भाकृअनुप
ICAR

ICAR NEWS

A SCIENCE AND TECHNOLOGY NEWSLETTER

VOLUME 1 NO. 1 JANUARY-MARCH 1995

BREAKTHROUGH

CONTENTS

Published by

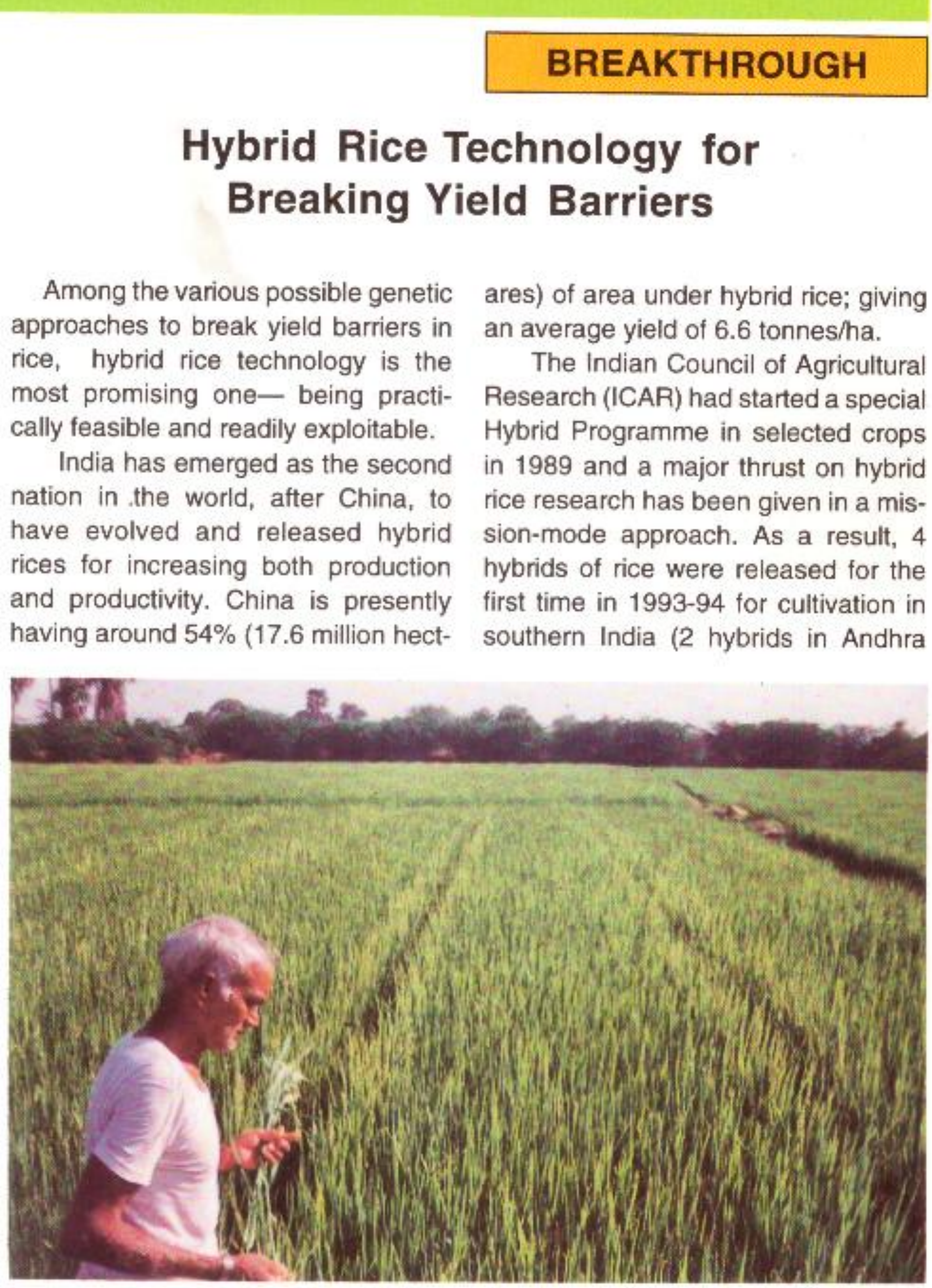
Indian Council of Agricultural Research
Krishi Bhawan, New Delhi 110 001
India

Hybrid Rice Technology for Breaking Yield Barriers

Among the various possible genetic approaches to break yield barriers in rice, hybrid rice technology is the most promising one— being practically feasible and readily exploitable.

India has emerged as the second nation in the world, after China, to have evolved and released hybrid rices for increasing both production and productivity. China is presently having around 54% (17.6 million hectares) of area under hybrid rice; giving an average yield of 6.6 tonnes/ha.

The Indian Council of Agricultural Research (ICAR) had started a special Hybrid Programme in selected crops in 1989 and a major thrust on hybrid rice research has been given in a mission-mode approach. As a result, 4 hybrids of rice were released for the first time in 1993-94 for cultivation in southern India (2 hybrids in Andhra



Pradesh and 1 each in Karnataka and Tamil Nadu). Also, private sector R&D organizations have come forward with some of their promising rice hybrids.

In a meeting recently convened by the ICAR, under the Chairmanship of Dr R.S. Paroda, Director-General, the present status was reviewed for accelerating the pace of this technology, since hybrids are capable of giving one tonne additional productivity, especially in irrigated rice areas. It was noticed that with the seed-availability position of different hybrids during the coming *kharif* season, about 6,000 hectares would be covered under the new rice hybrids both in southern states as well as in Haryana and Punjab.

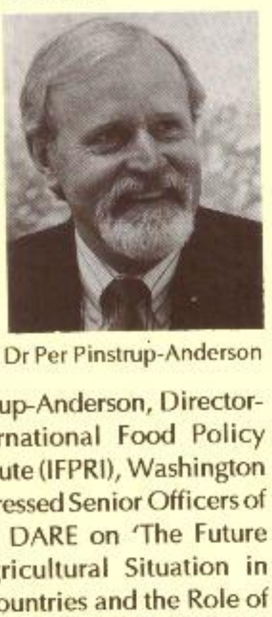
The ICAR Hybrid Rice Project is being supported by the UNDP-FAO, in which a large number of scientists and seed technologists have been trained in China. The project is being operated as a National Research Network with 12 centres across the country.

With the successful development and release of 4 hybrids, viz. APRH 1 and APRH 2 for Andhra Pradesh, TNRH 1 for Tamil Nadu, KRH 1 for Karnataka, and identification of CRH 1 and PHB 71 for more than one state, India has become the second country after China to make hybrid rice technology a field reality. Combining the firm grain and medium maturity, the hybrids yield a tonne more than the best variety. Many hybrids with still higher yield and disease/pest resistance are in the pipeline. The level of progress made in the development of parental lines promises sooner than expected hybrids of basmati quality and hybrids for rainfed lowlands. The better seed-yield advantage (as high as 2 tonnes/ha obtainable through well-perfected seed-production package) coupled with less than half the recommended seed rate required for normal planting, would ensure viability of the technology and its rapid spread to over 3 million hectares in the next 5 years.

