भाकृअनुप
ICAR

56th Foundation Day

1st November, 2017

Director's Report

भाचघाअसं
IGFRI

ICAR-Indian Grassland and Fodder Research Institute
Jhansi (U.P.) – 284003
(ISO 9001-2015 Certified Institute)

On the occasion of 56th Foundation Day of ICAR-Indian Grassland and Fodder Research Institute, I cordially congratulate all the past and present scientists, technical, ministerial and supporting staff of the institute for their sincere contributions towards the progress of the institute. Due to their continuous efforts during the year, the institute has made remarkable progress in the field of forage research, extension and capacity building and has widened its visibility at national and international level. Being the only institute in Asia researching exclusively on grasslands and fodder crops, also performs development and management of grasslands. From its inception in 1962, the institute has successfully served the country for 55 years achieving several milestones in generation of various need based technologies with an ultimate aim to serve the farming community and is now reaping the successes of multi-disciplinary research composed of soil-plant-animal components connecting both plant and animal research. The institute comprises seven multi-disciplinary divisions *viz*., crop improvement, crop production, grassland & silvipasture management, farm machinery and post harvest technology, seed technology, plant animal relationship and social science and three regional stations located at three different agroclimatic zones. To address the continuous and growing challenge of green and dry fodder shortage, institute has widened its approach in multi-directions with focus on meeting the demand through technological interventions and development of high yielding fodder varieties suitable for changing climate. IGFRI is focussing on nine distinctive programmes of forage research, with multi-disciplinary and inter-divisional approach to address basic, strategic and applied research needs of the nation. I take this opportunity to share the most noteworthy achievements of the passing year in terms of research, transfer of technology and human resource development. During the year, three varieties of oats (JHO-2010-1 and JHO 2012-2 for south zone, JHO-2009-1 for central zone), one each of marvel grass (JHD-2013-2 for north west zone), berseem (JBSC-1 for all berseem growing areas especially rice fallow) and clitoria (JGCT 2013-3 for all India) were identified for release. Six entries of red clover and two entries of white clover were contributed for all India testing. In addition, 148 germplasms of various grasses and legumes were collected, technologies for increased outputs from sole, mixed and inter-cropping patterns, integrated farming system as well as horti- and silvi-pasture models were developed. In recent past the institute had developed grasslands in Madhya Pradesh, Karnataka, Rajasthan, Bihar in association with state governments and NGOs. Various outreach programmes in Bundelkhand, Leh, Chhattisgarh and all over the country through NIFTD allowed us to showcase our technologies and have gained appreciation among the stakeholders. To boost the fodder seed chain and availability of quality seeds to the end users, the institute has supplied 17.37 tonnes of breeder seeds for further multiplication and 24.01 tonnes of TFL seeds directly to the farming community, besides, 8.32 lakhs rooted slips of perennial grasses have been sold. During the year, institute has organised a national symposium in collaboration with RVSKVV, Gwalior and RMSI, Jhansi, one winter school on *"Feeding strategies in relation to climate resilient forage and livestock production"*; a short course on *"Engineering*

interventions in fodder production and their value addition"; a model training course on *"Advances in grazing and pasture management practices for sustainable livestock production"* and a trainers training on *"Forage seed production and quality control"*. We have also continued the key national programmes for the welfare of farmers such as *Mera Gaon Mera Gaurav* programme with complete zeal to develop fodder based dairying in 80 villages and *Swachha Bharat Abhiyan* in toto.

Plant genetic resources and biotechnological research

Three varieties of oats (JHO-2010-1 and JHO-2012-2 for south zone, JHO-2009-1 for central zone), one each of marvel grass (JHD-2013-2 for north west zone), berseem (JBSC-1 for all berseem growing areas especially rice fallow) and clitoria (JGCT 2013-3 for all India) were identified for release. Six entries of red clover and two entries of white clover contributed for all India testing. One hundred and forty eight germplasms of various grasses and legumes were collected. Twenty six oat lines having Zn content >30 ppm were selected. Reproducible, rapid and efficient *in vitro* callus induction, regeneration and transformation protocols were standardized in oat. Transcriptome profiling in berseem was analysed from three different tissues (leaf, floral and root). Developed stable novel morphological variants in berseem *viz*., deformed leaf, pentafoliate pink flower (2n=32), pale leaf. Thirteen genotypes with high water soluble carbohydrate content (>70 mg / g fresh weight) were identified in buffel grass. One selected high water soluble carbohydrate buffel grass line IG-99-124 was hybridized with sexual line IGFRI CcSx-08 / 1.

