IGFRI welcomes Dr. P. L. Gautum, DDG (CS)

Dr. P. L. Gautum (DDG, CS) visited IGFRI, Jhansi on November 17 and 18, 2007. He was accorded a warm welcome by the IGFRI staff. He took keen interest in acquainting himself about the research work and the field activities at Central Research (CR) farm and emphasized the role of IGFRI as a premier institute in the country working on grassland and rangeland development, forage production, improvement, and utilization. He took an overview of newly developed mega seed production block and water harvesting structures at CR farm. He appreciated the basic research on apomixis and efforts for developing standards for organic milk production. He advised to offer the farmers a complete package of food, fodder and fuel production for enhanced livelihood opportunities. He addressed the staff of the Institute and emphasized the need for co-operation among all categories of staff to serve the cause of farmers in a better way. On this occasion he released a bulletin, "Research initiatives for fodder resources development in western Himalaya", describing the research activities of J&K and Palam pur regional stations of the Institute and inaugurated the Biotechnology laboratory & laid the foundation stone of building for seed processing plant. Describing communication as an art, he advised to take all measures to make farmers feel free to seek advice from the scientists of the Institute. He also suggested opening an agriculture information center at the institute to provide various information related to farming operations as well as seeds of improved varieties to the farmers.

IGFRI Celebrates 46th Foundation Day

The 46th Foundation day of the Institute was celebrated on November 1, 2007. The Chief Guest, Dr. Gautam Kalloo, Vice-Chancellor, JNKVV, Jabalpur inaugurated the function and delivered the Foundation day lecture on, "Grassland and Fodder Research: Achievements and Future Strategies". He emphasized that though it is difficult but change is inevitable for the overall development and stressed the need for integration of forage crops with prevailing cropping systems on considerations of profit as well as soil health. He reiterated that development of environment friendly technologies for regeneration of degraded non-arable lands for sustainable livestock production, supply of energy and fruits in consistence with the need of people are other important areas. In coming years, growing awareness and demand for organic food like milk and meat will require special focus on organic fodder, he added. Dr. K.A. Singh, Director IGFRI presented the report "Year at a Glance". An interactive session with farmers from Bihar, Bundelkhand region, Rajasthan etc., was organized on this occasion. The Chief Guest distributed seeds of improved varieties of forage crops to the farmers. Best worker awards to various categories of IGFRI staff for their significant contribution and best paper award to scientists were also presented on the occasion.
A recent study has revealed that the livestock in the country are prone to floods according to the National Flood Commission and on an average 18.6 m ha land is affected annually (NRSA, 2007). The major flood-prone areas in the country are the Brahmaputra, Ganga and Meghna river basins in the Indo-Gangetic-Brahmputra plains in North and Northeast India and the west flowing rivers such as the Narmada and Tapti in north-west region and east flowing rivers like Mahanadi, Godavari, Krishan and Cauvery in Central and the Deccan region. A recent study has revealed that more than 1600 human lives are lost annually in flood with resultant damage to crops, houses and public utilities to the tune of 4745 crores per annum during 1996-2005 (National Disaster Management Authority, 2008).

Livestock play an important role in the livelihood of people in flood prone areas because most of these areas are under developed and agrarian in character. Most of the studies on flood related problems have overlooked the miseries of the marooned livestock in the flood affected area. In the pandemonium that follows flood, the poor livestock gets the least attention. People would rush away with one or two goats that they own leaving behind many. The chain of Food Corporation of India has helped in minimizing the loss of human life due to starvation but can we vouch that we have taken well care of our livestock during flood. Is there a comprehensive policy in place to bring succour to livestock? Has a fair assessment been made to assess the actual number of livestock lost during flood and the resultant loss in productivity. Do we have an estimate of the number of livestock that get affected? With the increasing dependency of population on livestock for their income and employment, people rue the misery their livestock are subjected during floods. During recent floods in Bihar, a train carrying fodder was looted by the people. Bihar Chief Minister sought help from his counterpart in Punjab not for grain for people but fodder for livestock. Therefore, it is high time we take stock of the situation at all levels to define the magnitude of the problem and adopt mitigating strategies.

Restoring livelihood of people after a bout of natural calamity is the quickest way to rehabilitate them. Initiating agricultural activities may take some time, but livestock can provide succour right in the midst of such misfortune, provided prior planning and coordination of various stakeholders are in place. However, studies on livestock production system in these niches are lacking elucidating their problems and opportunities.