Comprehensive training programmes on various aspects of the seed production as well as cultivation of hybrid rice have been conducted at the Directorate of Rice Research, Hyderabad, and at the Krishi Vigyan Kendra, Gaddipalli, in Andhra Pradesh.

Seeds of the promising parental lines have been supplied freely to both public and private sector seed agencies, so that they get adequate experience and confidence to launch seed production on a much larger scale in view of the huge anticipated demand. ❑

Points to Ponder



Dr Per Pinstrup-Anderson

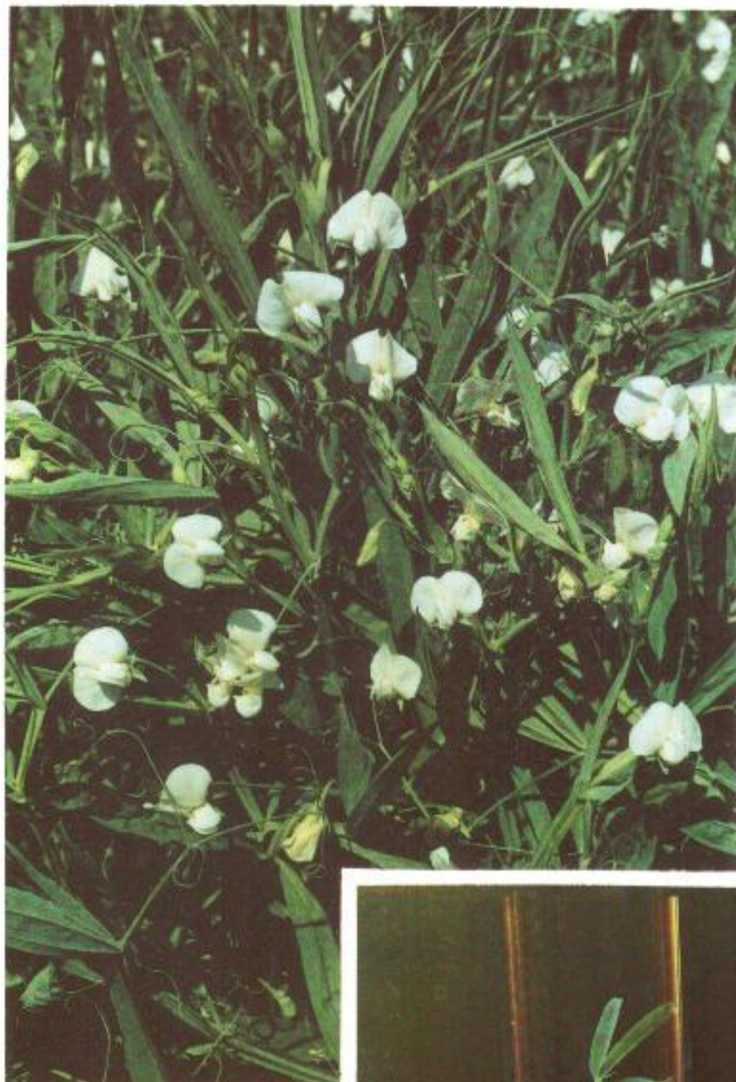
Dr Per Pinstrup-Anderson, Director-General, International Food Policy Research Institute (IFPRI), Washington DC, USA, addressed Senior Officers of the ICAR and DARE on 'The Future Food and Agricultural Situation in Developing Countries and the Role of Research' on 31 March 1995. He pointed out that despite impressive food production growth in recent decades the world is not food secure; the food production growth barely kept up with the population growth. In South Asia, home to one-third of the developing world's undernourished, the number of under-nourished increased from 254 million (34% of the population) in 1969-71 to 271 milion (24% of the population) in 1988-90. By the year 2010, it may come down to 12% but it will still be of the order of 202 million.

'Hunger is a consequent of poverty', he said. In 1990, an estimated 1.1 billion people lived in households that earned a dollar a day or less per person and 50% of these lived in South Asia, 19% in sub-Saharan Africa, 15% in East Asia and 10% in Latin America and the Caribbean.

Preliminary IFPRI projections indicate widening of gap between cereal production and consumption from 91 million tonnes in 1990 to 192 million tonnes in 2020 AD. South Asia will make net imports of 13.7 million tonnes in 2020 AD from the 1990 level of 0.7 million tonnes.

The agricultural development is essential both for producing more food and for ensuring better access to food through employment creation and income growth. **'Agriculture is a powerful engine of growth'**, he said.

Investment in research must be accelerated if developing countries are to assure food security. Expenditure on public sector agricultural research in low-income developing countries is less than 0.5% of the agricultural gross domestic product compared to about 2.0% in high-income developed and industrialized countries. Developing countries have 82 agricultural researchers per million economically active persons in agriculture compared to 2,458 in the industrialized countries. The rate of return on investment in agricultural research in Asia was very high.



Lathyrus in flowering

Regeneration of *Lathyrus* in test-tube

Banned *Lathyrus* Likely to Become Boon

Lathyrus sativus, popularly known as khesari dal, is a hardy grain-legume and is cultivated in Madhya Pradesh, Maharashtra, West Bengal and Uttar Pradesh in India. It is also grown in Bangladesh, Nepal, Pakistan and Ethiopia. In the early sixties, *Lathyrus sativus* was found to cause neurolathyrism (Lathyrism—lower limb paralysis) in children of the families who were using *Lathyrus* as the staple food for a long period. Despite the ban on its cultivation this is still being grown for its tolerance to drought and flood, and requirement of minimal management practices. Besides, it is a good source of quality protein (28-34%).

The causal agent for neurolathyrism has been identified as β-oxalylamino alanine (BOAA) or also called β-oxalyldiamino propionic acid (ODAP). The market samples of khesari show toxin content ranging from 0.8 to 1.0%. Any strain containing lower than 0.2% toxin content would be safe for human consumption even as a staple food. In view of this, attempts were made to develop lines with lower levels of neurotoxin through conventional plant breeding, screening of germplasm and mutation breeding. However the lines were not stable.

Lately, however, with the application of biotechnology and tissue-culture techniques, a breakthrough has been achieved at the IARI, New Delhi, in developing somaclonal lines with less than 0.05% neurotoxin. Many lines combine low toxin content with high yield. Advanced multilocation trials are under way to assess their performance.

It is also estimated that the total benefit by growing low toxin *Lathyrus* lines could be to the tune of Rs 20,000 million per annum in India alone. This would also be a boon for farmers in the arid regions of the world including Bangladesh, Ethiopia, Nepal and Africa.

