To our readers

I wish you a very happy and prosperous New Year.
I am happy to place before you the first issue of the Grasslands & Fodder News. It is the renamed IGFRI Newsletter (earlier brought out regularly) to bring a broader perspective of the Grassland & fodder research going on in the country. We expect now contributions from research and development workers in the area of this newsletter so that innovative thoughts are encouraged and views are exchanged fast.

The year began happy note. We organized a brain storming session on January 1 to discuss the newer forage research areas and research focus in the coming year. We committed ourselves to proactive working and a scientific culture to achieve more during the year. A national seminar organized on buffaloes feeding and rearing for three days resulted in many recommendations relating to its feeding and nutrition. Many eminent Animal Scientists participated.

The ACIAR supported project on Stylos has now closed. The Stylo genetic stock that has been shared between many centers needs continued evaluation and selection of the desired ones for exploitation of their potential to upgrade the nutrition of the rangelands. Some of the lines of Stylosanthes seabrana and S. scabra RRR lines are being preferred for leaf meal production that has potential for not only poultry nutrition but also the other livestock nutrition, specially during the dry months.

We resolved that during the year we will reemphasize perennials viz., Leucaena, Hybrid napier, Guinea grass and Stylos for extension to enrich the forage resources on the farmers’ fields to assure forage supply during the lean months. These efforts also require our commitment at the national level to integrate these into the existing cropping systems for sustainable natural resource enrichment. Research efforts in these areas are required to strengthen the base on different edaphic and environmental conditions.

The basic, strategic and anticipatory research focus needs sharpening to attend to some of these challenges. Our preparedness in some of these areas is to be assured to provide newer directions for improving the supply of grazing resources and also the fodder from cultivated areas. This all can be achieved only through cooperation and partnership between the centers of research on forages. We should activate the spirit of collaboration and sharing along with exchange of experiences of workers from laboratory and field through letters. I am sure through this initiative we shall try to make endeavor to achieve it.
Brain Storming for Future Forage Research

The meeting was held on Jan 1, 2004 to analyse research activities undertaken during year 2003 and visualize research requirements for the coming year. Following points emerged:

**Opportunities of Research at IGFRI**

- IGFRI is unique in terms of number of crops that it deals (25-30) and relatively large number of disciplines involved in conducting research
- Commitment for R&D in dry zones to facilitate higher forage production
- Eco regional balance sheet approach for fixing priorities of research

**The Approach**

- Develop projects through team approach based on thematic/regional priorities
- New organization structure based around practical problems and priority areas
- Focused- Participatory research
- Undertake impact studies to inventory the fate of disseminated technologies and to design areas of further research
- Prioritized researches in the background of limited resources (Ex: Decreasing scientific manpower)

**Implementing New Strategies**

- Genome Research & Bio informatics to learn about the structure, function and evolution of all genomes
- Grasses and fodder crops based solutions for protecting watershed services and edaphic enrichment
- Targeted livestock production from grasslands and other cropping systems
- Medicinal utilization of forage crops
- Biotechnology research needs to be streamlined and strengthened in view of incorporating multi directional resistance to fodder crops to combat with the abiotic and biotic stress situations
- Research on effective utilization of low grade roughages
- Farming systems research focusing on practices viz., zero tillage, organic farming, improved fallow, recycling of organic residues, carbon sequestration etc.
- Allelopathy as frontier area of science needs to be exploited from fodder point of view
- Participatory seed multiplication by farmers and delivery systems
- Conserve biodiversity and link with system function

**TOT**

The need for working together by all the divisions for effective transfer of technology (TOT) and translation of vision to action was felt

- The individual/group developing a particular technology/product/variety is equally responsible for transferring the same to farmers' fields/other stakeholders
- Information & Communication Technology (ICT) needs to be strengthened for effective TOT
- Four crops were identified for popularization and further dissemination during 2004:
  - Hybrid napier
  - Guinea grass
  - Stylo
  - *Leucaena*

