated that as and when the topic of the research work is finalized, it should be put up to website of the institute.
13. To avoid capacity building of faculty in the context of vocational or professional curriculum, only need-based certificate courses are to be started on ODL or conventional mode. The programmes should be self-financing and those having the required faculty and infrastructure may take them up.
14. It was pointed out that the ICAR is already supporting Educational Technology cell activity and any SAU where it is not functional must establish its educational technology cell.
15. All-out efforts should be made by the SAUs to make KVKs more robust in discharging their functions.



VCs' Conference

16. All agricultural universities were requested to develop a concept note on expectations on Agricultural Education from XI Plan and forward to the Education Division within 2 months.
17. The universities are in total freedom and flexibility to re-select niche area of excellence, which is in line with the objectives and guidelines of the project.
18. It was recommended that henceforth all the agricultural universities may invariably include Hindi or other local language version of the research synopsis and the abstract of all the Masters and Ph.D. theses. The agricultural universities should make sincere efforts to encourage teaching in Hindi medium at UG and PG levels.

#### Varieties released

During January-March 2006, eight new varieties of different crops were released. Two varieties of wheat, viz. UP 2554 for timely-sown conditions (50 q/ha yield potential) and UP 2565 for late-sown condition (41 q/ha yield potential); two varieties of blackgram, viz. Pant Urd 31 and Pant Urd 40 (12-15 q/ha yield) with multiple disease resistance; one variety of field pea, Pant Pea 13 (yield 15-20 q/ha) with resistance to powdery mildew and rust; one variety of forage sorghum, CSH 20 MF with 800-900 q/ha green fodder and 250-300 q/ha dry-fodder yield in 3-4 cuttings and with very low HCN content (100-120 ppm); one variety of sugarcane, Co Pant 97222, with 850-900 q/ha yield and 16.5-19.5% sugar content with very high sugar recovery (12.5-13.0%), and one variety of soybean Pant Soybean 1374 (30.35 q/ha) with multiple resistance were released for cultivation in Uttaranchal state and adjoining parts of other states.

#### Vermin-compost sent for Moghul Garden

The Instructional Dairy Farm of the College of Veterinary and Animal Sciences is converting the huge dung and agricultural waste of the university into vermin-compost. The first lot of 150 q vermin-compost out of the demand of 1,000 q has been sent to President's House at New Delhi on 29 March 2006 for use in Moghul Garden.

The college has planned to produce and sale initially of 50,000 q vermin-compost each year. Its packaging, labelling and marketing would be done through Uttaranchal Tarai and Seeds Development Corporation, Haldi (near Pantnagar). The college, in addition to increasing the farm production as well as environment cleanliness greatly, will generate a net additional income of Rs 9 lakhs per annum.

#### Fodder bank established

Quality fodder is scarce in the hills and in plains. The College of Veterinary and Animal Sciences has started the first fodder bank in Uttaranchal to meet this requirement. The bank is preparing Urea Molasses Mineral Blocks (UMMB) of 2 kg and Completed Feed Block (CFB) of 4 kg costing Rs 27 and 16 respectively. This year the university has planned to utilize every part of straw from the university farm for CFBS. The blocks are being sold to tarai as well as hill livestock farmers and to the Uttaranchal state cooperative dairy federation (Anchal) to meet the fodder demand. There is huge demand from other livestock farmers also.

#### MAHATMA PHULE KRISHI VIDYAPEETH, RAHURI

##### Twenty-third convocation

The twenty-third convocation of MPKV was held on 25 February 2006 at Central Campus, Rahuri. Shri Balasaheb Thorat, Pro-Chancellor and Minister for Agriculture, Water Conservation and Kharlands, Maharashtra State, presided over the function. Dr Mangala Rai, Secretary, DARE, Government of India, and Director-General, ICAR, New Delhi delivered the convocation address. He said that to keep pace with the technological, economic, environmental and social concerns and challenges, henceforth a strong science and technology input, infusion and application system will be necessary to support sustainable and equitable development of agriculture. It is indispensable to take knowledge and learning to farmers' door-steps at the time and place of their convenience. Employment of modern methods of information and communication (open and distance modes of education and learning) ought to occupy a front place for transmitting knowledge and skills. However, use of electronic media in extension education is less



Shri Balasaheb Thorat presenting certificates to students



Dr Mangala Rai delivering convocation address



developed than the perceived need. Shri Vijayrao Kolte, Vice-Chairman, Maharashtra Council of Agricultural Education and Research, Pune graced the function. Dr Rajaram Deshmukh, VC, delivered the welcome address and briefed about the research, education and extension education activities of the university.