Elaborate tests made at the Centre for Legumes Mediterranean Agriculture (CLIMA), Australia, have confirmed the IARI finding and the institute has signed an agreement with the IARI for collaborative research. ❑

National Agricultural Technology Project (NATP)

There has been an unprecedented increase in agricultural production during the past 4 decades or so. Notwithstanding the impressive gains in the agricultural production, the vast agricultural potential still remains highly under-realized. There are serious gaps both in yield potential and technology transfer as the national average yield of most of the commodities is low. Burdened with poverty, about 20% of the population does not have access to adequate food and is malnourished. To keep pace with the present rate of population growth and consumption pattern, the food requirement has been estimated to cross 225 million tonnes by 2000 AD. This would mean an annual agricultural growth of 6-7%, which is a daunting task considering the rapidly shrinking resource-base and fast declining input-use efficiency in major cropping systems. Further, the agricultural development in the country would also henceforth be guided by the concerns for environmental protection, sustainability and profitabilty. To meet complex challenges, national technology generation and transfer system must be made responsive and dynamic. Serious gaps in the national agricultural research and technology development system need to be bridged. In order to achieve these goals, the ICAR in active co-operation with the Department of Agriculture and Co-operation, Government of India, is planning to launch a National Agricultural Technology Project (NATP).

A steering committee on the NATP has been constituted comprising distinguished ICAR and Department of Agriculture and Co-operation officials with the Director-General, ICAR, and the Secretary, DARE, as its chairman. The concept paper of the NATP has been accepted by the World Bank with great appreciations. The project is expected to run for 5 years with an approximate budget of around Rs 8,000 million.

Why NATP

- For improving the congruence between the policy goals and overall resource allocations for agricultural technology generation, assessment, refinement and transfer for increasing agricultural productivity, sustainability, profitability and equity.
- To bridge critical gaps to ensure a sustainable and equitable all-round agricultural development with a vision and mission to make Indian Agriculture internationally competitive and nationally relevant to attain and sustain advantages on research and development fronts, regionally and globally.

The draft document on the NATP would be ready by October 1995 and the project is expected to be launched by June 1996.

Objectives

(i) Strengthen national capacity in research and extension management, policy planning, priority setting, monitoring and evaluation to meet current and emerging needs of agricultural development.

(ii) Strengthen and/or establish infrastructural and institutional supports to ensure adequate facilities for undertaking desired research and technology development activities.

(iii) Foster linkage mechanisms (a) between research, extension and client groups, (b) between technology and development-oriented departments, programmes, institutions including non-governmental organizations (NGOs), (c) between public and private sector initiatives in technology generation, assessment, refinement and transfer, (d) to introduce innovative means to share research and extension costs and responsibilities.

(iv) Maximize nation's capacity to effectively benefit from biotechnology and advances in other agrobiological sciences in a global context and develop first-rate international information retrieval and dissemination mechanisms and systems.

(v) Develop human resource, particularly in frontier areas of science and technology, management skills and technology assessment.

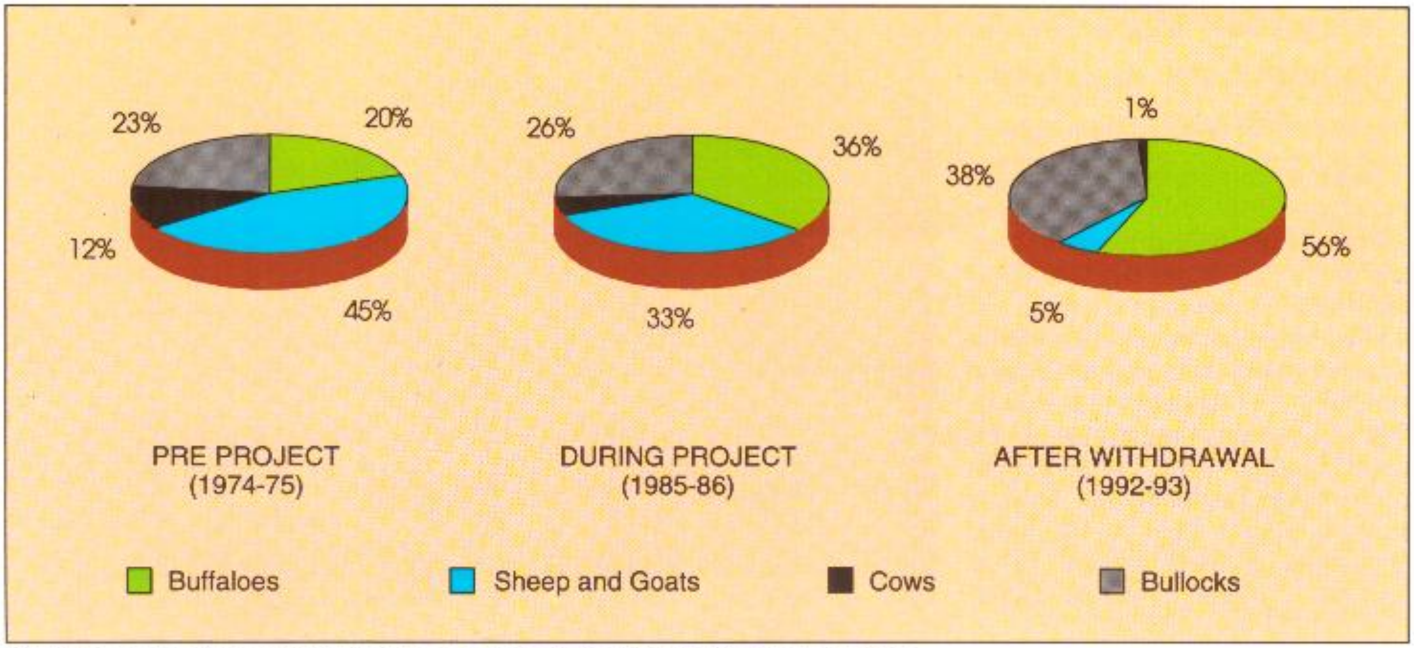
(vi) Formulate and initiate research and technology development based on programme and matrix approach in priority areas using systems concept so that the overall efficiency of the National Agricultural Research System (NARS) is improved. ❑

Integrated Watershed Management in Lower Himalayas

Resource conservation in Himalayas is of vital importance for it has an important bearing on the agroclimate of not only of the hills region but also of the vast areas in the plains. Integrated watershed management holds the key for conserving resources and for bringing prosperity to the people of the area. This was amply demonstrated by the scientists of the Central Soil and Water Conservation Research and Training Institute, Dehra Dun, in the lower Himalayas of India (Fakot, Tehri-Garhwal). Local material, skills,

Fakot watershed before the project (in 1974) was highly degraded with broken terraces and frequent crop failures.

Peoples' participation has helped to restore the watershed through water harvesting, storage and recycling as well as diversification into horti-pastoral systems.