Abiotic stress management

Root architecture identification and characterization in guinea grass indicated that during early period of growth, cutting hampered root growth but later trend reversed. Proliferation of root increased with more cuttings was observed by increased root: shoot ratio and increased root depth. Higher soil moisture content (3-4%) and soil moisture stock was recorded under life saving irrigation and *in situ* moisture conservation treatments compared to rainfed at soil depth of 0-15 cm in Tri specific hybrid (TSH) + *Sesbania* + (sorghum+cowpea-barley / chickpea) cropping system. Farmers' specific and resource based integrated farming system models of one hectare size were developed for sustainable productivity and income of semi-arid Bundelkhand farmers.

Biotic stress management

Among biological control agents, predatory beetle *Coccinella septempunctata* was more effective in suppressing aphids than microbial insecticides like *Verticillium lecanii* and *Beauveria bassiana.* Aphid incidence significantly influenced the green forage and seed yield in lucerne. Pollinator fauna studies indicated that honey bees, syrphid flies, megachilids and butterflies were major pollinators. Deep summer ploughing + seed treatment of *Tricho XP* (5g / kg seed) along with foliar spray of tebuconazole (0.02%) + imidacloprid (0.02%) was most effective IPM for MP chari + cowpea. In berseem + mustard crop, deep summer ploughing + seed treatment of *T. harzianum* @ 5g / kg seed was most effective practice.

Diversification and sustainable intensification

In round the year top feed and fodder production from silvipasture systems, higher fodder yield (t / ha) was obtained with grass [*P. maximum* (33.8), *Chrysopogon fulvus* (22.9), *C. ciliaris* (13.7)] than legume [*C. ternatea* (1.9), *S. seabrana* (9.7)] grown with different tree combinations and

increased water use efficiency. *H. binata* with staggered trenches (ST) recorded higher plant height (6.84 m), DBH (12.2 cm), top feed (0.96 t/ha) and fire wood (0.99 t/ha) and system supported daily body weight gain of 52 g in lambs and 55 g in kids through grazing. In aonla based horti pasture (HP) system, aonla fruit yield and DFY was highest (14.1 and 7.3 t/ha) with ST. In guava based HP system, pasture production (5.0 t DM/ha) was 19% higher under tree than sole pasture (4.2 t DM/ha). In sapota based system, GFY and DFY of all grasses were highest in sole cropping of guinea grass (39.0 and 9.1 t/ha), signal (32.9 and 7.5 t/ha) and grazing guinea (31.6 and 7.2 t/ha).

Managing natural resources and soil health

For sustainable perennial guinea+(cowpea-berseem) based organic forage production, a minimum of 0.62 % SOC is required and this level was achieved in 4 years by annual application of 65 t FYM/ha (50 t/ha to guinea + 15 t/ha to berseem). Afterwards with application of FYM @ 12.5 t/ha in guinea + 7.5 t/ha in berseem, fodder produced can fulfil dry matter requirement of 9-10 ACUs. Organic guinea + (cowpea-berseem) production system sequestered 0.96 to 2.51 t carbon/ha/year. Imazethapyr @ 0.1 kg a.i/ha as pre-emergence+one wheel hoe (20 DAS) recorded significantly higher GFY and DFY over weedy check in cowpea. *Brachiaria ruziziensis* intercropped with *Stylosanthes hamata & S. seabrana* in mango based horti-pastoral systems and *B. ruziziensis* intercropped with *S. seabrana* in sapota based horti-pastoral systems recorded the highest moisture conservation in soil. Phosphate solubilising bacteria 136(1) performed better in normal soil, recorded 25.2 t/ha cowpea GFY at par with RDF (20.23 t/ha). PSB103(1) and PSB136(1) recorded significantly higher cowpea biomass (35.2 and 35.1 t/ha), crude protein yield (11.8 q/ha) and CP% (14.6) in acid soil (pH 4.5) compared to RDF (32.0 t/ha).