During the function, B.Sc. (Agric.), B.Tech. (Agric. Engng) and B.Sc. (Hort.) degrees were awarded to 1041, 113 and 67 students respectively, whereas M.Sc. (Agric.), M. Tech. (Agric. Engng) and Ph.D. degrees were awarded to 361, 19 and 39 students respectively. Further, 105 students were awarded B.V.Sc. and Animal Husbandry degrees.

## MARATHWADA AGRICULTURAL UNIVERSITY, PARBHANI

### Second prize for exhibiting latest technology

MAU, Parbhani participated in the Western Region Exhibition-cum-Kisan Mela during 14-17 February 2006, organized by the Indira Gandhi Agricultural University, Raipur in co-ordination with the Ministry of Agriculture, Government of India, New Delhi at Raipur (Chhattisgarh). Development departments of the states, SAUs and ICAR institutes as well as NGOs and private companies from western region, Rajasthan, Madhya Pradesh, Gujarat, Maharashtra, Chhattisgarh and Goa along with Union territories Dadra & Nagar Haveli and Diu & Daman participated and exhibited their technologies at the mela. Shri Nankiramji Kanwarji, Minister for Agriculture, Chhattisgarh along with many other dignitaries and thousands of farmers, extension workers and students visited the MAU stall. MAU, Parbhani was honoured with second prize in SAUs group for exemplary exhibition of the latest agricultural technologies most useful to the farmers.



Shri Nankiramji Kanwarji at the exhibition

### First prize for national-level cattle show-cum-agricultural exhibition

MAU, Parbhani participated in All India Cattle Show and Agricultural Exhibition during 26 February-4 March 2006 organized by the Shideswar Yatra Committee, Latur in co-operation with the Government of Maharashtra at Latur (Maharashtra). Shri Sharadchandraji Pawar, Union Minister for Agriculture, inaugurated the function. Shri Balasaheb Thorat, Minister for Agriculture, Maharashtra and many other dignitaries as well as thousands of farmers, extension workers and students visited the university's Exhibition Stall. Agricultural and allied products and by-products, agricultural implements and accessories, seeds, saplings, seedlings, publications and planting materials were available for demonstration and sale. MAU, Parbhani received the first prize for excellently exhibiting the latest agricultural technologies.

## MAHARANA PRATAP UNIVERSITY OF AGRICULTURAL TECHNOLOGY, UDAIPUR

### RCA Golden Jubilee Lecture by Dr M.S. Swaminathan

Dr M.S. Swaminathan, President, NAAS and Chairman, National Commission on Farmers, delivered a lecture '2006-07: Year of Agricultural Renewal' on 11 February 2006 to commemorate Golden Jubilee celebrations of the RCA, Udaipur. Dr V.L. Chopra, Member, Planning Commission, New Delhi was the Guest of Honour and Prof. S.L. Mehta, VC, MPUAT, Udaipur presided over the function. To fully exploit the role of agricultural sector for achieving the stipulated 4% growth of agricultural GDP, leading to 8-10% growth of overall GDP of the country, Dr Swaminathan pinpointed the areas for priority approach. The identified areas included soil-health enhancement, supply augmentation and demand management of irrigation water, easy access to credit and insurance, technology management and input delivery, agro-processing and value addition, effective marketing of farm output, establishment of Indian Trade Organization (ITO), rural capacity building, management of infrastructure, knowledge connectivity etc. The National Commission on Farmers therefore recommended that the agricultural year 2006-07 be designated as Year of Agricultural Renewal.



RCA Golden Jubilee Lecture by Dr M.S. Swaminathan

## NARENDRA DEV UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, FAIZABAD

### Tenth convocation

NDUAT, Faizabad held its Tenth Convocation on 3 April 2006. H.E. the Governor of U.P. and the Chancellor Shri T.V. Rajeshwar while conferring the graduate and post-graduate degrees and medals to the students reminded them that they are standing at the threshold of a new world where they will have to face new challenges of the highly competitive life, and advised them to lead the nation on the path of progress practising value-based life-style and facing the difficulties with valour. Delivering the convocation address, the chief guest Dr Panjab Singh, VC, BHU, Varanasi, called upon them to mobilize their skill and knowledge gained during their studies for the cause and upliftment of rural masses, especially for the weaker sections of the society and small farmers. The university on this occasion awarded D.Sc. degree (Honoris Causa) to Dr Panjab Singh. The VC, Dr S.M. Ilyas, apprised the audience that the university within a period of three decades even under financial crises got recognition internationally in the field of developing technologies for amla as well as deep-water paddy, and their tolerance to salt and submergence. He stressed the need to exploit biotechnology, a new tool of 21<sup>st</sup> century for making India free of hunger and pollution and with safe environment for future generations. At the convocation 123 students of B.Sc. (Gen.); 31 girl students of B.Sc. (H.Sc.); 63 students of B.V.Sc.; 186 students of M.Sc. (Agric.); 9 girl students of M.Sc. (H.Sc.) and 60 students of Ph.D. received the degrees. Also 12, 49 and 61 students received Chancellor, Vice-Chancellor and University Gold Medals respectively.