Livestock composition continued to change in favour of better quality animals at Fakot.

resources and indigenous knowledge of the community were integrated into the improved technology. A watershed of 370-ha with elevation ranging from 650 to 2,015 m msl, average overland slope of 72% and average annual rainfall of 1,980 mm was adopted in 1974-75. Technology package consisted of fruit, fuel, fodder and grass plantation, rainwater harvesting at microscale, terrace management, erosion-preventing works and inputs of improved seeds, fertilizers, etc. Local community contributed in the form of labour only. As a consequent of watershed management measure, cropping intensity and area under cash crops, vegetables, orchards, fodder, fuel and grasses increased at the cost of coarse cereals as well as wastelands. Number of low-yielding traditional livestock like cows, sheep and goats decreased with concomitant increase in the population of high-yielding buffaloes. Seasonal migration of human work-force came down drastically due to increased own-farm employment generation and higher productivity. Farm income increased with increased production of foodgrains, fruit and milk. Runoff from watershed reduced by three times and soil loss by five times. Dependency on forests for fodder went down from 60 to 20%. These trends continued, rather got accelerated, in some items even after withdrawal of the support to the community. ❑

Dr Khush honoured with Fellowship of the Royal Society

Dr Gurdev S. Khush

Dr Gurdev S. Khush, Principal plant breeder, at the International Rice Research Institute, Los Banos, the Philippines, has been elected as a fellow of the Royal Society for his work in improving natural knowledge.

Dr Khush, an Indian, has led the rice breeding research at the IRRI for the past 28 years. During the period, more than 250 breeding lines developed at the IRRI have been released as varieties by the national rice improvement programmes worldwide. One of the varieties developed under his leadership is IR 36, which was the first high-yielding, early-maturing variety of rice with multiple disease and insect resistance.

For his rice varietal improvement work, Dr Khush has been honoured with several international awards, including the Japan Prize by the Science and Technology Foundation of Japan.

Indian Council of Agricultural Research

The Indian Council of Agricultural Research (ICAR) is an autonomous apex body responsible for the organization and management of research and education in the field of agriculture, animal sciences and fisheries in India. The Council was set up in 1929 on the recommendations of the Royal Commission on Agriculture. It was reorganized twice—in 1965 and 1973. The Headquarters of the ICAR is located in Krishi Bhavan, New Delhi.

Organization

The Minister for Agriculture is the President of the ICAR. Its principal executive officer is the Director-General. He is also the Secretary to the Government of India in the Department of Agricultural Research and Education (DARE).

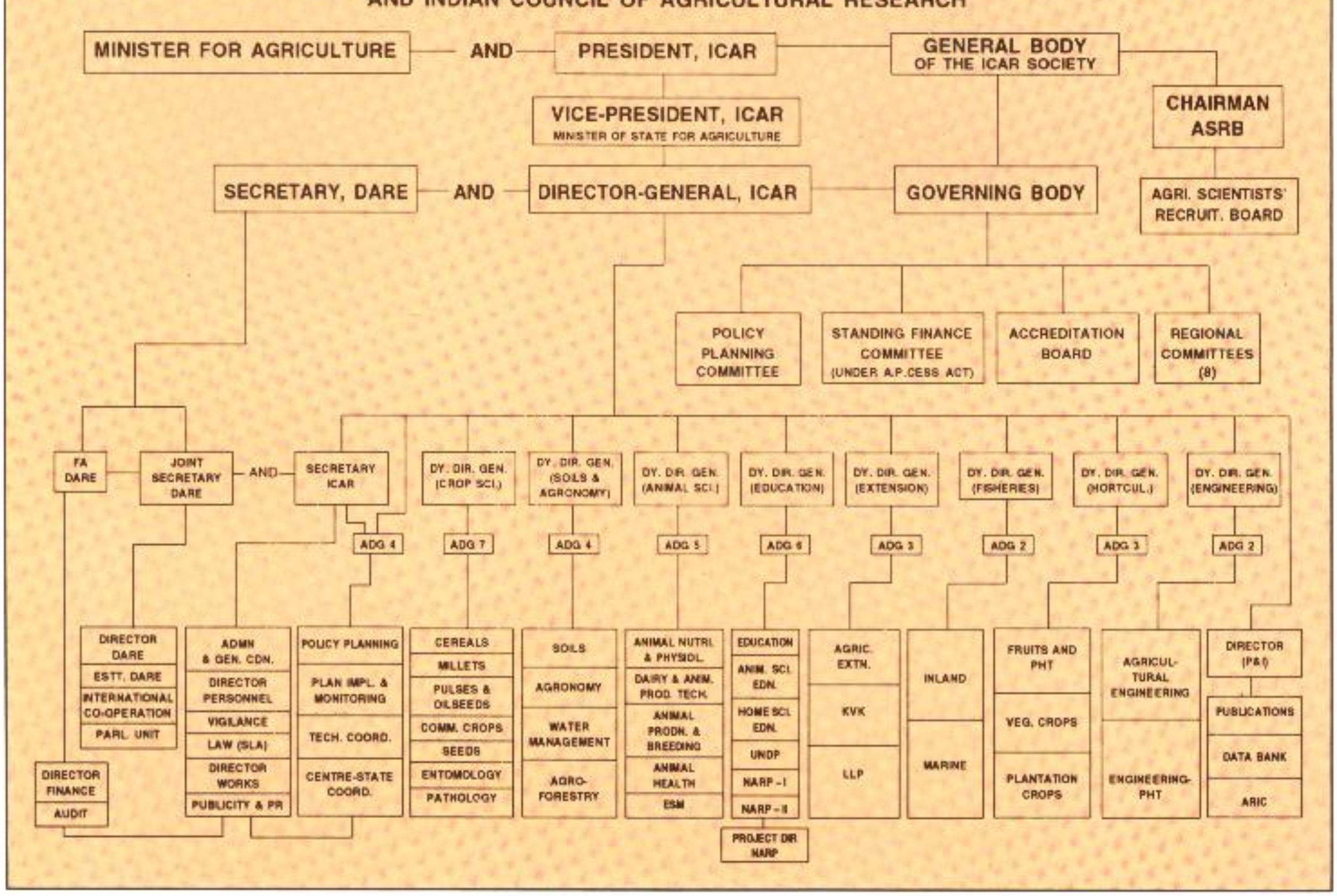
General Body

The General Body is the supreme authority of the ICAR. It is headed by the Minister for Agriculture, Government of India. Its members include the Ministers for Agriculture, Animal Husbandry and Fisheries, and senior officers of various state governments, representatives of the Parliament, industry, educational institutes, scientific organizations and farmers.

Governing Body

The Governing Body is the chief executive and decision-making authority of the ICAR. It is headed by the Director-General. It consists of eminent agricultural scientists, educators, legislators and representatives of farmers. It is assisted by the Standing Finance Committee, Norms and Accreditation Committee, Regional Committees, several Scientific Panels and a Publication Committee.

