

August
2021



Project Coordinator

.... a monthly update



ICAR-National Institute of Abiotic Stress Management
Baramati, Pune, Maharashtra 413115

From Director's Desk

Greetings from ICAR-NIASM...

The current issue on Project Coordinator highlights the progress made under all the ICAR-NIASM projects during August, 2021 and targets for September, 2021. We made progress in research and development efforts particularly in 1) developing web-scraping scripts and developing nutrient maps and soil fertility map for Haryana, 2) assessing canopy greenness and monitoring stomatal movements in soybean genotypes under drought stress, 3) field evaluation of different accessions of foxtail millet, finger millet, pigeon pea, ground nut and soybean, 4) developing technology data repository for grapes, mango, sapota and guava, 5) recording of comparative status of hematological status in different breeds of goat for the month, 6) measurement of the real time post-harvest quality parameters of onion, 7) preparation and application of *dashparni* ark, 8) determination of quantitative siderophore production by the

halotolerant bacterial strains, 9) Planting of lemon grass in tamarind orchard, 10) phenotypic evaluation of chick pea genotypes, and 11) waterlogging tolerance of pigeon pea genotypes. The current issue also features an article on ITKs for sustainable farming.

The Institute celebrated 75th Independence Day on 15th August, 2021, where all staff including scientist, administrative, SRF, JRF, YP, students and contractual staff were present for the event. I sincerely hope that this issue will help the scientists and the farm personnel of NIASM and other research Institutes for better coordination among project staff while implementing the planned activities. I thank Dr. Aliza Pradhan and her team for their dedication and sincerity in bringing out this publication and wish that the issue would be received well by readers across all domains.




(Himanshu Pathak)

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Celebration of 75th Independence day at ICAR-NIASM on August 15, 2021

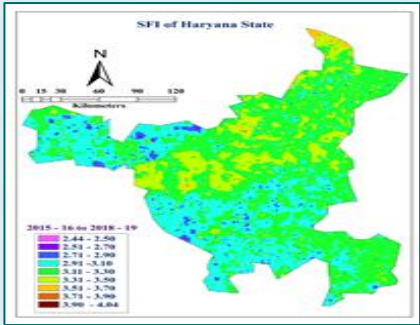


Planting of lemon grass in tamarind, ICAR-NIASM on August 25, 2021

UP 1. Abiotic Stress Information System (ASIS)

Geo-spatial digital maps of multiple abiotic stresses, management options and future scenarios

PI: Bhaskar B Gaikwad; **Co-PI(s):** Amresh Choudhary, Ram N Singh, Dhananjay D Nangare, Nitin P Kurade, Sachinkumar S Pawar, Mukeshkumar P Bhendarkar, Sunil V Potekar and Pravin H More



Outputs

- Web scrapping scripts for geo-tagged soil fertility datasets from open data sources.
- Web scrapping, curating and analysis (84 lakh farmer level dataset (2014-2020)) for Haryana.
- Preparation of “Soil Nutrient” and “Soil fertility Index” map for Haryana State.

Targets for next month

- Scrape, curate soil datasets and prepare Nutrient and soil fertility index Interpolated maps for rest of the States of India.

UP 2. Germplasm Conservation and Management (GCM)

Genetic garden and gene bank for abiotic stress tolerant plants, animals and fisheries for food security and sustainability

PI: Boraiah K M; **Co-PI(s):** Ajay K Singh, Basavaraj P S, Mahesh Kumar, Satish Kumar, Rajkumar, N Karthikeyan, Paritosh Kumar, Sanjeev K Kochewad, Mukesh Kumar P Bhendarkar, Harisha C B, Pratapsingh Khapte, Jagadish Rane, Neeraj Kulakshetran, Bhojaraja Naik, Gurumurthy S, Pravin B Taware, Aniket More, Rushikesh Gophane and Lalit Kumar Aher

Outputs

- Top dressing of urea in foxtail millet (118 accessions) and finger millet (77 accessions).
- Sowing of germplasm/promising varieties of groundnut (174 accessions), finger millet (30) and soybean (30) for multiplication and maintenance.
- Sowing of different varieties of groundnut, pigeon pea, cow pea, soybean, finger millet, sorghum, fenugreek and coriander in crop cafeteria for demonstration purpose.