A disaster management plan for livestock in flood prone areas can be divided into three phase: a) Flood preparedness (before flood), b) Relief and rescue during flood period and c) Post flood measures. After the flood prone areas have been delineated by the experts, the corresponding database with respect to different categories of livestock, their production levels, feed and fodder available and requirement need to be worked out. A comprehensive plan to enhance fodder production should be implemented. The IGFRI has developed fodder production technologies for various categories of land, right from irrigated area where round-the-year fodder production could be taken, to water logged area where moisture loving plants could be grown to semi-arid conditions and degraded lands. For various conditions, suitable cropping sequences and fodder plant species could be identified. Embankments along water bodies offer a good place to develop the fodder resources. There are about 20,511 km of embankments which can be planted with perennial grasses and
perennial top feed trees like pepal, bargad, jack fruit, gular, paker, bamboo etc. providing an in situ fodder bank.

There is an urgent need for creation of fodder bank in the zone of vulnerability. Suitable sites in the periphery of flood prone areas should be identified for creation of fodder bank, from where the supply will be rushed to the affected area. Individual household level feed storage on roof of buildings will play vital role. The establishment of Fodder Bank on the lines of Food Corporation of India will require many issues to be looked into:

* The state farms dedicated for the purpose of growing and conserving fodder.
* Bailing of dried fodder and their storage
* The use of Feed-Block making machine: The complete feed block made by Feed Block making machine can produce feed block for different categories of livestock taking into account the varying production levels. This can be run as a commercial venture in normal times, besides coming to help for creation and management of fodder reserves in the form of bales / complete feed blocks.
* The cycling of stored fodder: The stored fodder in the form of bales may be rotated on a three-year cycle, so that a strategic reserve remains in place simultaneously using the older stock gainfully.

IGFRI has done considerable work on bailing, densification and complete feed blocks to suit the requirements of animals with different production levels. It has the requisite technologies to assist the central and state agencies in formulating an action plan. The proposed setting up of a National Flood Management Institute should draw experts from livestock and fodder background to seek the welfare of livestock which support people during trying times.

(K.A. Singh)
Director

---

### Compositional analysis of Panicum maximum collections

Bioethanol production from lignocellulosic biomass is a fast emerging technology to meet the fuel requirement. Currently in India, molasses is the only significant raw material (75%) to produce ethanol, but its supply is inadequate and inconsistent. It is imperative to utilize abundantly available biomass materials as feedstock to produce ethanol as a biofuel. Feed stocks with potential to be utilized for conversion of ethanol include sweet sorghum biomass, switch grass (*Panicum virgatum* L.), corn stover, rice straw, wheat straw, by products like rice hulls, sugarcane bagasse etc. In addition energy rich grasses like switch grass, guinea grass (*Panicum maximum* Jacq.) can be used as low cost alternative sources of sugars for biofuel production. Guinea (*Panicum maximum*) is one of the potential source of biofuel due to its high biomass production within short period (40-45 days interval) and high energy value. Three promising collections of *Panicum maximum* (G1, G2 & G3) were found to be very robust, aggressive, with thicker culms, greater herbage biomass (130-150 t/ha GFY) and wider adaptability. As per the farmers’ perception in the demonstration plots, they were responsive to fertilizers, had good palatability and ease of establishment through seed. Crude protein content in these collections varied from 3.20 to 6.60 % (G1-3.2; G2-6.6 & G3-3.8) while total solids were found to be 64.3 % in G1; 65.5% in G2 and 71.8 % in G3. Major sugars were xylose and glucose with arabinose and galactose in lower concentrations.

<table>
<thead>
<tr>
<th>Sugars*</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xylose</td>
<td>20.18</td>
<td>18.22</td>
<td>17.50</td>
</tr>
<tr>
<td>Glucose</td>
<td>39.22</td>
<td>37.20</td>
<td>37.50</td>
</tr>
<tr>
<td>Arabinose</td>
<td>3.10</td>
<td>3.39</td>
<td>2.53</td>
</tr>
<tr>
<td>Galactose</td>
<td>0.96</td>
<td>0.55</td>
<td>0.47</td>
</tr>
</tbody>
</table>

*Values on dry weight basis (%)*

The efficiency recovery of xylose and glucose was 77% and 97%, respectively. The preliminary observations on guinea grass have given encouraging results to further explore the possibility of ethanol production.