Forage seed research/production

Cutting management resulted in species specific effect on morpho-phenological characters and seed yield in range grasses. In dinanath, cutting at 45 days after sowing led to synchronization in flowering. Autumn produced *C. ciliaris* and *C. setigerus* seed stored (3 months) had significantly higher germination (40.1 and 39.6%). The seed yield was highest in spring season whereas the fodder yield was highest in monsoon season across the lines of both species. Application of imazethapyr in berseem at 20 DAS @ 0.1 kg a.i./ha resulted in lowest weed index (7.4%) and better green fodder (40.2 t/ha), seed (0.45 t/ha) and straw yield (2.8 t/ha) than other treatments excluding weed free check. The berseem seed coated with polymer containing nutrient solution and the soil pelleted dinanath seeds showed better field performance than control.

Forage livestock production system

Oat straw based pellets fortified with ML-7 compound isolated from *Madhuca longifolia* reduced *in vitro* methane production from 28.0 (control) to 20.8 (2.5 % level). *Cenchrus* genotypes (IG96-358, IG96-96 and IG96-50) had > 7.0% sugar and higher GFY and DFY than checks. Eighteen *Sehima* accessions having more than 7% sugar content were identified for silage making. Sole maize or sorghum was better for silage making (pH 3.6-4.2) than maize / sorghum intercropped with cowpea (1:1). For improvement and conservation of Bhadawari buffaloes in the field, 3800 AI's were performed with 63% conception rate and 900 calvings were recorded.

Farm mechanization and conservation

A motorized tractor front mounted grass seed harvester was designed in collaboration with CIAE to harvest dinanath grass seeds. A screw auger type manually operated feed block making machine was developed to prepare feed block (2.5 – 2.7 kg / block & 11-12 blocks per hour) from feed mixed at appropriate moisture content. Power operated tyre type seed pelletizer was modified. The optimum speed of the machine varied from 30-50 rpm, size of pellets was of 10-15 mm diameter, 2.0-4.0 g in weight and effective capacity of the machine is 25-35 kg / h.

Exploring nanotechnology

The exposure of *Rhizobium* to nanoparticle up to certain level had positive effect on the beneficial properties. Treatments of 50 ppm nCuO and 750 ppm nZnO positively influenced leghaemoglobin content in lucerne root nodules. Seed treatment with 200 ppm nCuO recorded maximum shoot length, and 400 ppm recorded maximum number of tillers in barley. Chlorophyll and carotenoid contents were influenced by nanoparticles. Supplementation of nano ZnO at 60ppm to pre-ruminant Jalauni male lambs in five months feeding ($P<0.05$) increased their zinc absorption and had no adverse effect on intake, DM digestibility and blood metabolites.

Translational research

Forage-food cropping sequence and improved fodder varieties demonstrated at farmers' fields have resulted in 15-20% increase in GFY. Interventions on supplementation of concentrate mix, mineral mixture and silage in animal feed resulted in 10-15% increase in milk productivity. Fruit growers were promoted to grow fodder crops (BN hybrid, guinea and perennial fodder sorghum) in inter row spaces of mango, sapota and arecanut orchards in Dharwad and Belgaum (Karnataka) and in cashew orchards in Andhra Pradesh. Under TSP, 80.4 t bajra and 0.7 t guar seeds to 394 tribal farmers in Dausa district (Rajasthan) and Dharwad district (Karnataka), 0.1 t perennial fodder sorghum seeds and 8000 BN hybrid root slips to 200 tribal farmers in Nandurbar district (Maharashtra) were distributed.

Grasslands development

The institute had developed grasslands in Madhya Pradesh, Karnataka, Rajasthan, Bihar in

association with state governments and NGOs. Seventy hectare pasture land was developed in Tonk (Rajasthan) by introducing improved fodder species *C. ciliaris*, *C. setigerus*, *Pennisetum pedicellatum* and *Stylosanthes* spp.) by which fodder production increased three times besides providing quality fodder.