Targets for next month

- Recording of agro-morphological and physiological traits of sown crops.
- Identification of drought responsive genes using GenBank database for gene expression profiling study in promising, wild-relative/land races of brinjal.
- Primer designing for gene expression profiling in wild-relative/land races of brinjal.



Field view of foxtail millet accessions

UP 3. Model Green Farm (MGF)

Environment-friendly, economically viable, state-of-the-art model farm for abiotic stressed regions

PI: Dhananjay D Nangare; **Co-PI(s):** Himanshu Pathak, Goraksha C Wakchaure, Bhaskar B Gaikwad, Vanita Salunkhe, Rajkumar, Paritosh Kumar, Aliza Pradhan, Amresh Chaudhary, Mukesh kumar P Bhendarkar, Sangram B Chavan, Vijaysinha D Kakade, Pratapsingh S Khapte, Pravin B Taware, Rushikesh Gophane, Noshin Shaikh, Santosh Pawar and Avinash V Nirmale

Outputs

- Technology data repository for grape, dragon fruit, guava, sapota and uploading on krishi-portal.
- Recording of growth & physiological parameters in guava, sapota, custard apple planted with different planting techniques and filling mixtures.
- Planting of lemon grass in tamarind orchard.
- DNA extraction of pathogenic fungi from dragon fruit, optimization of PCR reaction for screening of morphotypes by ITS molecular markers.
- Recording of growth, reproductive parameters, yield as well as time required for different sub-principal growth stages of dragon fruit.

Targets for next month

- Fruit quality analysis of guava and dragon fruit.
- Recording of observation for time requirement for different reproductive growth stages in dragon fruit.
- Growth and physiological observations in sapota.
- Planting of sandal wood and lemon grass in tamarind orchards.
- Sequencing of PCR products.

UP 4. Climate-smart IFS (CIFS)

Climate resilient integrated farming system in semi-arid region

PI: Sanjiv A Kochewad; **Co-PI(s):** Goraksha C Wakchaure, Vanita Salunkhe, Rajkumar, Mukeshkumar P Bhendarkar, Aliza Pradhan, Vijaysinha D Kakade, Sangram B Chavan, Rajagopal V, N Subash, Laxman R Meena, Pravin B Taware and Patwaru Chahande



Erection of solar trap

Outputs

- Preparation and spraying of Dashparni ark on crops for insect and pest control.
- Purchase of native poultry birds from local farmers.
- Erection of solar traps for integrated pest management

Targets next month

- Harvesting of Green Gram.
- FYM application in orchard crops.
- Procurement of *desi* drought tolerant seeds for cultivation and multiplication of seed material.

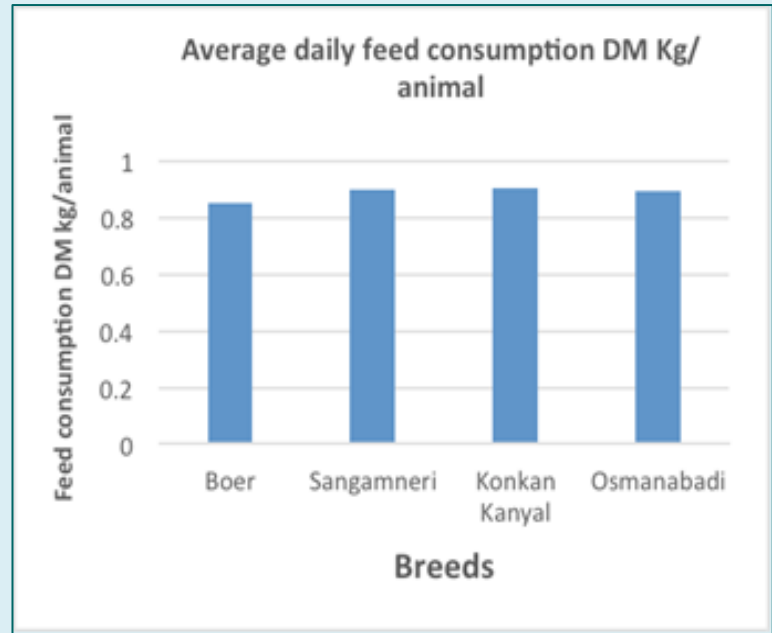


Purchased poultry birds under quarantine

FP 1. Atmospheric Stress Management

Adaptation and mitigation of atmospheric stress in crops, livestock, poultry and fishes for sustainable productivity and profitability