(K. Sridhar and Nagratna Biradar, IGFRI-RRS Dharwad)
Cereal-clover inter-cropping: A new approach for enhancement of fodder availability

Small land holding of the farmers in hills make it difficult to spare even a small piece of land for fodder cultivation. Integration of forage in existing farming systems can conserve resources, produce fodder and improve productivity of grain crops. White clover, a perennial forage legume, is a compatible crop for inter-cropping. When grown with cereal crops, its productivity is enhanced and the farmers obtain fodder as well as cereals from the same unit area. An experiment entitled, “Cereal-clover intercropping: A new approach for enhancement of fodder availability” was designed to integrate white clover in the hill farming system to obtain sustainable herbage and grain production in existing system of hills.

In an established sward of white clover wheat was sown in the sward during rabi followed by maize (Fig. 1 & 2). The seeds of the crops were drilled (minimum tillage) into the sward. Experiment consisted of 12 treatment combination of Wheat-Maize, White clover + Wheat-Maize with recommended dose of NPK and 50, 75, 100 per cent N to wheat and maize along with sole stand of White clover.

Application of 75% N to maize crop produced significantly higher grain yield (23.51 q/ha) than the crop sequence of white clover + wheat (50% N) - maize (50% N). The application of 75% N to maize crop produced statistically at par grain yield to 100% N application with 50, 75, 100 per cent N to wheat. Standard check of maize produced grain yield of 23.75 q/ha, which was at par to 100% N application.

Similarly application of 75% N to wheat crop produced significantly higher grain yield (24.17 q/ha) than 50% N application. The application of 75% N to wheat crop produced statistically at par grain yield to 100% N application. Standard check of wheat produced grain yield of 24.12 q/ha, which was at par to 100% N application.

From two cuts of white clover, green herbage production varied from 15 t/ha to 27 t/ha. Correspondingly the dry matter of white clover varied in the range of 2.45 to 4.89 t/ha. Sole white clover produced dry matter of 4.89 t/ha, which was significantly higher than all other treatments. Rest of the treatments produced statistically at par dry matter.

(Inder Dev, Bimal Misri and Sudesh Radotha)

Dominant springtails of fodder production systems

Springtails are soil and litter dwelling small insects (less than 5 mm in length) having springing or jumping ability. They are major component of terrestrial ecosystems feeding on decaying plant material, fungi, moss, bacteria etc. They exhibit colors: dull white to blue-black, green, yellowish, orange or irregular patches/bands of dark colors. The springtails can be seen on the surface of water or on decaying vegetables during rainy season. Based on a two year investigation, where soil samples were taken at monthly interval from over 30 locations, under various land uses ranging from natural grasslands to intensive production systems on red soils of Bundelkhand region; a wide diversity of springtail diversity was observed. Four species of springtails viz., *Folsomides purvulus*, *Proisotoma* sp., *Brachystomella* sp. and *Symphyleona* sp. were characterized as most dominant on the basis of their frequent occurrence in about 80 percent of the samples. The above four species constitute about 75% of the total collombola population in this regions.

(Sharmila Roy and Ruquaeya Bano)
Clean DNA transformation: A technique to minimize biosafety concerns

Microprojectile mediated whole plasmid bombardment leads to integration of undesired vector backbone sequences into plant genome along with the transgenes & thus vector sequences causes illegitimate recombination, transgene rearrangement and plasmid multimerization. In recent past a significant improvement has been made over conventional methods of microprojectile mediated plant transformation & the use of minimal gene expression cassette (promoter – open reading frame – terminator), devoid of vector backbone sequences for bombardment has been proposed. However, isolating the minimal gene-cassette DNA (Figure 1) in large quantities by restriction digestion is not only cumbersome and time consuming process but also laborious and expensive. Therefore, an alternate approach to generate sufficient amount of minimal gene-cassette DNA to be used for ‘clean DNA’ transformation was sought. The process involves PCR amplification of gene-cassette using high fidelity DNA polymerase with proofreading activity. When an embryogenic calli was bombarded with restriction digested or PCR amplified GUS gene fragments, transient GUS gene expression showed no significant difference in terms of the blue spots (Figure 2). Nucleotide sequence of GUS gene-cassettes, PCR amplified with Taq DNA polymerase or with high fidelity DNA polymerase, was compared with the original nucleotide sequence of GUS gene using Clustal-X software, alignment results indicated a number of base substitutions in case of Taq amplified GUS gene-cassette, while no error was observed in case of GUS gene-cassette PCR amplified using high fidelity DNA polymerase. Thus, PCR amplification of gene-cassette is a reliable alternative for generation of minimal gene-cassette for ‘clean DNA’ transformation.

