IGFRI VISION - 2020 : THE PLAN TO MEET FUTURE CHALLENGES.

Indian Grassland and Fodder Research Institute has served a very useful purpose within the frame work of its mandate ever since its inception in 1962.

In the context of fast changing global scenario, aiming to meet the future international competitions, the need of the hour is to remain visible with appropriate technologies for a range of clientele - from resource poor farmers to input intensive dairy concerns.

Based on the analysis of the scenario in terms of strengths, weaknesses, threats and opportunities, and considering achievements, short falls, and the demand and supply projections in feed/fodder related inputs, strategies have been finalized. The Institute Perspective Plan for the next 25 years encompasses the outcome of brainstorming exercise at Divisional and Institute level and the suggestions received from the learned members of different advisory bodies like Research Advisory Committee, Quinquennial Review Team and Peer Review Committee etc.

The future research programmes which include nine major areas, viz., forage genetic resources, crop improvement, intensive forage production systems, forage production from problem soils, range management, forage seed production and technology, forage -based farming systems, transfer of technology and human resource development have been further divided into different components. Each such research programme has been spelled out in a time frame indicating the emphasis on high or low priority. The annual targets have been envisaged for each programme and the mechanism of monitoring and review has been specified.

Considering the limited financial resources available and the added emphasis on generation of resources at Institute level, areas for these activities have been documented after identification of clientele for each such area like forage seed production and marketing, consultancies in the areas of rehabilitation and sustainable management of degraded rangelands and problem soils, intensive fodder production for individual dairy farms, small ruminant farming, silage and hay making, imparting different subject matter trainings and contract research and services etc. along with profitable mobilization of available internal physical resources.

Dr. R.S. Paroda, Secretary, DARE and Director General, ICAR, the brain and the strength behind the concept of perspective planning in the ICAR system has stressed the importance of such planned strategic management of R&D in the foreword of this document and has hoped that "the framework prepared would continue to be reviewed to accommodate changes in future so that the perceived vision continues to be close to the expected target".
BUNDEL BERSEEM-2: HIGH YIELDING VARIETY FOR CENTRAL AND NORTH-WEST ZONE

A new high yielding, nutritious and disease resistant variety, Bundel Berseem-2 (JHB-146) has been developed at IGFRI, Jhansi through mass selection from indigenous germplasm.

It has excelled existing national check 'wardan' by a margin of 7.9%, 7.3% and 10-15% for green fodder, dry matter and crude protein yield respectively. On the basis of multilocational testing the variety has been released for cultivation in Central and North-West Zone of India. Besides better yield and quality traits it scores over the existing variety 'wardan' in manifesting relatively higher degree of resistance to root rot and stem rot diseases, which are major threats for berseem growing areas. (D.R. Malaviya and G.P. Shukla)

HIGHLY PRODUCTIVE CENCHRUS GENOTYPES FOR SEMI-ARID REGIONS

Nine genotypes of Cenchrus ciliaris were evaluated for photosynthetic rate and biomass production under the field conditions. The genotypes IGFRI-3105 showed maximum dry matter yield with high leaf area index and canopy photosynthesis followed by IGFRI-3813. Significant positive correlations were found in DMY vs Pn DMY vs LAI and DMY vs Pn x LAI. The genotypes IGFRI-3105 and 3813 have high photosynthetic efficiency, water use efficiency and biomass production. On the basis of these observations, it is suggested that:

- Inter-dependence of parameters like dry matter yield with Pn, LAI and Pn x LAI can be used as preliminary indices for the selection of the genotypes for higher productivity.
- The genotypes like IGFRI-3105 and 3813 have been selected as promising material for maximum productivity under semi-arid environmental conditions. (M.J. Baig, R.K. Bhatt and U.S. Mishra)

NITROGEN MINERALIZATION

The soil is the principal resource from which plants derive a large amount of N. A good soil contains more than 560 kg available N per ha (equiva lent to 1217 kg urea ha⁻¹). The major source of N is the soil organic matter which releases N on mineralization. To assess the capacity of soils to supply mineral-N, that is available to plant, a study was conducted on a major soil type (black soil) previously amended with several organic and inorganic fertilizers and legume based fodder production system. A significant finding in this work was that when a legume crop, such as green gram, was taken as an intercrop with fodder maize, N mineralization rate was highest (9.23 kg ha⁻¹ day⁻¹) than urea application (8.06 kg ha⁻¹ day⁻¹). This shows a clear advantage of legume that could be harnessed if the released N is captured effectively and not allowed to move down through leaching or escape to the atmosphere. (A.K. Patra and M.R. Pahwa)