ORGANIZATION OF THE DEPARTMENT OF AGRICULTURAL RESEARCH AND EDUCATION AND INDIAN COUNCIL OF AGRICULTURAL RESEARCH



Directors-General—Past and Present

Funds

The ICAR receives funds from the Government of India and from the proceeds of the Agricultural Produce Cess. Its total budget for 1994-95 was Rs 4,956.3 million – Rs 2750 million under plan and Rs 2206.3 million under non-plan. It forms about 0.3% of the Agricultural GDP, which is planned to be increased to 1% level.

Functional Set-up

The Director-General of the ICAR functions as the Principal Adviser to the Government of India in all matters concerning research and education in agriculture, animal husbandry and fisheries.

In scientific matters, the Director-General is assisted by 8 Deputy Directors-General — one each in charge of (i) Crop Sciences, (ii) Soils, Agronomy and Agroforestry, (iii) Animal Sciences, (iv) Agricultural Education, (v) Transfer of Technology, (vi) Fisheries (vii) Horticulture and (viii) Agricultural Engineering. The DDGs are responsible for the institutes and projects in their respective fields.

In administration, the Director-General is assisted by the Secretary (who is also the Joint Secretary to the Government of India in the DARE), Directors of Personnel, Finance and Works, and other administrative officers and staff at different levels. The Joint Secretary (Finance) in the DARE is the principal financial adviser in matters of finance. In matters relating to publications, publicity and information, the Director-General is assisted by a Director (Publications and Information).

Agricultural Scientists' Recruitment Board (ASRB) is an independent recruiting agency of the ICAR for its Agricultural Research Service (ARS) and equivalent technical posts, and also for their 5-yearly assessments/promotions. The Council has a National Academy of Agricultural Research Management (NAARM), which provides required training to new entrants to Agricultural Research Service.

Research Set-up

During the past 57 years, the ICAR has developed a vast network of 45 Institutes, 4 National Bureaux, 9 Project Directorates, 30 National Research Centres, a National Academy of Agricultural Research and Management and 79 All-India Co-ordinated Research Projects spread over 1,400 Co-operating centres in the length and breadth of the country.

What ICAR Offers

The Central Research Institutes have been established to meet agricultural research and education needs of the country in terms of (i) pursuit of basic and strategic research not undertaken in the State Agricultural Universities (SAUs), (ii) evaluation and refinement of technologies through multilocation centres of the All-India Co-ordinated Research Projects, (iii) preparation of resource inventories which go beyond regional boundaries and (iv) human resource development for agriculture sector. These institutes have a mandate for working on single or selected group of crops, animals or commodities with each major discipline having status of the division. All the institutes have responsibilities for research, training and transfer of technologies. Some Institutes have regional stations to cover diverse agro-ecological areas for developing area-specific technologies.

The National Research Centres (NRCs) have been established for concentrated attention with a mission approach by a team of scientists under a single leader on selected topics with relevance to resolving national problems in a particular animal, crop or commodity. There is no divisional set up and rarely any regional station.

The creation of the All-India Co-ordinated Research Projects (AICRPs) under the ICAR system is a landmark in the history of agricultural research in India. The AICRP is a mechanism in building nation-wide co-operative, inter-disciplinary research network linking ICAR Institutes with the SAUs to focus attention on commodities and species of national importance. The AICRPs have succeeded in mobilizing country's scarce resources through inter-institutional and inter-disciplinary interaction and joint evaluation of new technologies to arrive at collective recommendation. The AICRPs also strengthen research base in each agricultural university.

A few projects are elevated to the level of Project Directorates with additional responsibilities for important areas, e.g. wheat, rice, oilseed, pulses and vegetables. The major advantage of the AICRP concept has been in evaluating suitability, adaptability and transferrability of technologies to different ecological regions.

The total staff working in the Agricultural System in different categories is over 30,000, of which over 4,300 are scientists in the Council. The state agricultural universities employ about 26,000 scientists for teaching, research and extension education assignments; of these over 6,000 scientists are employed in the ICAR-supported co-ordinated projects.

The country now has one of the largest research and training infrastructure to work on the production and other emerging problems confronted in agriculture to meet growing demand for food, fodder, fibre and fuel.

In addition, the ICAR supports a number of short-term ad-hoc research schemes, implemented by scientists in various colleges, universities and institutes. The programmes of ad-hoc research schemes are need-based and are formulated and executed in accordance with the recommendations of the scientific panels relating to different crops and disciplines.

The Council launched a National Agricultural Research Project (NARP) in January 1979 with assistance of World Bank to strengthen regional research capabilities of the state agricultural universities to solve location-specific problems. Under the NARP- I and II, Zonal Research Stations in 120 agroclimatic zones of the country have been established. In total 343 research centres (zonal stations and sub-stations) have been strengthened under the control of the state agricultural universities. The project has provided SAUs with resources to develop much needed infrastructure and manpower facilities.

The ICAR is also promoting excellence in science and technology in agriculture through creation of Professional Chairs, National Fellows and Centres of Advanced Studies and new schemes.

Education

The ICAR aids, promotes and co-ordinates agricultural education in the country through technical and financial assistance to the state agricultural universities, post-graduate educational programmes in the Central Institutes and schemes on manpower development and quality improvement.

With the assistance of the ICAR, 27 state agricultural universities and one central agricultural university for the north-eastern hills region have been established in the country. These agricultural universities are responsible for promoting agricultural education, research and extension education at the state level.

Four of the ICAR institutes, viz. Indian Agricultural Research Institute (IARI), New Delhi; Indian Veterinary Research Institute (IVRI), Izatnagar; National Dairy Research Institute (NDRI), Karnal, and Central Institute of Fisheries Education (CIFE), Bombay, have been conferred the status of 'Deemed to be University'.

The education system in the country offers degree programmes in 11 specific disciplines, viz. agriculture, veterinary science, agricultural engineering, forestry, home science, dairy technology, fisheries, sericulture, marketing/banking and co-operation, horticulture, and food science, with a total intake of about 10,000 students. It also offers postgraduate programmes in more than 55 fields of specialization, with a total intake capacity of about 4,500 students.

Under the Manpower Development Programme, the Council offers about 4,000 scholarships and fellowships for the promotion of agricultural education from the undergraduate to postdoctoral levels. Special fellowships are also offered to promote agricultural education in socially and economically handicapped groups, and faculty improvement in the agricultural universities and the institutes of the ICAR.

Transfer of Technology

The transfer-of-technology system is devoted to first-line extension activities, being conducted by scientists, for (i) demonstrating promptly the latest technologies to farmers and extension workers, (ii) testing and verifying technologies in the socio-economic conditions of the farmers, and (iii) getting the first-hand feedback to reorient research, education and training systems.