(Suresh Kumar)

Figure 2. GUS spots on calli bombarded with minimal GUS gene-cassettes generated by (a) restriction digestion or gel extraction, (b) PCR amplification using XT-5 DNA polymerase and (c) by PCR amplification using Taq DNA polymerase.

Figure 1. Plasmid pCAMBIA-1305.1. Minimal gene-cassette for GUS reporter gene can be excised by restriction digestion with Sph I.

Capacity building of IGFRI staff

Capacity building of scientific, technical, finance and administrative staff of IGFRI has been taken up in a big way. They are being trained in basic skills which are helpful in better discharge of their professional and personal duties. The National Academy of Agricultural Research Management, Hyderabad is supporting the training programme by deputing their trainers to IGFRI. In continuation of the earlier programmes, an specialized short course on “Improving efficiency of junior staff of IGFRI”, was organised during November 27-30, 2007 on the aspects of ice breaking, motivation and fun at work, personality development, conflict management, inter-team interaction etc. 25 participants from supporting staff category took part in the training. The programme proved to be very useful in enriching the knowledge, improving attitude and skills of the participants. Dr. M.M. Anwar, Dr. P. Manikandan and Dr. RVS Rao from NAARM, Hyderabad conducted the interactive sessions and practical exercises. In view of enthusiastic response, the Institute aims to train more staff in coming years.
Research Advisory Committee Meeting

The 14th RAC meeting of IGFRI & NRCAF was held on December 07-08, 2007 at IGFRI, Jhansi under the Chairmanship of Dr. Arun Verma, Ex-ADG (AN), ICAR with Dr. S.N.Shukla, ADG (FFC), Dr. A.K. Gogoi, ADG (AF), Dr. J.P.Chandra and Dr. G.Vijay Kumar as the Members. Dr. K.A. Singh, Director IGFRI and Dr. S.K. Dhyani, Director NRCAF presented the research progress and new initiatives to be taken up in their respective Institutes. Heads of the divisions and programme leaders of both the Institute's presented the research activities. New initiatives on organic livestock production was well appreciated by the committee.

Ber based hortipastoral system in semi – arid region

Ber based hortipastoral system offers one of the best economic alternatives for the class V and VI category lands which are not suitable for arable farming. Hortipastoral experiments conducted at this institute over fifteen years (1990-2006) involving ber has the potential to increase fodder availability, besides providing fruit to enhances income of the farmers.

1st Phase (1990-98): Different combinations of C.ciliaris, S.hamata with jujube (Ziziphus mauritiana L.) cv. Gola plants (6mx6m) were planted. Ber started producing fruits from third year onwards and yield up to 7.49t/ha were obtained. The pasture production also showed an increasing trend during the initial three years and yield in range of 4-5 t DM/ha were obtained. The highest forage yield was obtained with C. ciliaris + S. hamata were grown.

2nd phase (1999-2000): Eight year old ber orchard were pruned at bifurcation point of main trunk at three heights (30,60, 90 cm) and bajara (fodder) were grown applying four doses of nitrogen (0,40, 80, 120 kg/ha). Green fodder (bajara) yield to the tune of 22.6-26.5 t/ha were obtained with 90 cm height and fruit yield of ber increased significantly with increasing levels of nitrogen from 0 to 120 kg N/ha.

3rd phase (2001-06): Secondary branches of Ber tree were pruned at 20, 40 and 60 cm height. The understorey space was utilized with four pasture combination i.e. Guinea grass + S. hamata, Dinanath grass + S. hamata, Guinea grass + Dinanath grass + S.hamata and natural vegetation. Pasture production with heavily pruned tree was significantly higher (4.02 t DM/ha) as compared to light pruned tree (3.44 t DM/ha). The medium pruned tree produced significantly higher fruit yield (7.3 t/ha) as compared to heavily and light pruned tree.