NUTRITIONAL EVALUATION OF NEW FORAGE OAT VARIETIES

Evaluation of three varieties of oat (JHO-851, JHO-822 and Kent) revealed that JHO-822 contained higher CP (12.07%) and lower NDF (63.25%) than JHO-851 and Kent. It also contained higher digestible crude protein (6.27%) followed by JHO-851 and Kent and Total Digestible Nutrient content (66.76%) followed by Kent and JHO-851. (V.C. Pachauri, S.K. Mahanta and Sultan Singh)
Dear Readers,

In India, with ever increasing livestock population and without any commensurate increase in area under fodder production, there is a wide gap between demand and supply of feed and fodder. The R&D efforts have to be concentrated on increase in yield of quality fodder per unit area per unit time. In this direction, IGFRI together with the active support of forage production, testing and demonstration networks has made great strides in technology transfer.

In order to further widen the research base in forages as envisaged in the IGFRI Perspective Plan "Vision 2020" for the next twenty five years and to develop sustainable, site specific production technologies, there is a need to strengthen the linkages at the national and international level.

IGFRI, through an effective international collaboration, has generated a very valuable information on rehabilitation of degraded/wastelands under an IDRC funded Project. An Indo-UK Collaborative Project on Forage Production is currently operating at the Institute. IGFRI has also been recognised by FAO as the Indian Coordinating Centre of Temperate Asia Pasture and Fodder Network to study the problems and to undertake research programmes for pasture and fodder production in temperate and subtemperate Himalayan region. CSIRO, Australia has shown interest in germplasm testing, disease epidemiology and development of anthracose resistant 'Stylosanthes' varieties and their utilisation in the tropics in collaboration with this Institute. This ACIAR funded multi-country collaborative programme involving Australia, Brazil, China, Colombia and India is likely to take off in the beginning of 1998. Similarly, collaborative programmes involving IGER (UK), CIAT (Colombia) and IGFRI on stay green sorghum and IGER and IGFRI on forage on Bunds on Rainfed Farms are being initiated. Collaboration with ICRA, The Netherlands, IPGRI, Rome and Ministry of Agriculture and Agri-Food, Canada are also envisaged.

IGFRI is currently gearing itself to be more forward looking in its pragmatic approach towards establishing many more such collaborations.

(BHAG MAL)
The division of crop production was formed in July, 1996 when the erstwhile divisions of Agronomy and Soil Science were merged to facilitate multidisciplinary approach for forage production research. The parent Division of Soil Science & Agronomy was established under the leadership of Dr. C.T. Abhichandani and was later bifurcated into two divisions, namely, Agronomy and Soil Science. The Crop Production Division has a strength twenty three Scientists in different disciplines with Dr. P.S. Tomer as its Head.

**Spectrum of Research Activities**

The research programme of the division is oriented to meet the clientele need for quality forage. The major concern is to cater to the national need of developing agrotechnologies for maximizing forage production under irrigated and rainfed conditions under different agro-ecological situations. Evolving of new avenues of feed resources in dryland/ problematic areas through system approach constitutes another important area. The research thrust is also reoriented towards testing of nutritionally superior palatable perennial alongwith annual fodder species. Crop modelling using agro-meteorological approaches for strategic planning under rainfed situations is also an important emerging field. The division is well equipped with laboratories and field facilities to conduct research on all aspects of Agronomy, Soil Science, Soil Microbiology and Agro-meteorology. The division is capable to undertake the collaborative research programmes at the national and international level besides extending the consultancy services.

**RESEARCH ACHIEVEMENTS**

Over the last three decades the division has developed various agro-techniques for maximizing forage production under different conditions.

**IRRIGATED FORAGE PRODUCTION**

- Developed suitable agro-techniques for high yielding varieties of forage crops.
- Evaluated various nutrient sources and optimized the nutrient requirement of forage crops.
- Developed cropwise irrigation schedules for higher forage productivity and maximum water use efficiency.
- Identified suitable weed control techniques in forage crops.
- Explored the possibilities of forage production in association with food and commercial crop based cropping systems.
- Worked out the opportunities of forage production in alley cropping systems.
- Farming system research for small, medium and large farmers evaluated.
RAINFED FORAGE PRODUCTION

- Identified various forage crop varieties suitable for rainfed situations.
- Evolved different food-fodder production systems under dryland conditions along with their improved package of practices.
- Developed various soil moisture conservation techniques for sustaining increased biomass productivity under dryland conditions.
- Worked out the opportunities of integrated nutrient management involving organic, inorganic and biological sources of nutrients to exploit the locally available resources.
- Explored the possibilities of increasing fodder resources through alternate land use system, such as lay farming and alley cropping under dryland conditions.
- Established the applicability of long range forecast of South-West monsoon rainfall at micro level for crop planning. The mean length of rainy season exhibits a decreasing trend, i.e., one week/decade thereby indicating a possible climate change over Jhansi region.

