A workshop on client orientation was organised at the Institute under the aegis of Indo-UK Collaborative Forage Project during Nov. 17-22, 1997. The programme was facilitated by Dr. John Farrington, Overseas Development Institute, London. Dr R.J. Hagger, U.K. Technical Co-ordinator for the project took active part during the interactions with the participating scientists on the Institutional experiences in the transfer to forage production technologies. The underlying objective of this workshop was to identify whether technologies existed "on-the-shelf" that had potential for rapid uptake and impact, and if so, how they might most effectively and rapidly be disseminated. It was further, aimed at stimulating discussion and reflection among scientists on how research problems and clients for research should be identified and the other characteristics that research must have if technologies driving from it are to have good prospects of uptake and impact.

The presentations during the workshop clearly made out the success story in the adoption of technology developed for berseem-improved variety, packages of forage and seed production with the farmers having irrigation in north western states. The technologies for other crops under high input production situations also have reasonably good adoption.

The majority of technologies identified as "on the shelf" having potential for uptake, are directed towards rainfed areas. These can conveniently be divided into two categories: those for individual small farmers and those for rangelands and wastelands rehabilitation. The small farmers operating under the difficult rainfed conditions invariably give primary attention to food crops on whatever arable land is available. The principle of low risk and low investment requirement underpins the general lack of successful uptake of technologies meant for them. The dissemination efforts for technologies recommended for rangelands needs more gearing up towards agencies funding rehabilitation and those contracted for implementation of such programmes.

There is a need to strengthen the studies relating to economic, social and institutional opportunities and constraints relating to clients for which particular technology is intended, at the stage of considering research options.

During the deliberations, it was also acknowledged that a package of technologies should be offered to farmers so that the prospects are enhanced of meeting needs across the wide range of socio-economic and agro-ecological conditions that exist within the same village. This concept needs to be reinforced widely. In order to be effective it needs to be accompanied by three components packaged together, the samples of the material, advice on where larger quantities can be obtained and also the advice on its use.


चारा अनुसंधान व पशुधन विकास के नए आयाम पर राष्ट्रीय संगठन

भारतीय धरागाह एवं चारा अनुसंधान संस्थान तथा भारतीय चर्चलम ग्रसस्त्र समिति के संयुक्त तत्त्वाध्याय में चारा अनुसंधान एवं पशुधन विकास के नए आयाम विवाह पर संस्थान के तीन दिवसीय (दिसंबर 20-22, 1997) राष्ट्रीय संगठन आयोजित की गई। डॉ. मंगला राय एवं महाशिवराम (उपस्थिति) भारतीय कृषि अनुसंधान परिषद, नई दिल्ली, ने संगठन का उद्घाटन किया।

इस अवसर पर उन्होंने वैज्ञानिक शोध परिणामों को खोले तक पहुँचाने के लिए हिंदी में प्रचार-प्रसार की आवश्यकता पर विचार किया। उन्होंने कहा कि यदि मानव प्रत्यय होगे तो माना के बांध स्वतः दु:ख जायेगी। उन्होंने प्रतिविरोधियों से कहा कि आयस्क, विकास एवं मुनाफ़ को अगे बढ़ने की आवश्यकता ही सफलता का मार्ग प्रस्तुत करती है।

अपने अध्यक्ष संस्थान में संस्थान के निदेशक डॉ. भगवंथ ने कहा कि भारत का भूमि विवेक का 2% है जबकि पशुधन विवेक का 15-16% है। उन्होंने वायुता कि हालाती देश में मान्य के बिना चारा बीज आयुक्ति मात्र 40% है। अतः किसानों को चारा बीज उत्पादन हेतु प्रोत्साहित किये जाने, खण्ड प्रदर्शन एवं प्रचार-प्रसार की महत्व प्रत्यक्षता है। उन्होंने वायुता कि झाउ के बांध अभावाचूण्य, तकाली, काराली व हेजपुरा में खण्ड प्रदर्शन कर किसानों को लागू किया गया है। संस्थान सस्ती व पैकेट चारा उत्पादन के अनुसार, उनके संप्रभुतियों एवं झाउ बीज के विवेक हेतु निर्देश प्रस्तावना है।