PI: Nitin P Kurade; **Co-PI(s):** Sachinkumar S Pawar, Sanjiv A Kochewad, Bhaskar B Gaikwad, Rajkumar, Mukeshkumar P Bhendarkar, Ram N Singh, Dhananjay D Nangre, Avinash V Nirmale and Sunil V Potekar



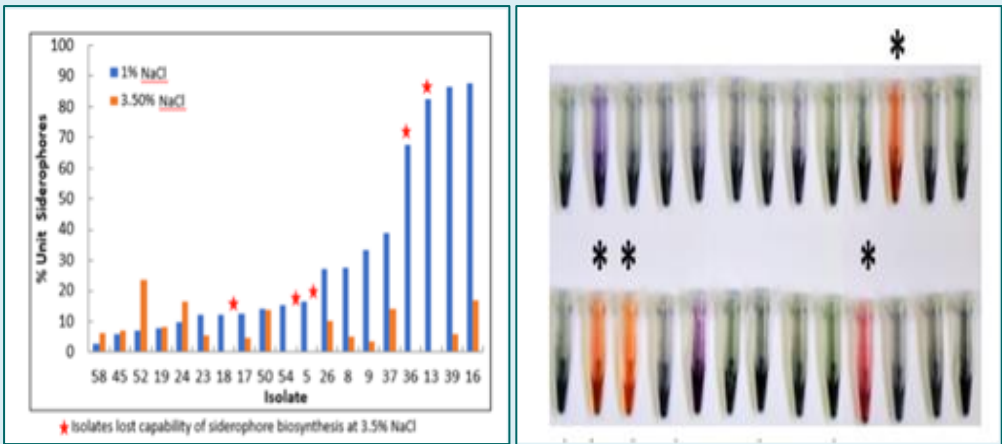
- Outputs
- Recording of comparative status of growth, physiological and haematological parameters in different breeds of goat for August.
 - Assessment of thermal stress in poultry and goat.
 - Amplification of HSP-70 polymorphic region in Vanaraja poultry birds.
 - Experiment on salinity stress levels in GIFT tilapia.
 - Procurement of set up for mass culturing of black soldier fly (BSF).
 - Programming of microcontrollers and sensors.
- Targets for next month
- Evaluation of stress parameters & parasitic prevalence in different breeds of goat.
 - DNA isolation from four goat breeds for further polymorphism analysis.
 - Continuation of research on IPM of fall army worm in maize.
 - Biophysical analysis of salinity stress in GIFT tilapia.
 - Carrying out trial checks of microcontroller and sensors.
 - Establishment and preparations of breeding unit of BSF; procurement of BSF.

FP 2. Bio-saline Agriculture

Exploitation of halophytic plant and associated microbiome for amelioration of saline agricultural land of arid & semiarid regions

PI: Satish Kumar; **Co-PI(s):** Ajay K Singh, Vanita Salunkhe, Sanjiv A Kochewad, Mahesh Kumar, Paritosh Kumar, Neeraj Kumar, Amresh Chaudhary and Himanshu Pathak

- Outputs
- Determination of quantitative siderophore production by the halotolerant bacterial strains.
 - Four (isolates 36, 13, 39 and 16) displayed hyper-siderophore production in quantitative assay even under hypersaline conditions.
- Targets for next month
- To investigate the ACC deaminase and IAA production capability of the bacterial isolates from the coastal ecosystem.
 - To establish the molecular basis of ACC deamination in halotolerant bacterial isolates using PCR approach.