Adarsh Chara Gram

Fodder demonstrations (125) on bajra (AVKB 19), sorghum (MP chari), cowpea (BL-2), maize (African Tall) and BN hybrid (IGFRI 6) and 170 demonstrations on berseem (Wardan, BB-2 and BB-3) and oat (JHO-822 and JHO-851) were taken up. Green fodder yield from two cuts of MP chari under ICMP was 42 t / ha (23% >local sorghum with traditional practice). Similarly, bajra recorded 39.9 t / ha GFY under ICMP on farmers field. BN hybrid and guinea were promoted on field boundaries, bunds and fields of farmers which led to production of 2-3 kg GFY / running meter length / cut. Fungicides treated seeds increased 10.8% bajra and 12.5% oat yield. Application of *Rhizobium* alone and seed treatment with bavistin and *Rhizobium* together increased berseem yield by 13.3% and 19.4%, respectively. BN hybrid treated with VAM produced 15.3% higher GFY. Nine biogas units were installed led to saving of time of women, reduction in health hazards and women's drudgery and improvement in sanitary conditions of their houses.

Human Resource Development

Institute had organized four national training programmes *viz*., one short course on 'Engineering interventions in fodder production and their value addition' during 30th Jan. to 8th Feb. 2017; one model training course on 'Advances in grazing and pasture management practices for sustainable livestock production' during 27th Feb. to March 6th 2017; a trainers training on 'Forage seed production and quality control' during 16-18th March, 2017 and one winter school on 'Feeding strategies in relation to climate resilient forage and livestock production' during 5th-25th September, 2017. In addition one 'skill development training program' for SSS was organized on 10th November, 2016. Six scientists, 6 technical, 33 administrative and 39 skilled supporting staff received trainings organized by various national institutes and agencies. Twenty five students got training / dissertation works done from IGFRI.

IGFRI in ICAR Sports

IGFRI Jhansi participated in ICAR Inter-Zonal Sports Meet 2016 in kabaddi and athletics events

held at Indian Agricultural Research Institute, New Delhi during 25th to 29th April 2017. Dr. Tejveer Singh won gold medal in 800m and 1500m races.

Awards and recognition

Dr. AK Roy was awarded with *Fellow* by Indian Society of Plant Genetic Resources, New Delhi and Uttar Pradesh Academy of Agricultural Sciences, Lucknow. Dr. PK Ghosh received *VIRA - Distinguished Scientist* of Venus International Foundation, Chennai. Drs. Sultan Singh and SK Mahanta was awarded with *Recognition Award* of RMSI, Dr. Sunil Kumar was awarded with *Fellow* by Indian Society of Agronomy, Dr. JB Singh was awarded with *Fellow* of RMSI, Dr. Vinod Kumar was awarded with *Fellow* of ISST, Drs. D Vijay, and DR Palsaniya were awarded with *Associate Fellow* by RMSI, Dr. D Vijay was awarded with *Young Scientist Award* of ISST, SSDAT and *Best Researcher Award* by EET CRS, Noida, Dr. R Srinivasan was awarded with *Young Scientist Award* of RMSI and SSDAT. Team of Drs. D Vijay, CK Gupta, VK Wasnik, Manjunatha N, A Maity, Sanjay Kumar, VK Yadav and PK Ghosh was awarded with *Outstanding Interdisciplinary Team Research* by SSDAT and Dr. Vikas Kumar received *Scientist of the Year* from Shobhit University, Meerut.

National Symposium

RMSI, IGFRI with RVSKVV organized a National Symposium on "New directions in managing forage resources and livestock productivity in 21st century: challenges and opportunities" during March 3-4, 2017 at RVSKVV, Gwalior, M.P. which was attended by 200 delegates from various corners of the country.