**IGFRI on Move**

Several generalized, interesting points emerged during the deliberations:

- Scientists are the most important component of ICAR system and they have to keep fit and fighting fit for all 365 days in a year. In order to improve the overall output from each individual scientist, the following points to be kept in mind:
  - Be proactive
  - Begin with the end in mind
  - Put first things first
  - Think win-win situation
  - Seek first to understand, then to be understood
  - Rather to compete with others, compete with self and target 5% extra for the new year.
National Seminar on Economic Feeding and Rearing of Buffaloes under different Agro-climatic Regions

The IGFRI and Indian Society of Buffalo Development, Hissar (Haryana) jointly organized a national seminar on “Economic feeding and rearing of buffaloes under different agro climatic regions” from March 12-13, 2004 at Jhansi. The thematic area of the seminar was “Forage based nutritional and management interventions for optimizing buffalo production” covering all major aspects i.e. feeding systems in different agro-climatic regions, buffaloes genetic diversity, genetic improvement and conservation and also health management.

The seminar was inaugurated by Dr. V.K. Taneja, Deputy Director General (Animal Sciences), ICAR, New Delhi.

A book entitled “Buffalo production under different climatic regions” edited by S.S. Kundu, A.K. Misra & P.S. Pathak and the compendium of abstracts and lead papers were released on the occasion. Dr. O.S. Tomar, President of ISBD gave an over view of buffalo production in the country. About 100 delegates from all corners of the country participated in the seminar and presented research papers on various aspects of buffalo production. An exclusive session on Farmer-Scientists Interaction was organized, wherein about 50 farmers from seven districts of UP and MP participated. Besides the farmers, there were representatives from the feed industry to provide them a closer view of the new technologies and products of their requirements. A brain storming session for free exchange of innovative ideas for the buffalo production was also organized under the chairmanship of Dr. Nagendra Sharma, Director, NDRI, Karnal. The brain storming session was a grand success, where the delegates participated with great enthusiasm and many researchable and debatable issues were put forward.

The plenary session, chaired by Dr. P.S. Pathak, Director, IGFRI, Jhansi, highlighted the need to develop area based feeding systems to meet the deficiency and also emphasized that the animals having moderate yield should be maintained in their native tracts. Animals with high productivity like Murrah, should be reared and promoted in the feed and fodder rich areas. Conversely, in feed and fodder deficit areas, the crossbreeding of low yielders of native tract with Murrah and other high producers should be avoided.
Walk behind type reaper - a solution for harvesting of wheat, oat and barley in Bundelkhand region

Self propelled type of reaper was introduced in the farmers’ field of Bundelkhand region for the first time for harvesting wheat, oat, barley, mustard, gram etc. This reaper uses a 5.0 hp diesel engine to run the machine and the operator has to walk behind it while harvesting the crop. During the process of harvesting, vertically standing crop comes in between guide vane from where it reaches reciprocating cutter bar, which cuts plant stems. After cutting, the cut crop proceeds to conveyor belt, which dislodges the crop to ground in such a way that the entire ear heads of the cut crop fall in one side. There are some precautions, like the field should be level and free from any bunds and stones on the path of machine.

This reaper was operated in the farmers’ field in nearby villages of IGFRI. Using this machine, a total of 12 ha area was harvested in 4 villages, which covered the field of 11 farmers. At least 1000 farmers visited and observed the machine, while in operation and appreciated it.

The field capacity of this machine is 1.0 to 1.3 ha per day depending upon the field conditions and skill of the operator. Harvesting by reaper costs Rs. 971, whereas, using manual labourers it costs Rs. 2100. Thus, there is a saving of Rs. 1129 per ha on harvesting the crop by self propelled reaper. Using the reaper saved 7.5 days time per ha in farmers’ field when 4 persons were supposed to harvest the field. The machine is able to cut the crop from as low as 5 cm above the ground so Bhusa, which is an important by product of the crop is also saved.