Tenth convocation

## PUNJAB AGRICULTURAL UNIVERSITY, LUDHIANA

### Six new varieties approved

Punjab State Variety Approval Committee approved and recommended for release four Bt cotton hybrids, and one maize and one bajra hybrids for cultivation in the state. In addition, PAU's Research Evaluation Committee has recommended adaptive trials of a semi-dwarf rice variety, a hybrid of *desi* cotton and a variety of summer greengram.

The four Bt cotton hybrids are RCH 134, RCH 317, MRC 6301 and MRC 6304, developed by private companies. They are high-yielding and resistant to American bollworm and spotted bollworm, mature in 160-165 days and give 43 to 64 % more yield than LHH 144. The new maize single-cross hybrid is PMH 2, which is tolerant to bacterial stalk rot and resistant to root lodging and stem breakage. Recommended already for timely sowing under rainfed conditions, now it is recommended also for sowing under irrigated conditions. The bajra hybrid PHB 2168 matures in 80 days and has better yield potential than PHB 47. It is also resistant to downy mildew.

PAU 2769 rice gives 10% more yield than PR 116, and is resistant to all eight pathotypes of bacterial blight prevalent in the state. It matures in 142 days after seeding. *Desi* cotton hybrid recommended for adaptive trials also has high yield potential. Summer greengram SML 732 gives 23% higher grain yield than SML 668. It is tolerant to yellow mosaic virus and has bold, shining seeds.

## RAJASTHAN AGRICULTURAL UNIVERSITY, BIKANER

### Sixth convocation

RAU, Bikaner organized its sixth convocation on 23 March 2006. Addressing the faculty and the recipients of degrees, H.E. Smt. Pratibha Patil, Governor of Rajasthan and Chancellor of RAU, stressed the need for increasing the productivity of the dryland areas of Rajasthan by developing appropriate technologies for enhancing water-use efficiency to ameliorate the declining trend of water availability for agricultural purpose. She also emphasized the importance of rapid dissemination of suitable technologies at the farmers' level with the help of modern communication systems. Smt. Patil suggested establishment of a Knowledge Village in every Panchayat, as it will act as a catalyst in enhancing technology transfer. Dr Y.L. Nene, Chairman, Asian Agri-History Foundation, Secunderabad in his convocation address drew attention of the young graduates and post-graduates to the emerging opportunities in the agriculture sector. He called for promotion of agri-business activities to speed up the growth of the Indian economy and to project the country



Chief Guest, Governor Smt. Pratibha Patil at Sixth Convocation



as a leader in international trade. Presenting his report, Dr Parmatma Singh, VC, RAU, highlighted the salient achievements of the university during the past 1 year such as financial resource generation and management, infrastructural development, technology development and its transfer, addition of new academic programmes including short-term courses through resident and distance-education modes, human resource management etc. The university conferred 572 graduate, masters and doctorate degrees. Eighteen scholars from the faculties of agriculture, veterinary and animal science, home science and agri-business management were awarded university gold medal for their academic excellence.

## **TAMIL NADU VETERINARY AND ANIMAL SCIENCES UNIVERSITY, CHENNAI**

### **Significant event**

The information-retrieval package (IRP) developed by Bio-Informatics Centre and ARIS Cell, Madras Veterinary College, Chennai has been granted a copyright registration certificate by National Research Development Corporation, New Delhi. IRP is an application software or tool used to create database and search or retrieve documents from the database created using IRP. It contains two modules, viz. Information Entry Module and Information Search Module. It has been tested and validated by creating a database on abstracts of research findings of poultry by TNVASU scientists.

### **Utilization of carcass and by-products**

A carcass and by-products utilization centre has been established at Veterinary College and Research Institute, Namakkal at a total cost of Rs 135 lakhs by the Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India, New Delhi and the Government of Tamil Nadu. Dr N. Balaraman, VC, TNVASU inaugurated the new facility on 18 January 2006. The centre has been created to impart training on carcass utilization, demonstration of safe disposal of dead animals and birds, and by-product utilization to livestock farmers and entrepreneurs.