Interface meet for improving Bundelkhand livestock health and production

An interface meeting of Veterinary Officers, Animal Husbandry Department, Milk Federations and SMSs working in Bundelkhand region was jointly organized by IGFRI, Jhansi and IVRI, Izatnagar on 2nd August, 2017 at IGFRI, Jhansi, which was attended by 200 field officers and farmers. The mandate of the meet was to make field officers aware about the technologies developed by IVRI & IGFRI for improving livestock health and production.

Mera Gaon Mera Gaurav (MGMG)

A total of 760 demonstrations on fodder varieties (sorghum, pearl millet, maize, BN hybrid, guinea grass, cowpea, berseem, oat *etc.*) were conducted at farmers' fields. Two thousand farmers were benefitted from kisan gosthies, livestock health camps and mobile based advisories. Demonstrations helped 10-20% additional fodder production in different crops.

Linkages developed

Linkages were created with ICAR institutes, Central and State Agricultural Universities, 34 Gaushalas [Rajasthan (20), Karnataka (1), Madhya Pradesh (6) and Uttar Pradesh (7)], NABARD / Commercial Banks, Forest Department, NGOs (20), farmers groups, government seed corporations, private seed companies, state livestock and line departments.

Swachha Bharat Abhiyan

Our institute organized two Swachha Bharat Pakhwada during 16th to 31st May 2017 and 15th September to 2nd October 2017 to emphasize the importance of clean working and living environment and to create awareness. The abhiyan was observed with complete zeal to make entire campus clean. In addition, it was also practised in MGMG villages to create awareness.

Celebration of other events

Institute also celebrated many events *viz*., World Soil Day on 5th December, 2016 wherein soil health cards were distributed to farmers of MGMG villages located in Bundelkhand region; Agriculture Education Day on 3rd December 2016, to mark the birth anniversary of 1st President of India Dr. Rajendra Prasad wherein 55 students from different schools participated in a drawing and painting competition on "Educating Indian farmers"; Vigilance Awareness Week during 31st October to 5th November, 2016 with the theme "Public participation in promoting integrity and eradicating corruption". Hon'ble Director General, ICAR and Secretary, DARE, Dr. T. Mohapatra visited IGFRI during 29th-30th July, 2017 and interacted with the scientists and other staff members regarding the progress made by the Institute and future course of works.

Publications

Research papers (30); Presentations / Papers / Abstracts in Seminar / Symposia / Conferences: International (15) & National (80); Books (2); Book chapters (33); Technical bulletins (9); Popular articles (4); Folders / Extension leaflets (107); Annual Report – 1; Chara Patrika (e-copies).

Extension talks

DD Kisan / Other TV talks / Radio talks – 7

New Appointments

Dr. A.K. Roy on 16th August, 2017 as Director, IGFRI

Dr. R.V. Kumar on 11th September, 2017 as Director, IGFRI

Mr. Vikas Chandra Tyagi (1.4.2017), Mrs. Rekha Balodi (13.04.2017), Dr. Hanamant M. Halli, Dr. Kamini, Shri H.S. Meena, Shri S.K. Mahawer, Shri Swami S.R., Shri Neeraj Kumar (16.10.2017) as Scientists.

Promotions

Senior Scientist to Principal Scientist - 1, Scientist (RGP 6000 to 7000) - 3

Asst. Chief Technical Officer to Chief Technical Officer - 6, Sr. Technical Officer to Asst. Chief Technical Officer - 6, Technical Officer to Sr. Technical Officer - 9, Technical Assistant to Sr. Technical Assistant - 4, Sr. Technician to Technical Assistant - 1, Technician to Sr. Technician - 3, Financial upgradation (3) under MACP scheme - 1

Transfers

Incoming - 4; Dr. S.N. Rokde (Principal Scientist), Shri Maharishi Tomar, Mrs. Ritu Verma and Dr. S.S. Bhat (Scientists).

Outgoing - 2; Drs. D.C. Joshi (Scientist) and D. Vijay (Senior Scientist)

Retirements

Scientific - 3,

Technical - 4, Administrative - 1, Skilled supporting staff - 8, Saman vetan staff -13

स्वच्छ भारत
एक कदम स्वच्छता की ओर

हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद
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Published by:
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Darpan Printers & Lamination