संस्थान के भवन परिणामों से प्रभावित होकर कई राज्य सरकारों एवं बुद्धिजीवित कार्यालयों ने भी अपने वैज्ञानिकों को प्रशिक्षण हेतु संस्थान में नजरने की पेशकश की है। डॉ. सी.आर. हाजरा, परियोजनासंगठन (भारा कलसल) एवं संचार, भारतीय चर्चलम प्रबंधन समिति, ने संगठन की कर्मस्थल एवं उद्देश्यों पर प्रकाश डाला। अतिरिक्तीय का स्वागत, डॉ. नी.एस. तोमर, धन्यवाद ज्ञापन डॉ. बी.एस. उपविकास तथा संस्थान डॉ. आर.श्री. भास्कर ने किया। इस अवसर पर वैज्ञानिक डॉ. मंगला राय के संगठन की सारांश पुस्तक का तथा संस्थान द्वारा प्रकाशित 'चारा एन्टल्स' का विनिमय किया। संगठन में देश मर से आये हुए कृति वैज्ञानिकों ने भाग लिया तथा लगभग 150 शोध पत्र प्रस्तुत किये गये।

During the last few years new strides in forage research and animal production have been achieved through the concerted efforts made by the Indian Grassland and Fodder Research Institute, Jhansi. The Institute organised a three day Seminar (Dec 20-22, 1997) on the subject in Hindi. The main issues discussed relate to making forcers more nutritious in order to increase the milk yields and further developing efficient crop production cycles to make the green fodder available throughout the year. The Seminar was inaugurated by Dr. Mangla Rai, Dy. Director General (Crop Science), ICAR, N. Delhi. In his address, he emphasised the need to communicate the scientific achievements for better adoption of technologies by the farmers.

Dr. Bhag Mal, Director, IGFRI, in his presidential address, laid stress on the issue of boosting the forage production to meet the challenge of meeting the deficit in the availability of the forages.

Over 150 Scientists, extension workers and policy makers discussed the ways for the farmers to improve the economic condition by adoption of improved forage production technologies.

ICAR Media Team visits IGFRI

The media team comprising of eleven representatives of National News Papers accompanied by Shri Ratan Prakash, Chief Publicity & Public Relation Officer, ICAR, New Delhi visited this Institute during December 19-22, 1997. They were appraised of the different activities and programmes of the Institute. Media team was taken around the research farm and laboratories for appraisal of the research activities and the transfer of technology sites wherein the Institute's generated technologies are being implemented for the betterment of the range of clientele.
Dear Readers,

The Institute in the course of time has developed a number of forage crop varieties and production technologies and has achieved wide uptake and impact amongst the identified clients, the end users like farmers producing fodder crops for internal consumption under dryland and irrigated situations, commercial fodder producers under resource rich situations and the governmental, non-governmental and intermediary agencies for their developmental programmes. The analysis of the uptake pattern of available technologies amply demonstrated that the adoption is far more in case of technologies meant for resource rich situations than for the less well-endowed areas. The technologies remaining "on-the-shelf" but having a strong potential of uptake are meant for rainfed areas both for farmers and agro-ecodevelopment of rangelands. The proliferation of such technologies would help in reducing the growing competition on the resource affluent areas and at the same time help in revegetating the wastelands.