(C.S. Sahay, D.S. Rajput and P.K. Pathak)

Morphological and in vivo Nutritional Evaluation of QPM Maize Cultivar in Heifers

QPM (Quality Protein Maize), an improved cultivar of maize was sown on July 20, 2003. Plant samples were collected on October 9, 2003 and separated in to leaf, stem and cob fractions and pooled sample of these fractions were used for different morphological attributes (Plant height, number of leaves, leaf length, leaf width and number of internodes and leaf to stem ratio) and in vivo nutritional evaluation. The morphological character of QPM cultivar revealed that mean plant height, number of leaves, leaf length, leaf width and number of internodes were 189.4 cm, 13.2, 74.7 cm, 7.39 cm and 13.8, respectively. Protein content (%) was higher in leaves (9.8) than cob (7.7) and stem (5.6). However, NDF, ADF, cellulose and lignin contents (%) were lowest in cob (51.65, 19.80, 17.80 and 2.01) than stem (55.39, 32.22, 27.18 and 4.66) and leaf (59.95, 28.87, 23.35 and 3.07) fraction.

In vivo nutritional evaluation was carried out on eighteen heifers divided equally in 3 dietary groups (G1, G2 and G3) Heifers were fed QPM+ concentrate mixture 1% of body weight (G1), QPM+ concentrate mixture 1% of body weight + 1 kg wheat straw (G2) and QPM+ concentrate mixture 1% of body weight + 2 kg WS (G3).

Results indicated that the voluntary consumption of dry matter (kg/100 kg BW) was higher in heifers fed sole QPM and concentrate (3.11 kg) compared to the animals fed on QPM + concentrate with 1 and 2 kg wheat straw (2.78 and 2.89 kg). Similarly, the DM digestibility was also higher in sole QPM+concentrate fed group (64.24%) compared to G1 (53.78%) and G2 (50.11%). The digestibility of fibre components viz; NDF, ADF and hemicellulose was higher in sole QPM+concentrate diet (63.1, 54.4 and 73.6%) compared to the diets, where 1 and 2 kg wheat straw was supplemented to G1 and G2, respectively.

Higher aphid infestation in berseem under elevated carbondioxide

Berseem (*Trifolium alexandrinum*) cv. Wardan was grown under three environmental conditions *i.e.* elevated carbondioxide at 600±50 ppm in Open Top Chambers (OTCs), OTCs with ambient carbondioxide (360 ppm) and open field. The temperature and humidity increased to 2-3°C and 2-3% respectively than the ambient environment (open field). Observations were recorded on disease pest infestation throughout the cropping season. Interestingly occurrence of severe black bean aphids (*Aphis craccivora*) infestation was observed in the crop grown under elevated carbondioxide while under normal condition *i.e.* under open field even in the OTCs with ambient carbondioxide crop was free from the pest. This higher infestation of the black bean aphids may be due to the higher carboxydrate accumulation in the crop under elevated carbondioxide.

*(M.J. Baig, R.K. Bhatt, K.C. Pandey and H.S. Tiwari)*

**Stylo leafmeal for livestock**

Stylo leaf meal is already a success in southern China where it is used to feed poultry, pig, fish, cattle and ducks among others. In its extended phase this project has focused on the use of stylo leaf meal in commercial poultry feed. Pioneering base line studies have been made on the nutrition and economics of incorporating stylo leaf meal as a component of poultry feed in India.