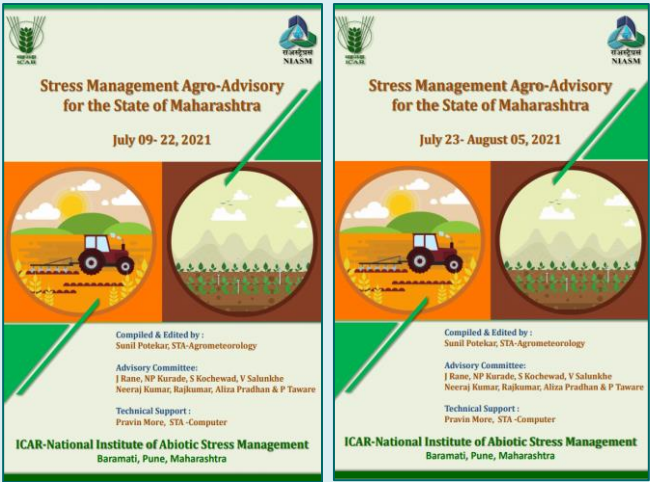
Siderophore production by the halotolerant bacterial isolates from the coastal ecosystem. In general, the siderophore production decreased with increase in salt concentration.

FP 3. Technology Targeting and Policy

Targeting prospective technologies for abiotic stress resilience in rainfed and dryland regions

PI: Dhananjay D Nangare, **Co-PI(s):** Sachinkumar S Pawar, Sanjiv A Kochewad, Bhaskar B Gaikwad, Boraiha K M, Kartikeyan N, Rajkumar, Mukeshkumar P Bhendarkar, K Ravi Kumar and Himanshu Pathak

- Outputs
- Preparation of the draft of questionnaire for survey of farmers regarding facing abiotic stress in crops, livestock, fishery including their personal profile, social and economic variables.
 - Review of research work, literature, and secondary data on indigenous technical knowledge resources available for compilation specifically on abiotic stress management.
 - Publication of two fortnightly agro advisories on institute website for stakeholders.
 - Coordination of visits of farmers, students and guests.
- Targets for next month
- Literature review on methodology of impact assessment of technologies.
 - Coordination of extension activities and visits of stakeholders.
 - Collection of information on ITKs related to abiotic stress management.
 - Finalization of interview schedule/questionnaire of survey.
 - Development of ATIC and activities related to agro-tourism.



Agro-advisory of ICAR,NIASM

B) School of Water Stress Management (SWSM)

1. Mitigating water stress effects in vegetable and orchard crops

PI: Goraksha C Wakchaure; Co-PI(s): Dhananjay D Nangare, Satish Kumar, Aliza Pradhan, K M Boraiah, Pratap Singh Khapte and Jagadish Rane



Post-harvest analysis of onion

- Outputs
- Assessment of effect of planting method, soil depth and filling mixtures on antioxidant potentials of sapota fruit.
 - Real time post-harvest quality analysis of stored onion bulbs.
 - Evaluating effect of coating materials and storage temperatures on shelf life of custard apple (*Annona squamosa* L.).
 - Finalization of the treatment and layout for field trial on responses of different cultivar of custard apple to bio-regulators during fruiting season.
 - Assessment of long terms effects (7 years) of soil filling mixture on yield and quality of dragon fruits.
- Targets for next month
- Custard apple cultivar responses to plant growth regulators.
 - Layout and establish field trials on water stress tolerant root stocks in eggplant.

EXTERNALLY-AIDED PROJECTS

EAP 1. Evaluation of halotolerant rhizobium and PGPB based biomolecules for alleviation of drought and salt stress (Funded by: AMAAS, NBAIM, Mau)

PI: Satish Kumar; Co-PI: Goraksha C Wakchaure



Appearance of the black gram crop under the influence of the bio-formulation treatment (T: Bioformulation treatment; C: Control)

- Outputs
- Preparation of three liters of the bioformulation for field treatment.
 - Application of bioformulation treatments as per schedule in black gram, sorghum and pigeon pea crop.
 - Monitoring influence of the bioformulation treatment in black gram, sorghum and pigeon pea crop in terms of biomass, canopy temperature, and aerial growth.
- Targets for next month
- To conduct bio-formulation applications in black gram, pigeon pea and sorghum crop.
 - To monitor the crop performance under the influence of bio-formulation treatment as per schedule.