Currently, there is a greater thrust for multidisciplinary team work at this Institute. The experiences gained by the scientists during the Participatory Rural Appraisal training in identifying the clientele needs are required to be consolidated and extended into more such focussed exercises. The information on clients' needs and the feedback on the technologies offered, form an integral part of each and every activity of the Institute like project preparation, specifically mentioning the targeted clients. Incorporation of economic and social assessment needs to be introduced prior to taking up any programme. The sequence of output and activities against the likely outcome, needs to be monitored internally at the specified time interval for incorporating changes, if any. This would help in assessing the likely uptake of the project outcome on the basis of the range of values appealing to the end users.

The criteria to evaluate research should not only be the quality of research but also its market orientenedness, development relevance and sustainability. The research product generated should be offered to farmers in the shape of a "basket of choices" of technologies to enhance the prospects of adoption across the wide range of clientele.

(BHAGMAL)

ICRA Director visits IGFRI
Dr. JRV Daane, Director, International Centre for development oriented Research in Agricultural (ICRA), Wageningen, The Netherlands visited IGFRI during November 20-27, 1997. The purpose of his visit was to explore the possibility of collaboration between ICRA and ICAR Institutes. During his stay at IGFRI, he participated in the Client Orientation Workshop and inaugurated a training programme of forest officials of Andhra Pradesh. Two IGFRI scientists were selected for 1998 ICRA Programme. It was also agreed to have ICRA field study at this Institute during the forthcoming trainings. He was highly impressed with the activities of the Institute and showed keen interest to have long term collaboration with IGFRI.

Dr. Hazra joins as Agriculture Commissioner
Dr. C.R. Hazra, Project Coordinator (Forage Crops), who has been associated with this Institute in different capacities since more than two decades, joined his new assignment as Agriculture Commissioner, Ministry of Agriculture, Government of India, New Delhi on December 22, 1997. Everyone of us at this Institute join in congratulating Dr. Hazra for this prestigious assignment.

Visits abroad
Dr. L.P. Mishra, Dr. K.P. Singh, Dr. Sunil Gupta from IGFRI headquarters and Dr. V. Ramamurthy from Regional Centre, Dharwar, participated in Forage Seed Workshop organised at Thailand from November 10-15, 1997 under Indo-UK Collaborative Programme on forage production and utilization.
SEED TECHNOLOGY

The Division of Seed Technology was established in the year 1974 under the leadership of Late Dr. Amar Singh with the goal to perfect forage seed production technology through the integrated research programme involving the disciplines of Agronomy, Physiology, Pathology, Entomology, Soil Science, Seed Technology and Plant Breeding. The division is presently headed by Dr. L.P. Misra with a strength of eleven scientists specialised in various disciplines.

**UNITS**
- Seed Production
- Seed Physiology & Seed Testing
- Seed Health & Storage

**MANDATE**
To conduct research on all aspects of forage seed production, seed testing, quality control and devise suitable measures for protecting seed during storage.

**SPECTRUM OF ACTIVITIES**
- Development of appropriate package of practices for seed production in cultivated forages and range grasses & legumes.
- Multiplication of truthfully labelled seeds, breeder seeds, seed quality control and certification measures in forages.
- Site specific seed production.
- Development of seed standards for forages.
- Development of forage seed testing techniques.
- Development of safe storage techniques for forage seeds.
- Seed production and multiplication networking with registered seed growers/farmers.
- Supply of quality seed to the growers and transfer of forage seed production technologies.