Over 2 tonnes of leaf meal produced at Dharwad have been used in three separate poultry feeding trials, two at Agricultural Universities and one by a commercial poultry integrator. Although the number of treatments, the length of trials and the number of birds vary in these trials, results on the effectiveness of stylo leaf meal as a component of broiler rations are equally encouraging from all three trials. The ANGRAU trial at Hyderabad had separately tested leaf meal made from *S. scabra*, *S. guianensis* and *S. seabrana* at 3, 6 and 9% of broiler rations besides control. Body weight gains were generally superior for 3 and 6% levels than control and feed intake increased with increasing level of stylo. Feed Conversion Ratio (FCR) was lowest for control (1.872), followed by 3% *S. guianensis* (1.873) and 6 and 3% *S. scabra* (1.881, 1.883) and FCR was generally higher for 9% stylo in diet. As there was no significant difference between *Stylosanthes* species for weight gain, feed intake or FCR, the fast growing *S. seabrana* will be equally useful in broiler ration. There was no significant change in dressed yield, ready to cook yields, organ weights etc. with stylo in the diet. In comparison to the control, skin and shank colour was significantly superior with stylo diet due to high levels of b-carotene in the leaf meal. The feeding trial at the Tamil Nadu Agricultural University used 2.5 and 5% of stylo meal to record similar body weight gains and there were less fat deposits around the gizzard area. Addition of stylo leaf meal to a starter ration at the 3, 6 and 9% levels, costs Rs. 11.55, 11.6 and 11.68 per kg. Respectively and compares favourably with the Rs. 11.72 per kg for a maize based diet. Although small, these gains compound considering the massive quantities of feed used in raising broilers and layers. Also, it is possible to further increase the level of stylo leaf meal in broiler rations if tannins in leaf meal can be lowered from its current level of nearly 5%.

*(Sukumar Chakravorty)*
Identification of *Dichanthium* line(s) possessing high level of drought tolerance

*Dichanthium annulatum* (Marvel grass) is one of the important component of Indian grasslands. An effort was made to identify and characterize line(s) possessing high level of drought tolerance, which will pave the way to define the attributes of tolerance at molecular level.

To identify such lines, a simple approach was adopted by observing the water holding capacity of thirty accessions of diverse origin by measuring the loss of leaf weight (collected at a time) as kept open in petridish at different duration. On the basis of this, three groups were made and two best performing lines of each group were further established in pots through tussocks. After one month of establishment, stress was imposed by watering the plant every third day to the level of field capacity in control and half of the field capacity in stress marked plants for two months. After sixty days, the lines showing less and slow reduction in leaf weight loss were physiologically similar in both control and stress, whereas the lines which depicted fast weight loss were wilted in stress condition. The relative water content (RWC) and water potential (WP) of these lines also supported the results as the tolerant lines maintained RWC and WP in stress to the level of control where as in susceptible lines both declined significantly. Tolerant lines possessed high level of super oxide dismutase activity in both control and stressed plants.

The lines identified as tolerant (IG 95-30 and IG 95-25) showed 2 to 3% loss in RWC, -0.1 to -0.3 MPa decline in WP and increased level of SOD activity in both control and stress imposed plants.

In contrast, susceptible lines depicted 4 to 16% loss in RWC, -0.6 to -1.4 MPa decline in WP and increase in SOD activity only when stress was imposed. Study indicated the putative identification of IG 95-30 and IG 95-25 collected from Lalitpur (UP) as drought tolerant lines to be used as source for identification of genes associated with drought tolerance.

(Amaresh Chandra, R. Saxena and A.K.Roy)

**Kisan Mela organized at IGFRI**

Dr P. Das, Deputy Director general (Extension), inaugurated *Kisan Mela* organized on March 22, 2004 at the Institute. Dr Mathura Rai, Director, Indian Institute of Vegetable Research, Varanasi, was special guest for the occasion.

Exhibition stalls were put to depict the developed technologies to the farmers. Minikits for improved from sorghum variety were distributed to the participating farmers.
Logarithmic spiral trench - An ideal method for tree root estimation in silvopastoral

By using "Logarithmic spiral trench method", the root distribution pattern was evaluated in fodder trees of five silvopastoral systems established during 1982 under IDRC programme. This method is a non-destructive one that involves preparing a logarithmic spiral trench whose dimensions is related to above ground tree variables of crown width and stem diameter (20 cm above the root collar). Each trench was dug to a maximum of 30 cm depth and the width depends on formula

\[ OM = OA e^{\alpha \theta} \]

Where \( OA = 1.5d; \quad \alpha = \ln (D/d) / \pi \)
\( d = \) stem diameter (cm); \( D = \) crown width (m)

Since each trench is different for each tree, roots are to be recorded at relative positions along the trench walls, corresponding to different values of Angle AOM and different soil depths (Fig.1). At each recording position the root density could be recorded using grids placed against the trench wall.