FORAGE PRODUCTION ON PROBLEM SOILS

- Identified various forage crops/tree species suitable for problematic soils (acidic, saline, sodic, and water logged).
- Evaluated various sources of plant nutrients for increasing fertilizer use efficiency in forage crops under acidic and saline-sodic soils.
- Developed different soil amelioration techniques involving organic, inorganic and biological ameliorantes for acid and saline-sodic soils for raising forage crops.
YE, TIVE, R PRODT-CES

Vetiver, khus grass (Veteveria zizanioides) attracted global attention in the recent past as it has been considered to offer a practical and inexpensive solution for controlling erosion. It is reported not to produce viable seeds, (Wasteland News, April 1987, pp.21-23). This grass is widely distributed along the river bank adjoining Research Farm of this Institute. An area was established using vetiver rooted slips of locally collected material for studying the flowering behaviour, seed yield, germinability and viability. Studies revealed that vetiver starts flowering during mid August and produces viable seeds in the first half of September. Potential yield of pure germinating seed was estimated to be 400-600kg/ha/yr under rainfed condition. Seeds require after - ripening period of about 3 months and 40-50% seeds germinate after 6 months storage. Germinability of seed, is however, reduced to about 30% after one year. (S.S.Parihar)

PROMISING BRADIRHIZOBIIUM STRAINS FOR STYLOSANthes

Application of Rhizobium in low input legume based tropical pastures such as Stylo, increases biomass yield and quality of herbage besides improving soil fertility. However, to make such technology effective, it is important to identify suitable and competitive strains having wide adaptability in harsh soil conditions. In view of this, experiments have been conducted using several effective strains collected from local Indian soil and other countries.

The strains (Native : JSB-4, JSB-6, JSB-7, JSR-3, JSR-4 and JSR-6, Exotic : TAL-309 from USA, ISI-2, NSI-5 from UK and CB-82 from Australia) tested on Stylosanthes hamata for their relative effectiveness, competitiveness and performance in terms of productivity (+44%), N content and its uptake by plants were compared with JSR-3 strain. The relative effectiveness, occupancy of native strains against the reference strain, TAL-309 was found to be 114-122%, the highest being with JSR-3. Antibiotic labelled strain studies demonstrated 75-100% occupancy in nodules by native strains as compared to 35-60% by exotic ones.

The results of these studies indicated greater promise and competitiveness of local strains (JSR-3 and JSR-4) over the exotic ones of S. hamata for rakar soils (red soils) of this region. (M.R. Pahwa and A.K. Patra)

SUBABUL LEAF MEAL AS PROTEIN SUPPLEMENT

Protein is a major nutrient affecting animal productivity. The price and demand of protein rich oil cakes are very high which can be replaced with a cheaper source i.e., fodder, tree legumes etc.

Seventy five per cent of CP in mustard cake or groundnut cake can be replaced through Subabul Leaf Meal (SLM) in small ruminants without any detrimental effect on nutrient and energy utilization as well as growth performance. The feed cost per kg live weight gain of SLM incorporated diet was cheaper by nineteen per cent. (S.K.Mahanta, Sultan Singh, Anil Kumar, V.C. Pachauri and A.K. Pokharna).

OPTIMIZING IRRIGATION SCHEDULE IN BERSEEM

Berseem is a widely grown high quality forage crop in India. However, it requires frequent irrigation to maintain higher productivity which becomes a major concern because of limited water resources. For effective use of water, scheduling irrigation based on quantification of evapotranspiration (ET) is a reliable approach. Experiments conducted at this Institute using field lysimeter show that the maximum water use efficiency (WUE) (19.5 kg dm ha⁻¹ mm⁻¹) corresponds to 2nd cutting of berseem in rabi season. The dry forage yield (35.6 q ha⁻¹) and the highest ET value (8.24 mm day⁻¹) coincides with the 5th cutting. A mathematical relationship (Y = 3.127 + 0.1267 X, r²=0.89) has been established which reflects that the yield of berseem is a linear function of ET. (Pradeep Behari, J.B. Singh and A.K. Patra)
**Indo-UK Project Activities:**

Dr. R.K. Bhatt, Vishnu Bhatt and Dr. A.K. Misra proceeded for 4-6 months training at IGER Aberystwyth, UK on May 5, 1997 in the field of seed physiology, biotechnology and forage evaluation & animal production, respectively.