EAP 2. Conservation agriculture for enhancing resource-use efficiency, environmental quality and productivity of sugarcane cropping system (Funded by: CA Platform ICAR)

PI: Goraksha C Wakchaure Co-PI(s): Aliza Pradhan, Amresh Chaudhary, Paritosh Kumar and Himanshu Pathak

- Outputs
- Measurement of real time soil, water and growth of parameters of sugarcane cropping system.
 - Analysis of yield data of groundnut harvested from field trial for optimizing planting geometry, intercropping and crop residue management under sub-surface drip irrigation.
- Targets for next month
- Measurement of real time soil-water-plant parameters for sugarcane trials under CA.
 - Establish field trial on efficacy of bio-regulators under CA practices towards managing water stress in sugarcane.



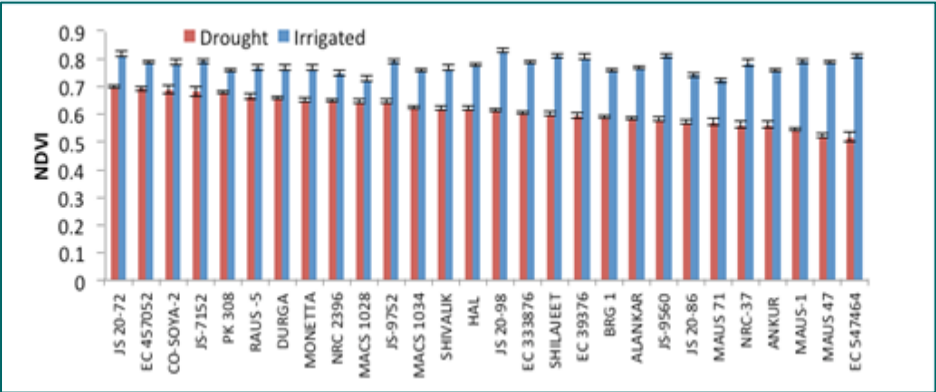
Harvesting of groundnut in CRP-CA

EAP 3. Genomics strategies for improvement of yield and seed composition traits under drought stress conditions in soybean (Funded by: ICAR-NASF)

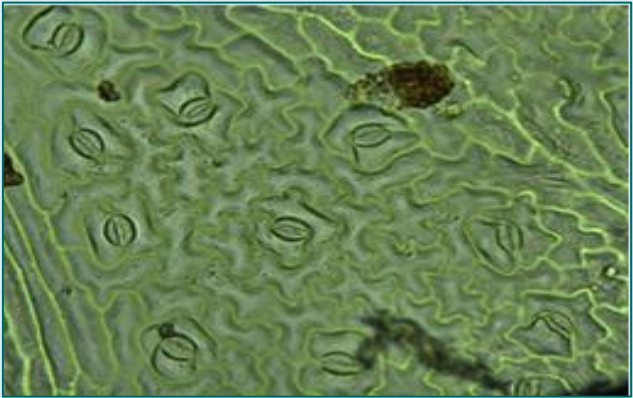
PI: Ajay Kumar Singh; Co-PI(s): Mahesh Kumar, Jagadish Rane

- Outputs
- Soybean genotype EC-39376 showed cooler canopy under drought stress compared to check variety JS-7152.
 - Soybean genotype EC-457052 showed greener canopy compared to check variety JS-9752.
 - Stomatal movement study was carried out and opening of stomata were microscopically documented in soybean.

- Targets for next month
- Gene construct development for silencing two drought responsive genes in soybean.
 - Root system architecture study in 100 soybean genotypes under *in vitro* condition.