The transfer-of - technology projects consist of National Demonstration Projects in 48 districts, Operational Research Projects at 152 centres, Krishi Vigyan Kendras (Farm Science Centres) in 183 districts, 8 Trainers' Training Centres in specialized institutes, Lab-to-land centres at 115 existing institution/stations, Scheduled Castes and Schedules Tribes Projects at 46 locations, and National Communication and Training Centres on Oilseeds and Pulses.

During the Eighth Five-Year Plan (1992-97), most of the transfer-of-technology projects have been integrated into Krishi Vigyan Kendras with responsibilities of (i) vocational training (ii) on-farm research and (iii) demonstration of improved technology.

International Co-operation

An important facet of the ICAR activities is its continuous interaction with various agencies in the international agricultural research system both with the developing and developed countries. It has close co-operation with the Consultative Group of International Agricultural Research (CGIAR), as well as other agencies like the FAO, UNDP, UNICEF and UNESCO. International co-operation has helped to strengthen national research efforts through various channels such as financial assistance, exchange of germplasm, scientific materials and information, visits by scientists and other experts and training for scientific manpower development. Currently over 100 projects are operating with international co-operation. India is a donor country in the CGIAR and the ICAR has entered into bilateral agreement with 10 International Agricultural Research Centres supported by the CGIAR.

Publications and Information

The ICAR acts as a clearing-house of research and general information relating to agriculture, animal sciences fisheries and allied disciplines. It publishes technical and popular books, bulletins and other informative literature, besides 6 periodicals in English and 3 in Hindi. Financial assistance is given to about 75 learned societies for bringing out scientific journals. The ICAR Reporter is brought out in English and Hindi to provide the latest information on the activities of the ICAR, its institutes and projects. The Council brings out its Annual Report every year in English and Hindi.

The press, radio and television are assisted in getting authentic information on the latest research findings. Films covering various research activities are produced by the ICAR and loaned to educational and extension agencies.

The Agricultural Research Information Centre (ARIC) is the main source of information on current projects. ❑

International Co-operation

Lucerne Declaration and Action Plan of the CGIAR

Dr Balram Jakhar, Minister for Agriculture and President, ICAR, presenting an additional one-time Contribution of US $ 1 million to Mr Ismail Serageldin, Chairman of CGIAR.

A two-day ministerial meeting of the CGIAR (Consultative Group for International Agricultural Research) was held at Lucerne on 9 and 10 February 1995. It adopted a declaration and action programme aiming to break the vicious circle of poverty, population growth and environmental degradation. The meeting was attended by the ministers of developed and developing countries, heads of International development agencies representing the CGIAR membership and independent experts.

The members called for increased efforts in International research to alleviate the suffering of 1 billion people who are poor and hungry, and also to meet the demand of rising population which will double by the year 2025. The CGIAR research centres were urged to address more forcefully international issues of water scarcity, soil and nutrient management and aquatic resources with emphasis on sustainable agriculture.

A new powdery-mildew resistant variety of grainpea

Alankar (DM 7), a new powdery-mildew resistant variety of grainpea has been developed at the IARI, New Delhi, through hybridization (6587 xL 116), followed by a pure-line selection and progeny evaluation for cultivation in the north-west plain zones of the country with a yield average of 23-24 q/ha (about 11 to 28% margin). It has attractive white, lustrous and round grains, and 100 grains weigh about 18.8 g. It is found suitable for a number of cropping systems in irrigated and unirrigated areas.

New high-yielding varieties of vegetables

The following high-yielding varieties have been identified and recommended for release in various agroclimatic zones: Sel 4, DBSR 31 in brinjal (long); KS 224, DBR 3 in brinjal (round); DBSR 44 in brinjal (small found); Sel 99 in spongegourd; Agriround in onion (light red); Sel 1-6-4 in tomato and PH 1 in mid-season peas; and 8 F_1 hybrids NDBH 6 in brinjal (long); ABH 2 in brinjal (small round); BSS 32 in cabbage; NA 601, KT 4, FMH 1 NA 501 and DTH 4 in tomato. Besides, hybrids Swarna Rekha and Swarna Alaukik in parwal; Swarna Shree in brinjal and Swarna Poorna in cucumber have been identified for the benefit of the tribal farmers of Chhota Nagpur plateau and adjoining areas.

New varieties of grapes and litchi released

In grapes 6 new varieties Arka Shwetha, Arka Majestic, Arka Chitra, Arka Krishna, Arka Soma and Arka Trishna have been released. In litchi, one hybrid Swarna Roopa has been identified for tribal farmers of Chhota Nagpur plateau and adjoining areas.

Superior varieties of chrysanthemum and China-aster

In chrysanthemum, Kirti and Chandrika have been released. Earlier released Poornima is becoming popular.

Two superior varieties of China-aster, Arka Kamini and Arka Sashank with attractive colour have been released by the Indian Institute of Horticultural Research, Bangalore.

Chrysanthemum hybrid Poornima

India—the Third Highest Producer of Tobacco

India is the third highest producer of tobacco after China and the USA, and it ranks 9th among the tobacco-exporting countries and 5th in the export of flue-cured virginia (FCV) tobacco after Brazil, Zimbabwe, the USA and China. The country's share is a mere 4.7% in the international market and in 1992-93 it exported 94.7 thousand tonnes of tobacco worth Rs 5,077.4 million. Nearly 40-50% of the tobacco exported from country is of Virginia type.

The demand for tobacco and its products is growing at the rate of 2% per annum at the global level and world tobacco market is around US $ 300 billion.

Indian tobacco is cheaper than the tobacco from other tobacco-producing countries. This enables India to increase substantially the export of tobacco. However sustenance of export would depend on the success of the development of the export-oriented varieties like Virginia and Burley. Besides the raw and manufactured tobacco other potential products such as pesticide, pharmaceuticals, leaf proteins and organic manures could also be exported.

Agroforestry system involving *Faidherbia albida*-sorghum-groundnut is an efficient way of resource utilization and risk distribution.

Faidherbia albida — A non-competing tree for agroforestry system

In an agroforesty system trees and crops compete for light, moisture and nutrients, and it is desirable to search for those cohorts which are symbiotic in relationship. Of the 4 tree species, viz. *Acacia ferruginea, Albizia lebbek, Faidherbia albida* and *Leucaena leucocephala* tested for their compatibility with arable crops, *F. albida,* a native of African Sahel, offered least competition to tiny arable companions. Rather it helped in their nourishment because of its voluntary leaf-shedding habit which improved soil fertility. *F. albida* also yields protein-rich green pods which give valuable nutritious fodder for cattle. There is a need to identify more native trees for combining with arable crops to rehabilitate degraded red soils in drylands.

High capacity multi-crop thresher

A high capacity multi-crop thresher has been developed at the Central Institute of Agricultural Engineering (CIAE), Bhopal, suitable for threshing wheat, chickpea, maize, soybean, pigeonpea and mustard. The thresher is operated by a 30-horsepower tractor and is mounted on pneumatic wheels to facilitate field transport. Its capacity varies from 400 kg/hr for small seeds to as high as 2.9 tonnes for crops like maize. For wheat and chickpea, it is about 1.3 tonnes/ha.