Ms. Seema Srivastava, Technical Officer (Library) left for Aberystwyth, UK, for one month training from June 14, 1997 in the field of Library Science. She would also participate in International Summer School at Aberystwyth.

Dr. Bhag Mal, Director, Dr. Vinod Shankar, HD, GSM and Dr. V.S. Upadhyaya, Principal Scientist (LPM) attended 18th International Grassland Congress from June 8-19, 1997 held at Winnipeg and Saskatoon, Canada under the financial support from this project.

**Dr. S.K. Sharma, Scientist (SS) who is currently participating in the Sixteenth International Training Programme for Development Oriented Research in Agriculture organised by the International Centre for Development oriented Research in Agriculture (ICRA), Wageningen, The Netherlands; writes that the programme is designed to give participants direct experience in:**

* interdisciplinary communication, group research management and participatory research with rural people.
* research methods to analyse agricultural systems and to identify constraints to sustainable rural development.
* prioritization of research and development proposals, within the context of both farmers' needs and national research and development programmes.
* development of research proposals.

Twenty eight participants from 13 countries (Brazil, Ethiopia, Ghana, Honduras, India, Kenya, Mexico, Nepal, Pakistan, Tanzania, The Netherlands and UK) are undergoing the training from January 13, 1997. The first six weeks were spent in Wageningen followed by a short visit to relevant institutes in UK. The remaining time will be spent in Wageningen in planning field work. The participants are grouped into five teams. Each team will be visiting one of the countries namely, Brazil, Ethiopia, Kenya or Pakistan. The teams are expected to prepare projects which will be implemented by the host countries.

Dr. Sharma acknowledges the financial support from ODA, UK and ICRA, The Netherlands for participation in this important training.

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**XVIII International Grassland Congress - A Report**

The eighteenth International Grassland Congress hosted for the first time in Canada was held at Winnipeg and Saskatoon during June 8-19, 1997. Delegates numbering approximately 1200, representing 94 countries participated to present and exchange the most up-to-date information on world grasslands under the theme "Grasslands 2000".

The wide array of themes, numbering a total of 30, covered issues from emerging environmental concerns to world food demand, highlighting the importance of forage research as we move into 21st century. It also provided ample networking opportunities to develop collaborations needed to address these issues.

Seven Indian participants including three from IGFRI attended this conference. Four papers from this Institute were presented by the participating scientists namely Dr. Bhag Mal, Dr. Vinod Shankar and Dr. V.S. Upadhyaya. "Role of non-traditional forages in livestock production in India", "Strategies for forage research and technology transfer in India", "Growth of heifers and changes in vegetation in a natural grassland oversown with caribbean stylo" and "Foraging behaviour of heifers, sheep and goat in grass-legume cafeteria".

The congress concluded on June 19, 1997 with the declaration to hold the XIX IGC in Brazil in the year 2001 under the theme "Grassland Eco-systems: An Outlook in the 21st Century".

**Participation in International Conference**

Dr. C.R. Hazra was on deputation to Federal Research Centre on Agriculture, Braunschweig, Germany to participate in the International Conference on Sustainable Agriculture for Food, Energy and Industry held from June 22-28, 1997. He presented an invited paper on "Bio-diversity and natural resource conservation through participatory resource management on watershed basis for sustainable agriculture - A case study".
THE SABBATICAL LEAVE UNDER ICAR SYSTEM

The council has approved and circulated Sabbatical Leave Rules for academic, scientific, technological and other related activities at any relevant institution or organisation in India or abroad to enable the academic and scientific staff to promote their professional competence. The senior scientists and above having rendered not less than six years of service in ICAR/SAUs with at least five years service left for superannuation after completion of this leave are eligible to avail leave for a maximum period of one year at a time, twice during the entire career. The scientists desirous to avail this opportunity may obtain further information from the Institute.

FAO Sponsored Training Programme

Fodder trees/shrubs are important sources of quality feed in subtropical and temperate region of the Himalaya. Substantial information is now available on these aspects in the countries sharing the natural endowments of the Himalaya. In order to share techniques and materials for mutual benefits an International Training Course on "Management and Utilization of Fodder Trees & Shrubs in Subtropical and Temperate Himalaya" is planned to be organised at this Institute during September 22-30, 1997.

The training aims to update participants on current status and incorporation of fodder trees/shrubs in agroforestry/silvopastoral systems for utilization of degraded lands and strengthen the coordination in research and developments among participant countries.

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