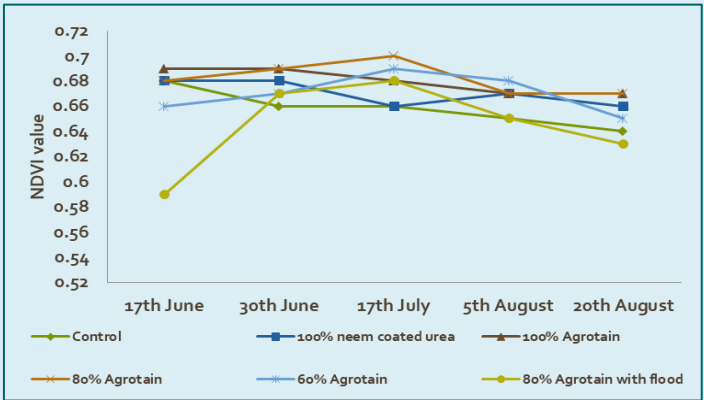
Canopy greenness of soybean genotypes



Stomatal movement study in soybean

EAP 4. N-(n-butyl) Thiophosphoric Triamide (NBPT) as a urease inhibitor for improving nitrogen use efficiency in sugarcane cropping systems in India (Funded by: CIMMYT)

PI: Aliza Pradhan Co-PI(s): Amresh Chaudhary, Jagadish Rane, Pravin B Taware and Himanshu Pathak



Canopy greenness under different treatments

- Outputs
- Highest NDVI value recorded in 100% agrotain which was at par with 80% agrotain and lowest value was under 80% agrotain with flood.
 - Completion of soil sample analysis for ammonium and nitrate content for (0-15) and (15-30) cm during pre-growth stage.
- Targets for next month
- Data analysis and final dose of treatment application followed by soil sample collection and analysis.

EAP 5. Phenotyping of pulses for enhanced tolerance to drought and heat (Funded by ICAR-NICRA)

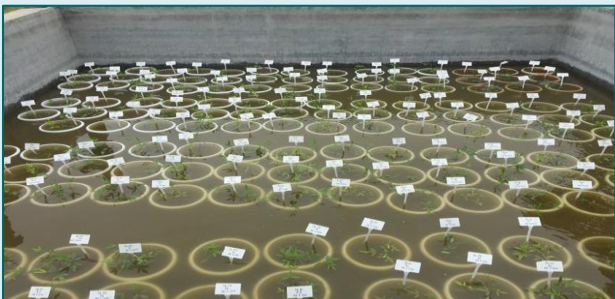
PI: Jagadish Rane; Co-PI(s): Mahesh Kumar, Basavaraj P S, Boraiah K M

- Outputs
- Phenotypic evaluation of 22 chickpea genotypes under drought stress condition in green house for early stage drought stress tolerance based on Shoot architectural parameters, leaf senescence, RWC and photosynthetic efficiency (Qy_Max) observed.
 - IPC (14-16), JG 16 found to be promising genotypes under depleting soil moisture stress.
 - Evaluating performance of 170 pigeon pea cultivars including 144 mini core collections, 22 state released varieties and 4 waterlogging stress tolerant for yield and yield attributing traits under rainfed ecosystem. Selfing is also carried out to maintain purity of seed material.
 - Waterlogging tolerance of minicore collection of pigeon pea showed that among the 50 germplasms ICP-6128, ICP-7076, ICP-7507 and ICP6815 showed better survival ability in comparison to tolerant checks (ICP-5028 and MAL-15).

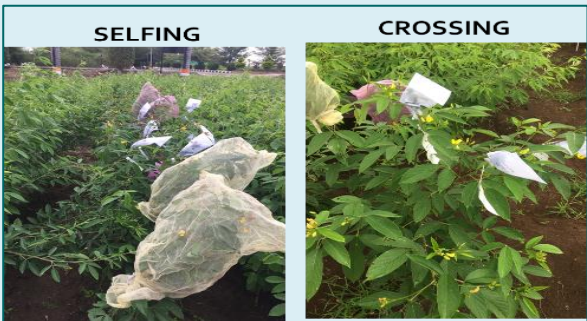
- Targets for next month
- Characterization of chickpea using root architecture study using image-based techniques.
 - Developing mapping population for dissecting waterlogging tolerance in pigeonpea cultivar.