Organic varnish for traction motors

The Indian Lac Research Institute, Ranchi, has developed a pigmented (red colour) shellac-based insulating varnish which was hitherto imported. The properties of this varnish have been found superior to imported varnish used in traction motors. The institute has established linkages with the Chitranjan Locomotive Works, West Bengal, for commercial exploitation of the varnish.

Jute fibres for geo-textiles

The Jute Technological Research Laboratory, Calcutta, has developed several products utilizing jute fibres to be used in geo-textile applications which are bio-degradable. These can also be utilized in filter media and in floor covering. These materials are prepared by cross-laid needle punched technique.

PANTNAGAR ZERO-TILL FERTI-SEED DRILL

Save time, money, fertilizer and increase yield of wheat using Pantnagar zero-till ferti-seed drill.

Paddy-wheat crop rotation is very common in our country, and covers about 10 million hectares. After the harvest of rice, fields are prepared by using harrow or cultivators. At least 6-8 or even more operations of harrow are needed for clay soils. This involves money and time of the farmer, and it delays wheat sowing and consequently results in lesser yields. Major reason for late sowing of wheat is excessive tillage operation required in field preparation. To facilitate farmers to sow wheat in time, the Department of Farm Machinery and Power Engineering of the Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, has developed a Pantnagar Zero-Till Ferti-Seed Drill which is used for sowing of wheat directly in paddy field without preparing the seedbed. The drill is similar to drills available in the market; with only difference that it is heavier and its furrow opener has pointed tip of high carbon steel which forms a very narrow slit in the soil. The total time required in zero-tillage sowing is about 1 hr 45 min. and fuel required is 6.68 litres of diesel per hectare whereas in conventional method time required for 6 harrowings plus 2 plankings and sowing is about 14 hr 30 min and fuel consumption is 71 litres of diesel per hectare. There is a saving of about Rs 1,200-1,500 per hectare in seedbed preparation, if tractor is hired. The performance of seed drill has been demonstrated on the farmer's field for the last two years; no difference in yield is observed on farmers' fields as well as in experimental plots. Moreover, through zero-till ferti-seed drill, wheat can be sown in time which may result in net higher production in addition to saving time and money in seedbed preparation. Less weed population in zero-till sowing is another advantage to wheat growers. Similarly there is a scope to add organic content in soil through paddy stubbles in zero-till wheat sowing.

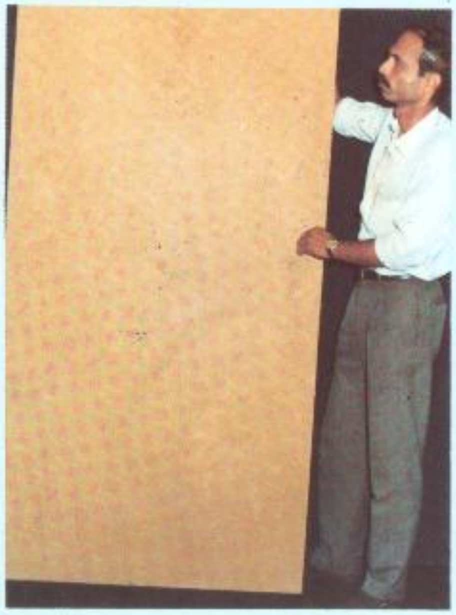
UTILIZATION OF COTTON WASTE

Particle boards from cotton-plant stalks

The cotton-plant stalk is an agro-waste material of little commercial value. In India, over 15 million tonnes of this material is generated every year, which is usually burnt in the field itself to avoid carry-over of insects and pests to the next crop.

The Central Institute for Research on Cotton Technology (CIRCOT), Bombay, had initiated studies for effective utilization of this agro-waste for preparation of particle boards, using cotton stalks as the chief raw material. The boards prepared are of good quality and meet all the specifications of the Bureau of Indian Standards. This technology has been recently transferred to a firm in the co-operative sector, which is setting up a plant of 20-tonne capacity using CIRCOT technology.

The boards can be used for table-tops, window/door panel inserts, furniture, wall-panelling, false-ceiling and partitions. The boards can also be made water resistant by addition of suitable chemicals at the time of mixing with binder.



Particle boards

Paper-making

A process has also been developed and standardized at the CIRCOT to prepare writing and printing grade paper from cotton-stalks.

Unbleached paper made from the cotton stalks could be used as wrapping paper and the bleached paper for writing purpose. The quality of the paper produced by this process was quite satisfactory. The kraft paper made from cotton-plant stalks could be conveniently used for preparation of good quality 3-ply and 5-ply corrugated boards.

Biogas from willow dust

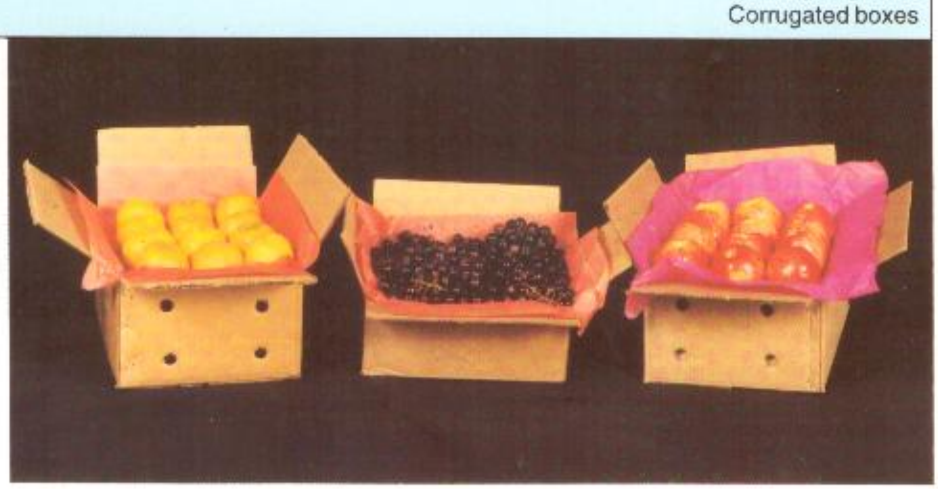
The technology for the production of biogas from willow dust (textile-mill waste) has been developed. A fibre-glass biogas plant was fabricated and installed having two glass windows on the floating gas holder to allow sunlight to pass through, for multiplication of photosynthetic bacteria. This process obviated the problem of slurry handling, as the same is obtained in almost dry condition. The process is considered very economical.

Mushroom crop on cotton stalks

Cotton-plant stalks were found to be an effective medium for growing edible mushroom. The method has been standardized at the CIRCOT, Bombay.