**RESEARCH ACHIEVEMENTS**

**Seed Production**
- 60 Kg P₂O₅/ha was found to be optimal for higher seed yield in cowpea and berseem. Seed treatment with Bavistin and Dithane Z-78 each at the rate of 2.5 g/Kg seed and spray of Endosulphan 0.1% at 40 and 60 days after sowing controlled insect pests resulting in better germination and higher seed yield in cowpea.
- Oat sown at the rate of 75 Kg/ha with basal dose of 60 Kg N and 50 Kg P₂O₅/ha, inter-culture after cutting for fodder and fertilized with 30 Kg N/ha gave higher seed yield.
- In sorghum, HC-136 showed the maximum seed setting and yield, followed by PC-6 and PC-9. July sown M.P. Chari for seed production fertilized with 80 Kg N/ha, half at sowing and half at knee stage of crop produced higher seed yield. Treatment of seeds with 2.0g/Kg each of Bavistin and Thiram controlled leaf spot and downy mildew.
- In berseem, higher seed yield was recorded when the last cut was imposed in second week of March followed by two irrigations one at the last cut and other at seed formation stage.
- Transplanted crop of Deenanath grass (*Pennisetum pedicellatum*) cut for fodder after 60 days of growth gave a green fodder yield of 18 t/ha without reduction in seed yield as compared to uncult crop.
- *Panicum maximum* when intercropped with *Stylosanthes hamata* and siratro gave seed yield
equivalent to the yield obtained with the application of 30 Kg N/ha and 20 Kg N/ha, respectively.

- *Setaria sphacelata* planted at a row to row distance of 50 cm and application of 80 Kg N/ha gave the highest seed yield. Uncut crop gave the maximum seed yield.

- In *Cenchrus ciliaris*, seed yield was significantly increased with the basal application of nitrogen of 80 Kg/ha.

- *Cenchrus ciliaris* var. IGFRI 3108, *Chrysopogon fulvus* cv. Chandigarh, *Setaria sphacelata* cv. Nandi were found high seed yielders as compared to other varieties.

- In *Clitoria ternatea*, the seed yield increased from 80 Kg/ha to 105 Kg/ha when fertilized with 20 Kg N and 30 Kg P₂O₅/ha.

- Application of 40 Kg P₂O₅/ha at sowing time increased seed yield in siratro. Crop supported for climbing resulted for enhanced seed yield upto 25%.

- In *Stylosanthes hamata*, summer sowing at the seed rate of 10 Kg/ha produced higher seed yield than monsoon sowing.

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**Breeder Seed Production**

- Breeder seed production is carried out in berseem (cv. Wardan and Bundel Berseem-2), oats (Kent, JHO-822 and JHO-851), cowpea (Bundel Lobia-1 and EC-4216), guar (Bundel Guar-1 and Guar-2), sorghum (MP Chari and HC-136) and *Dolichos* (Bundel Sem) under National Seed Project (Crops).

- The quality seed production is also in progress at large scale in range grasses and legumes, viz., *Cenchrus ciliaris*, *Cenchrus setigerus*, *Pennisetum pedicellatum*, *Sehima nervosum*, *Chrysopogon fulvus*, *Panicum maximum*, *Dichanthium annulatum*, *Pennisetum* (Trispecific hybrid), *Setaria sphacelata*, *Borthrioeloa intermedia*, *Stylosanthes hamata*, *Sesbania sesban*, *Clitoria ternatea* and Siratro.

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**Seed Physiology and Seed Testing**

- The maximisation of seed production, synchrony of flowering and seed setting in range grasses and legumes can be manipulated by application of growth regulators and nutrients.

- Foliar application of KNO₃ (4 kg/ha) at flower initiation stage in cluster bean and vegetative and flower initiation stage in *Cenchrus ciliaris* improved seed yield by 10-25%.

- Foliar application of 2 kg KNO₃ + 1 kg superphosphate in cowpea and 2 kg KNO₃ + 2.5 kg/ha superphosphate with 60 kg P₂O₅ as basal dose in berseem enhanced seed production upto 25%.

- NAA (100 ppm) and MH (50 ppm) foliar spray at flower initiation stage and at 35 day after sowing + flower initiation stage increased flowering intensity resulting into higher seed yield in Siratro and *Dolichos*.

- Foliar spray of GA3 (10-50 ppm), applied at vegetative and anthesis stage in cowpea and at flower initiation stage increased the seed production in berseem.

- Seeds of *Clitoria*, siratro and stylo soaked in hot water (60°C) for half an hour gave maximum germination. Soaking of *Cenchrus ciliaris* seeds in fresh water for 8 to 10 hours before sowing was found effective for better germination.