Experimental setup in Phenomics facility



Waterlogging tolerance in pigeonpea



Selfing and crossing in pigeon pea at field

Indigenous Technical Knowledge (ITK) for Sustainable Farming

Shital P. Sindhe (Jawale), YP-II

Traditional knowledge is vital for well-being and sustainable development as it has evolved after thousands of years of observation and experience. A suitable integration of the traditional and modern knowledge coupled with technology systems has immense potential towards economical, ecological and environmental benefits. Over the years, numerous time-tested experiments in this context are practiced by the farmers on trial-and-error basis on agriculture and allied activities to overcome the problems or adverse situations. These eco-friendly farming practices categorized as “Indigenous Technical Knowledge (ITK)” due to their vast innovation potential at grassroots level. These ITKs should be promoted through scientific approach in order to develop low cost-effective, eco-friendly technologies for the benefit of the farming community.

India is a country with many diverse indigenous communities, having their own set of unique traditional knowledge and technology base, which play a significant role in their socio-economic development. Traditional Indian agriculture dates back to about 10,000 years, and India is classified among the 12 mega diversity centres of the world, with regards to crops. The genetic diversity within the Indian crop species is remarkable, some of them are like rice (50,000 varieties), sorghum (5000 varieties), mango (1000 varieties), pepper (500 varieties), cattle (27 breeds), goat (22 breeds), sheep (40 breeds), poultry (18 breeds) and buffalo (8 breeds) (Lenka and Satpathy, 2020). This amazing diversity is primarily due to careful selection and crossbreeding over centuries by Indian farmers. About 1000 Indian plant species are known to possess insecticidal properties, 300 species with repellent properties, and 30 species possessing insect growth regulatory (IGR) properties. Several ITKs are used for crop, livestock, poultry and fishery management.

- For conserving moisture and to control weed, the crust formed in rice field is broken with ‘rake’ after one month of sowing.
- To increase potassium content in the soil, Bilb (commonly known as Bael i.e., *Aegle marmelos*) rasayan is prepared (dissolving 5 kg fresh bilb or half kg dry bilb in 20 liter water along with one kg jaggary), followed by its application to plant roots after one month.
- To control early shoot borer in sugarcane, neem kernels or neem cake are powdered, soaked in water overnight and the filtrate is diluted and sprayed.
- Guddeli (a local farm equipment) is used for easy harvest of ginger without any power requirement.
- During storage of potato, fern is kept to avert insect infestation.
- Similarly in animals to cure swelling of udder (due to Mastitis), 200 grams of soil from the termite mounds is collected and boiled in water, and the boiled suspension is given to animal which give relief within a day.
- To increase fish growth, banana stems are placed in the ponds after harvesting, to make water alkaline.
- To strengthen fishing nets, glue made from tamarind bark is used.



Pot charcoal chicken breeder

Pot charcoal chicken breeder as an ITK:

- To maintain the proper house temperature, use of pot charcoal chicken brooder is mostly common in backyard poultry farmers.
- It made of mud and can be purchased from local pottery people.
- The inner cylinder of the pot had 28 cm length and 25 cm diameter.
- It had been built in a way to have 35 to 45 holes on the sides to allow oxygen entrance and heat exit.
- Another similar empty pot was overlapped mouth to-mouth on each of the pots for the purpose of retaining heat and flames of fire, before it had been put at the centre of brooder.
- In the pot charcoal chicken brooder, wood charcoal is used as source of heat to warm the pots. The heat that radiates from the pot makes the environment in the brooder warm.

To boost sustainable agriculture development special efforts are needed for understanding, documenting, validating and disseminating Indigenous Technical knowledge in farming system. Conservation, transmission or implementation of ITKs is essential to increase awareness among the common people. Government schemes, research and development activities need to reach the indigenous users and scientific rationale for patenting the ITKs. The ITKs being low in cost will also benefit the national economy besides sustainable agricultural development. The uniqueness of ITKs is that it is eco-friendly, ecologically protective, socially acceptable, economically viable and sustainable. Incorporation and adoption of ITKs in today’s intensive cropping system will be challenging task, however, in order to achieve long term sustainability of major cropping systems under current scenario of global warming and climate change, promotion and adoption of ITKs on large scale is essential.

References

- Lenka S and Satpathy A (2020) A study on indigenous technical knowledge of tribal farmers in agriculture and livestock sectors of Koraput district. Indian Journal of Extension Education 56(2): 66-69.