Mushroom crop on cotton plant-stalks

Corrugated boxes



Frieswal bull

Production of Frieswal bulls

The Frieswal bulls produced by the Project Directorate on Cattle in collaboration with the Military Dairy Farm are being extensively used for production of second-generation cows. Twelve bulls have attained the said target of 12,000 doses of frozen straws per bull. The total production of the Frieswal bull semen was 249,968 doses, out of which 102,343 doses of frozen semen straws have been supplied to the Military Dairy Farm.

New feeders for goats

In commercial goat farms about 70% of the running expenditure is incurred on feeding of animals. By reducing wastage of feed with cheap feed resources this cost could be reduced substantially.

The Central Institute for Research on Goats developed Rectangular and Hexagonal feeders suitable for all type of feeds. These new models have following advantages.

(i) No contamination of feed trough with faeces and urine.

(ii) Reduced wastage of pellets (negligible), straw (15%) and green fodder (7.12%).

(iii) They are space- and labour-saving equipment and can accommodate more number of animals.

Pilot-scale pen culture in beels

Pen culture is especially relevant for weed-choked beels, where open ranching and harvesting is not possible due to obstructions caused by weeds. In such beels, marginal areas can be cleared for erecting pens.

In Akaipur beel, pilot-scale studies were initiated to culture giant freshwater prawn, *Macrobrachium rosenbergii*. During the 87-day period of rearing, juveniles stocked at an average initial size of 74.9 mm and 4.0 g grew to 191.8 mm and 86.1 g, gaining 82.1 g in this short span. A feed supplied by a private firm comprising 17-20% protein, 25-30% carbohydrate and 9-11% fat was used. The results point to the possibilities for taking at least 3 crops in a year. The annual capital cost and recurring cost for 2 crops worked out to Rs 9,550 on which sale proceeds of Rs 65,400 can be obtained (with a net income of Rs 32,643 per year) from a pen area of 0.16 hectare.

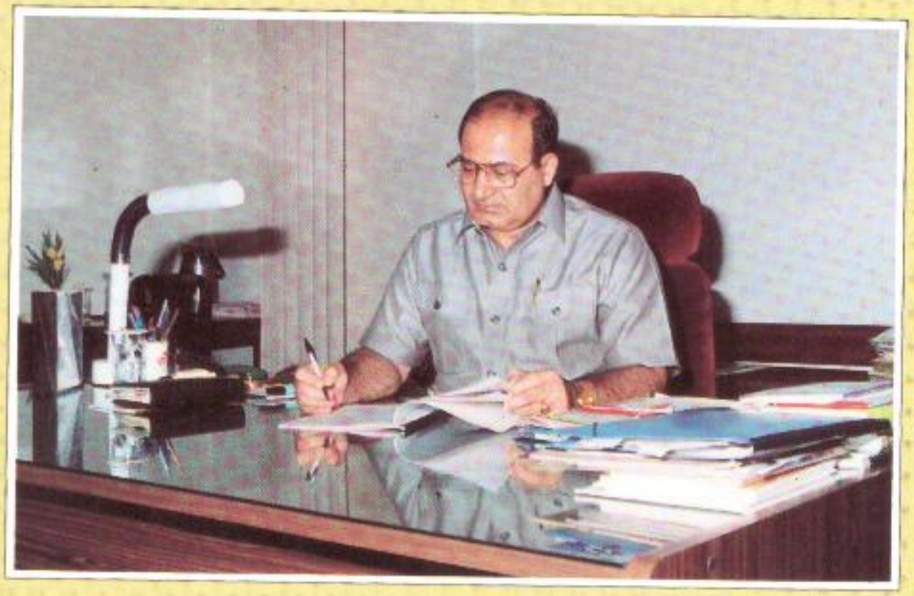
Indicators of stress in fish

The Central Inland Capture Fisheries Research Institute (CICFRI), Barrackpore, has devised a technique to identify stress in any aquatic ecosystem through the presence of ciliate parasites (*Trichodina* sp. and *Tripartiella* sp.) as indicators. Presence of these ciliates above 20 in 0.05 ml of gill mucous is indicative of stress in fish.

Basal diet for rohu and catla spawns

A basal diet using 50% goat liver, 30% probiotic supplement—Bioboost forte, 13% starch, 5% cod liver oil and 1% each of vitamin and mineral mixtures has been developed for rohu and catla spawn. Feeding with this diet ensured fast growth rate and cent per cent survival indicating its possible use in indoor hatchery for large-scale spawn rearing and also doing away with the nursery phase of rearing as the larvae could attain 108-133 mg weight within 15-20 days which can be directly stocked in rearing ponds for raising fingerlings. ❑

Published by Dr R.D. Sharma, Director (P&I), Publications and Information Division, Indian Council of Agricultural Research, New Delhi 110 012; Lasertypeset by Sumitech Inc., H-333, New Rajinder Nagar, New Delhi 110 060, and printed in India at M/s Nutech Photolithographers, 4759/XI, Pratap Street, 23, Daryaganj, New Delhi 110 002. Editorial : Shashi A. Verma; Production : Punit Bhasin; Art : B.C. Mazumdar.



DR R.S. PARODA, DIRECTOR-GENERAL, ICAR

IN the past, our agricultural research was aimed at meeting domestic food, feed and fodder demands. For entering in the 21st century, we would have to compete in the global arena. The General Agreement on Tariff and Trade (GATT) and subsequent establishment of the World Trade Organization (WTO) demand globalization of markets. With the changing scenario, I see no reason why we should not be among the front-runners. We will have to enhance our research preparedness to a level where we are in a position to meet our current needs, assess for emerging trends and accordingly restructure research agenda so that we are neither caught unaware nor do we feel left behind. Accordingly, the Council has called upon the heads of the constituent research institutes, centres, bureaux and directorates to prepare a perspective plan of research till 2020 AD. A Policy and Perspective Planning Cell has also been established at the ICAR headquarters to accelerate the process of perspective plan formulation and priority setting.

The application of frontier technologies for improvement of agriculture would require a highly skilled and competitive human resource capable of delivering goods. The Council has finalized an Agricultural Human Resource Development (AHRD) programme which is being launched in a phased manner. A National Agricultural Technology Project (NATP) is also contemplated to bridge critical gaps of technology generation, assessment, refinement and transfer, and to enhance our institutional capability to meet the future challenges.

For a sound planning, accessibility to and exchange of information is of paramount importance. Accordingly, an advanced information management system is being made operative at the headquarters which will link all its constituent institutions as well as state agricultural universities. It is hoped that its effective operation would substantially bridge information gap.

I personally feel that the ICAR is on "take-off" and in order to ensure the required 'change' for improved efficiency work-culture and entrepreneurship; co-operation and contribution of all the members of the ICAR family will be the first and the foremost prerequsite. The ICAR news has been launched as a window of regular communication of the latest developments in agricultural research, education and extension education under the aegis of the Council's policy and perspective planning. I shall welcome your comments, suggestions and contributions for this new venture.

(R.S. PARODA)