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**Seed health and Storage**

- Polyethylene bags (700 guage) and plastic containers were found the best for seed storage without impairing the germinability.

- Seed with 10% moisture content resulted in minimum pest damage under storage.

- Use of Neem leaf powder at the ratio of 1:100 parts w/w effectively reduced the incidence of insect pests and pathogens in stored seeds while maintaining viability.

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*For your requirements of quality fodder seeds, kindly contact: Head, Seed Technology Division*
Biochemical polymorphism in apomictic, sexual and progeny lines of *Panicum maximum*

Biochemical characterization of various apomictic lines, sexual lines and their progenies from open polycross nursery indicated presence of considerable genetic variation as revealed by the horizontal starch gel electrophoresis. On comparison of zymogram patterns of six enzyme systems viz. peroxidase, esterase, acid phosphatase, alkaline phosphatase, superoxide dismutase and aspartate aminotransferase, it was found that esterase and peroxidase isozyme were well differentiated between these lines. Polymorphism was observed for bands $A_1, A_2, A_3, A_4, A_5, A_6, A_7$ in esterase enzyme system and for bands $B_1, B_2, B_3, B_4, B_5, B_6, B_7$ in peroxidase enzyme system.

(P.Kaushal and D.R. Malaviya)

**Genetic relationship in Pennisetum species**

For estimating the relationship in terms of genetic distance between various available accessions of *Pennisetum* species and to identify species closer to the cultivated one i.e. *P. glaucum*, biochemical analysis utilizing isozyme behaviour were carried out with respect to peroxidase, esterase, acid phosphatase, alkaline phosphatase, superoxide dismutase and aspartate aminotransferase enzymes. The relationship observed and expressed in percentages is as follows:

- *P. glaucum* $\rightarrow$ *P. violaceum* $\rightarrow$ *P. squamulatum* $\rightarrow$ *P. purpureum* $\rightarrow$  
  - *P. violaceum* $(57.69\%)$  
  - *P. squamulatum* $(35.71\%)$  
  - *P. purpureum* $(21.21\%)$

Thus species viz. *P. violaceum*, *P. squamulatum* and *P. purpureum* could potentially be utilized for transfer of desirable traits to *P. glaucum*.

(P. Kaushal & A.K. Roy, S.N. Zadoo, R.N. Choubey)

**In vitro flowering of embryo rescued Pennisetum hybrid**

This unique phenomenon was observed during the course of inducing multiple plantlets from single immature embryo in *P. glaucum*. Embryo from intervarietal cross was rescued 14 days after pollination and germinated in MS media and provided with NAA and Kinetic. First subculturating was done after 20-25 days in media containing NAA and BAP supplemented with light for 10 h followed by 14 h of darkness. After 40 days the bud initiated on 5 cm plantlet, which bloomed in 5 days. Though the plant and the inflorescence was miniature, the stigma and the leaf sheath hairs were similar to the mother plant.


*In-vitro flowering in embryo rescued Pennisetum hybrid*
Temperature tolerant strains of Bradyrhizobium for Stylosanthes hamata

High temperature in summer months (max. > 40°C) is a major constraint for the survival of efficient strains of stylo rhizobia in red (sandy loam) soils of this region. In an experiment, under varying temperature and moisture stress conditions, survival of these strains was evaluated in the absence of host plants to eliminate the effect of the symbiotic relationship, if any.

Three native strains (JSR-3, JSR-4 & JSR-6) identified earlier, as highly efficient and competitive against a reference strain (USA-TAL-309) were examined at two moisture (100% and 25% of the field capacity) and temperature (30°C and 40°C) levels. Sterilized sandy loam soil (10g/vial), having poor water retention capacity was inoculated with (10-15x10^6 cells ml^-1) of each strain. After three and six days, soil samples were studied for viable cells.