Root density

The root density was found to be significantly influenced due to different tree species, angles and depths. In general, the root density decreased significantly (P<0.01) with increase in depth from 10-30 cm. Among tree species, significantly higher root density (cm²) was recorded in Albizia amara followed by Hardwickia binata, Albizia lebbeck, Leucaena leucocephala and Acacia tortilis, respectively.

Root biomass

In general, the root biomass declined with progressive increase in radial distance from tree (angle). The pattern of biomass accumulation in roots varied significantly among species and depths. The following prediction models for root assessment in three tree species were found significant at 0-10 cm depths with respect to different angles.

**Albizia amara**

Root biomass = -1 + EXP (7.780-0.0369** Angle), \( R^2 = 0.894 \)

**Acacia tortilis**

Root biomass = -1 + EXP (9.5195-0.0561** Angle), \( R^2 = 0.962 \)

**Leucaena leucocephala**

Root biomass = -1 + EXP (6.4618-0.0265** Angle), \( R^2 = 0.829 \)

(G. Suresh and T.A. Khan)

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Retirements from IGFRI

Sri O.P. Dixit, Principal Scientist retired on March 1, 2004

Sri Kallan, T-3 Compositor retired on March 31, 2004

Sri Motilal, Assistant retired on February 29, 2004

We wish them a happy and prosperous life
"Shodh Yatra" - IGFRI Scientists visiting villages

Shodh Yatra is a new participatory approach to diagnose farmers’ problems and to provide them with spot solutions in the context of their livelihood. The Shodh Yatra consist two words - Shodh and Yatra. The literal meaning of Shodh is “Research” and of Yatra is “Visit or travel”. The Shodh Yatra is an exploratory visit of the researchers on the farmers' field to study the location specific problems. The Shodh Yatra is also a way of learning from and with the farming community to investigate, analyze and evaluate constraints and opportunities to need assessment and priorities of the farming community in the area of crop production, horticulture, animal husbandry, beekeeping, soil and water conservation, small scale rural enterprises and overall development of the farming community. The main objectives of Yatra were to develop an appropriate technological framework. Thus, Shodh Yatra is an intensive and systematic mutual learning process of farmers, scientists and development officials.

The multidisciplinary team was chosen representing scientist of the different disciplines like Agronomy, Soil Science, Plant Breeding, Plant Pathology, Entomology, Horticulture, Agrisilvipasture, Farm Machinery and Post Harvest Technology, Livestock Production Management, Animal Nutrition, Animal Disease Management, Home Science, Agriculture Economics and Agriculture Extension. The team also included State Development Officers and farmers.

An exploratory study of the selected villages (Karari, Ambabay, Patalpur, Punawali, Rajapur, Imalia and Khera in Jhansi district of UP and Garera, Dhobia and Sanora in Datia district of MP) was carried out in a participatory mode on February 3, 2004.

During the Shodh Yatra, the crops like wheat, gram, mustard, barley, berseem, oats, pea and vegetable crops and MPTs were witnessed by the scientists and on the spot solutions were provided to the farmers to solve their problems. About 56 farmers availed this opportunity for enhancing their knowledge.

The following researchable issues were identified by the multidisciplinary team:

1. Problems relating to diseases and insect pests in crops
2. Livestock disease and management
3. Income generating enterprises and their market accessibility
4. Soil and water conservation measures
5. Contribution of MPTs in farming system
6. Poor knowledge on package and practices about fodder crops/range species
7. Bio fertilizer and micro nutrient
8. Management of fodder scarcity period

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