Inauguration of carcass and by-products utilization centre

## **UNIVERSITY OF AGRICULTURAL SCIENCES, BANGALORE**

### **Disease and pest resistant high-yielding hybrid maize**

Hybrid maize NAH 2049 has been identified by UAS, Bangalore at ARS, Naganahali, Mysore. It matures in 120 days with a yield potential of 8 to 9 tonnes/ha and is tolerant to turicum leaf blight, downy mildew and stem borer. This hybrid has been recommended for Zones 4,5,6 and 7 of Karnataka state under rainfed and irrigated conditions.

### **Roof-water harvesting**

The rain-water harvesting (RWH) work for agricultural college building at GKVK, UAS, Bangalore was completed during May 2005 at a total cost of Rs 4.08 lakhs. The rain-water project now in operation is the third-biggest roof-water harvesting structure in Bangalore, next only to those of the Vidhan Soudha and the Karnataka high court buildings in the city. The RWH at GKVK has a storage capacity of 50,000 litres, connected to an infiltration gallery (1,200 cft) for further ground-water recharge of the overflow. The water from roof top is first sent to 24 down pipe chambers and 5 bigger inspection chambers, before reaching the stabilization tank, which ensures complete removal of physical impurities from the harvested water before storage. This RWH is designed to harvest roof water from 1,562 m<sup>2</sup> area to the extent of 1,617,142 litres (compared with the current requirement of 2,45,000 litres (10,000 litres/day for 245 days), i.e. the harvested water can meet the requirement of the college for 162 days in a year.

## **AWARDS AND RECOGNITION**

### **DR.B.S. KONKAN KRISHI VIDYAPEETH, DAPOLI**

#### **Dr S.S. Magar visits Ethiopia**

Dr S.S. Magar, VC, attended an international conference on 'Best

practices and technologies for agricultural water management' in Ethiopia, organized jointly by Central Agricultural and Rural Development Ministry Ethiopia; Central Water Management Ministry International Development Institute of the USA; and International Water Management Institute, Addis Ababa, Ethiopia from 7 to 9 March 2006. He presented a research paper on water management at this conference. His visit was sponsored by International Water Management Institute.



Dr S.S. Magar

#### **Shri Dhanajirao Tatugade secures first rank in GATE, 2006**

Shri Dhanajirao Tatugade, a student of College of Agricultural Engineering and Technology, the constituent college of DBSKKV, Dapoli, gave excellent performance in GATE, 2006 and ranked first at national level.



Shri Dhanajirao Tatugade

### **MAHATMA PHULE KRISHI VIDYAPEETH, RAHURI**

#### **Shivner Bhushan Award to VC**

Dr Rajaram Deshmukh, VC, MPKV, Rahuri, was honoured with Shivner Bhushan Award by Shri Gajanan Maharaj Shikshan Prasarak Mandal, Otur, dist. Pune. The award was presented on the occasion of the birthday of Shri Sharadchandraji Pawar, Minister of Agriculture, Government of India on 12 December 2005. He received the award for his research on pulses. Fifteen varieties of pulses developed by Dr Deshmukh have been recognized at the national level. Dr Deshmukh is the recipient of the national and international awards like Colombo Plan, Dorin Mashler and King Bowedoin awards. Dr Arun Nigwekar, ex-Chairman, University Grant Commission, felicitated Dr Rajaram Deshmukh on this occasion.

## **MAHARANA PRATAP UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, UDAIPUR**

#### **Dr H.C.L. Gupta elected Vice-President, IAUDA**

Dr H.C.L. Gupta, Dean, Rajasthan College of Agriculture, MPUAT, Udaipur was elected Vice-President of Indian Agricultural Universities Dean's Association in the first meeting held at ANGRAU, Rajendranagar, Hyderabad on 20 January 2006.

## **PUNJAB AGRICULTURAL UNIVERSITY, LUDHIANA**

#### **NAAS fellowship**

Dr A.S. Sidhu, Head, Department of Vegetables Crops, was awarded the prestigious fellowship of NAAS, New Delhi for the year 2006. There is only one national fellowship in horticultural crops. He is the first horticultural scientist from PAU for the conferment of this fellowship.

Dr Sidhu has to his credit outstanding research contributions in the field of improvement of vegetable crops for the last three decades. His researches have resulted in the evolution of 20 improved vegetable varieties or hybrids.



Dr A.S. Sidhu

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