It was observed that out of four strains only JSR-3 and JSR-4 survived in higher number (2-8 x 10^6 g^-1) at 40°C irrespective of moisture levels for first three days than did JSR-6 and TAL-309 (2-5 x 10^4 cell g^-1). The number of JSR-3 and JSR-4 cells, however, decreases (2-4 x 10^2 cells g^-1) when high temperature (40°C) was prolonged for 6 days. Thus, it appears that strains JSR-3 and JSR-4 were found to be temperature tolerant and promising for field inoculation and production.

(M.R. Pahwa & A.K. Patra)

Field bean (Lablab purpureus) - a promising range legume for livestock

Field bean (locally known as Sem), a legume crop has potential for herbage yield, tolerance to dry spell, persistency under grazing, high nutrient content and palatability. The crop is comparable with well established legumes like berseem and cowpea with respect to its feeding value, but this crop is yet to establish as a forage crop in our country.

The varieties of Sem, namely like IGFRI-13-1, JLP-3 and Bundel Sem-1 were found to have an average green forage yield ranging from 18 to 25 t/ha. On adlibitum feeding as hay (conserved at flowering stage) to sheep, it was found to contain 9.03 to 10.71% DCP and 62.65 to 66.31% TDN. The dry matter intake was also quite high ranging from 3.96 to 4.24% of body weight, reflecting their high palatability in sheep. So, the field bean can be exploited as quality range legume for livestock.

(S.K. Mahanta, V.C. Pachauri, Sultan Singh and D.N. Singh)

Bundel Jai-851 : New Multicut Forage Oat

Bundel Jai-851 (JHO-851) developed at this Institute through single plant selection from Japanese oats HIUGAIRYURO was and released as a multicut variety in 1997 by the Central Sub-Committee for notification and Release of Crop Varieties. The salient features of the variety are:

- Prostrate plant growth at juvenile but erect at tillering stage, thin stem and grassy.
- High forage yield (GFY 55-60 t/ha).
- Higher resistance to crown rust, leaf blight, sclerotial wilt and aphids.
- Superior forage quality : Crude protein (11-12%), gross energy (55.88%), lower ADF (64.04%) and cellulose (77.88%) performance with respect to animal feeding far superior to net intake, digestibility coefficient, maintenance requirement for DCP and TDN and concentration of nitrogen metabolites in rumen.
- High leaf/stem ratio (1.70).
- Excellent regeneration ability and high tillering potential giving 4-5 cuts under multicut system of management.
- Responsive to high fertility and irrigation.

(S.K. Mahanta, V.C. Pachauri, Sultan Singh and D.N. Singh)
Mahila Divas

Mahila Divas was organised at village Sherkala, Talbehat, Lalitpur on October 18, 1997. A large number of farm women/farmers/extension workers and development officers participated and interacted with scientists. The seed packets of high yielding varieties of berseem and oats were distributed to the farm women/farmers by the chief guest Dr. K.R. Solanki, Director, NRCAF, Jhansi.

Kisan Gothi

Kisan gothi was organised on October 1, 1997 at Gursarai, Jhansi, in which large number of farmers, extension workers and scientists participated. The seed packets of berseem (Var. Wardan) and Oats (Var. JHO-822 and JHO-851) were distributed to the farmers by the chief guest, Shri Dhanpat Singh, Joint Director (Agril Extn.) Bundelkhand Region, Jhansi.

For any further information, you can reach us in person or through mail at:
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Retirements

Dr. S.T. Ahmed, Principal Scientist & Head, Crop Improvement Division, who has been associated with the Institute on different scientific positions for the last 26 years retired after superanuation on Dec. 31, 1997.

Shri Bhagwati Prasad, Chowkidar, an Ex-serviceman who served the Institute for the last 27 years retired after superanuation on Dec. 31, 1997.

IGFRI family joins in wishing them a healthy & happy life.