(Sunil Kumar, S. N. Ram and B. K. Choubey)

Visit of Zambian delegation to IGFRI

A four member high level delegation from Zambia sponsored by Golden Valley Agricultural Research Trust, Lusaka visited IGFRI on Nov. 29, 2007 to explore the possible cooperation in the field of rangeland improvement and fodder production. The delegation visited the Central Research Farm of the Institute and interacted with the scientists on research aspects related to grassland improvement and fodder production. The work in grassland and silvipasture technologies, farm machinery, densification of forage and complete feed block and forage based livestock production elicited keen interest among the Zambian visitors.
National Symposium on Rangeland and Forage Resources in Changing Socio-economic Scenario

A National Symposium on “Rangeland and Forage Resources in Changing Socio-economic Scenario”, held at IGFRI, Jhansi on November 15-17, 2007. It was organised jointly by Range Management Society of India and IGFRI, Jhansi. The symposium was attended by over 150 scientists. Eminent scientist Dr. K. G. Tejwani inaugurated the symposium. In his inaugural address he dwelled upon the need for grass and fodder and the socio-economic issues related to it. He pointed out that the neglect of grass and tree leaf fodder threatens the survival of livestock during drought and famines. The society conferred Dr K. G. Tejwani with the Honorary Fellow of the Society. Key note addresses on various topics were delivered by experts in the field of forage and animal science, like Dr. S.D. Rai, Dr. N. N. Pathak, Dr. N. P. Singh, Dr. Jai Singh, Dr. N. P. Melkania, Dr. S. S. Parihar, Dr. T. Srinivasa Mohan, Dr. P. S. Pathak, Dr. K. A. Singh, Dr.M. S. Siddhu, Dr. S.K. Gupta and Mr. A. K. Garg. The plenary session was chaired by Dr P. L. Gautam, Deputy Director General (CS), ICAR. The symposium was organized into 7 technical sessions viz., i) Grassland/ rangeland resource and production systems for non-arable lands ii) Forage resource & production systems iii) Forage crop improvement iv) Livestock production v) Technology transfer vi) Climate change, environmental issues & water harvesting and vii) Post harvest technology.

Forage Biotechnology: Initiative, achievements and prospects

A national seminar on “Forage Biotechnology – Initiative, achievements and prospects” co-sponsored by IGFRI, Jhansi and Dept. of Animal Husbandry and Dairying, Ministry of Agriculture, Govt. of India was held on November 2, 2007 at IGFRI. Dr. Gautam Kaloo, Vice-Chancellor, Jawahar Lal Nehru Krishi Vishwa Vidhayalaya, Jabalpur, MP inaugurated the seminar. He emphasized the need for using the modern tools in combination with conventional breeding techniques for genetic improvement in forage crops, especially for abiotic and biotic stresses. Delegates from ICAR, Plant Biotechnology, National Institute of Plant Genomic Research, New Delhi, IGFRI & NRCAF, Jhansi, Department of Animal Husbandry, Govt. of India and Asia-Pacific Consortium on Agricultural Plant Biotechnology, participated in the seminar. The scientists deliberated upon various theme areas including biotechnological achievements and prospects in improvement of forage grasses, legumes and cereals, and rumen ecology and manipulation. The major recommendations of the seminar were: (i) Forage biotechnology is in incipient stage and it needs more allocation of resources in terms of human and financial resources. The scientists working in this field should be trained in cutting edge technologies to accelerate the pace of development. (ii) The key areas of research in forage biotechnology should include root rot and stem rot resistance in berseem, weevil resistance in lucerne, quality improvement, salinity tolerance and moisture stress in oats and berseem, association genetics of abiotic stress tolerance in sorghum, maize, range grasses & legumes, MSA breeding for abiotic and biotic stress tolerance, manipulation of rumen ecology for effective utilization of roughages, insect tolerance in cowpea and understanding the phenomenon of apomixis and its exploitation.
विश्व क्षेत्र में चरागाह प्रबन्धन एवं उपयोगी प्रज्ञातियों का चरम पर वृद्धि कार्यक्रम, नवंबर 12-14, 2007

कृषि दिनांक
एवं
कृषक गोपाली

ग्राम-सत्तोला
10 अक्टूबर,
2007

मुजाहिदपुर
11 अक्टूबर, 2007

निधन
डा. विजय दीर्घ सिंह, कांग्रेस प्रत्यक्ष
(10-6-1958-14-10-2007)
संस्थान परिचार अध्यक्ष अधिपत्य करता है।

संवादनिवृत्ति
श्री राम किशन, टी-4
31 दिसंबर, 2007
संस्थान परिचार अध्यक्ष अध्यक्ष का कामना करता है।

निर्देशक
भारतीय चरागाह एवं चाय अनुसंधान संस्थान, इंदिरा
हार्वर्ड: (0510)2730666, फैक्स: (0510)2730833

8