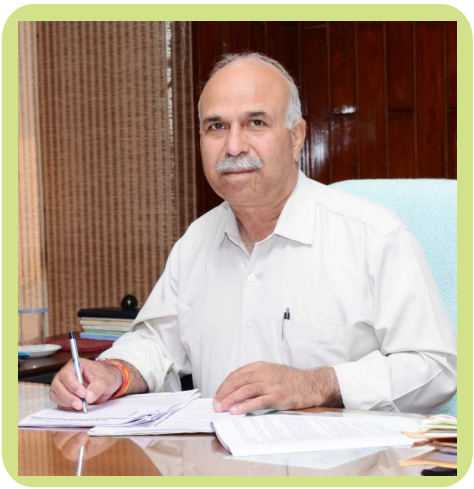
हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद
Agrisearch with a human touch

SALINITY News

Vol. 28, No. 2 | स्वच्छ भारत एक कदम स्वच्छता की ओर | July-December 2022

From Directors' Desk



The foundation of Indian Council of Agriculture Research-Central Soil Salinity Research Institute was laid in 1969 on the mandate of developing technologies for management and reclaiming the salt affected soils and poor quality waters of the country. After decades of research and experiments many technologies like alternatives of gypsum, salt tolerant crop varieties, innovative technologies for management of water logged soils, guidelines for use of poor quality waters, climate smart agriculture practices and rehabilitation of salt affected soils using forestry trees and many more developed by ICAR-CSSRI has made significant impact nation-wide to increase land productivity. Despite the huge success in restoring the productivity of salt affected lands, the several constraints, such as, out-dated database of salt-affected soils and waters, coexistence of multiple abiotic stresses, resodification of waterlogged alkali soils, and limited options for dry land salinity management have plagued the reclamation progress of salt affected soils. While many effort has been made to reclaim, manage and improve the productivity of salt-affected soils and maximum utilisation of poor quality waters the new challenges and problems at the regional and national level advocate more intensive efforts in this direction. Therefore, present research has been focused to develop appropriate strategy and action programmes at the national level to achieve the sustainable development goals.

This volume of Salinity News (July-December, 2022) includes following listed major research achievements: Municipal solid waste compost enricher block for improving health and productivity of sodic soils, Bio-fortification of wheat with iron through soil and foliar application of iron fertilizers, Pulpwood based silvipastoral system: Good alternative for livelihood security under saline Vertisols, CSR 65 (CSR B31): A potential donor for sodicity tolerance in basmati background & Characterization of mineral components of nodules under Moringa plantations. Several extension and training programs were organized during these six months such as Kisan Diwas Celebration, Mini STL Training and Quality Seed distribution programme. Various institute programs and activities related to SCSP and MGMG programs were also organized during this period. This issue also highlights two major awards given to ICAR-CSSRI scientists during 94th ICAR Foundation Day Celebration at A.P. Shinde Symposium Hall, NASC, PUSA, New Delhi on 16th July 2022.

In This Issue.....

(Parbodh Chander Sharma)
Director

ICAR-CENTRAL SOIL SALINITY RESEARCH INTITUTE, KARNAL 132 001 INDIA
Phones : 0184-2291119, 2291218
Email : director.cssri@icar.gov.in

SALINITY News
Vol. 28, No. 2 एक कदम स्वच्छता की ओर July-December 2022

Municipal solid waste compost enricher block for improving health and productivity of sodic soils

The salt affected soils are poor in microbial activity and having poor bio-chemical properties. Also intensively cultivated normal soils have similar problems due to high chemical use. Bio-augmentation of municipal solid waste compost as well as other composts through compost enricher block enables inoculation of efficient halophilic plant growth promoting microbes that enhances mineralization of nutrients. The efficient microbe enriched compost helps in build-up of soil C that can facilitate reclamation of sodic, saline-sodic and normal soils and overall improvement in soil health. The consortia of three efficient and compatible halophilic bacterial strains having plant growth promotion traits were prepared in suitable standardized media as 'Compost Enricher Block' (CEB) and the same can be used to enrich the compost or manure with these beneficial microbes. It has been tested and validated at multi-locations and found effective, easy to apply and eco-friendly approach for management of soils, nutrient recycling and soil health management to promote chemical free organic farming. The compost enricher block infused with active beneficial halophilic micro-organisms that helps is stabilizing compost and mineralize soil nutrients viz. N, P, K and Zinc. The microbially enriched municipal solid waste compost (MSWC) is found to be effective in ameliorating and enhancing crop growth and yield under salt affected soils. It is eco-friendly and cheap approach for taking additive advantages from the compost. It can also be used to enrich the kitchen waste or city waste, or any compost with plant growth promoting halophilic microbes that helps convert wastes to enriched manure. It is highly effective in all types of crops, soil and climate. It encourages the microbial activities in soil by inducing appropriate environment for their generation and re-generation and increasing their substantial population in the amended soils.

One block of 1000g is sufficient for enriching the 1000kg of matured compost

Impact on crop yields and soil properties

The MSW compost enricher block was tested and validated through multi-location trials on sodic and partially reclaimed sodic soils ranging pH from 8.2 to 9.2. There was increased yields of wheat, paddy and mustard crops. The prepared enriched compost use was also beneficial for amelioration of salt affected soils and also be used for enhancing productivity of normal soils. The yield increase through use of MSW compost enricher block was to the tune of 9.45 to 26.20 percent in wheat with mean of 16.42 per cent, 8.05 to 34.83 with mean of 20.32 per cent in paddy and 20.86 per cent in mustard over the unenriched compost. Decrease in soil pH2, and increase in soil OC and N was noticed in CEB treatments at all locations.

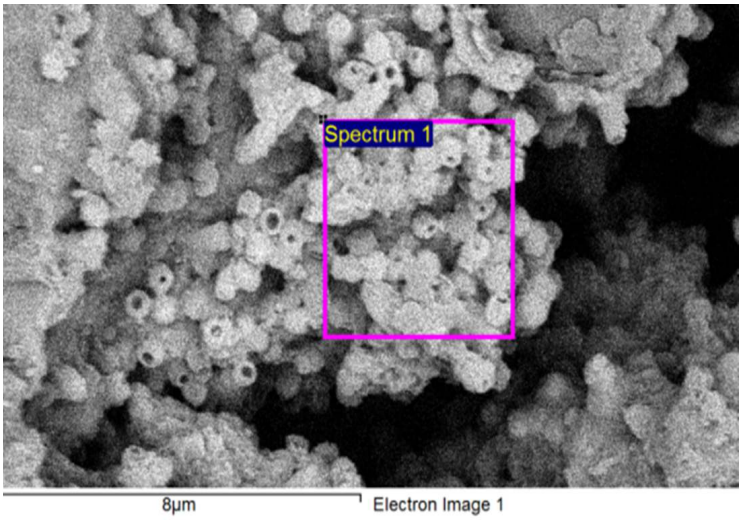
Table 1. Effect of compost enricher block on crop yield in sodic soils

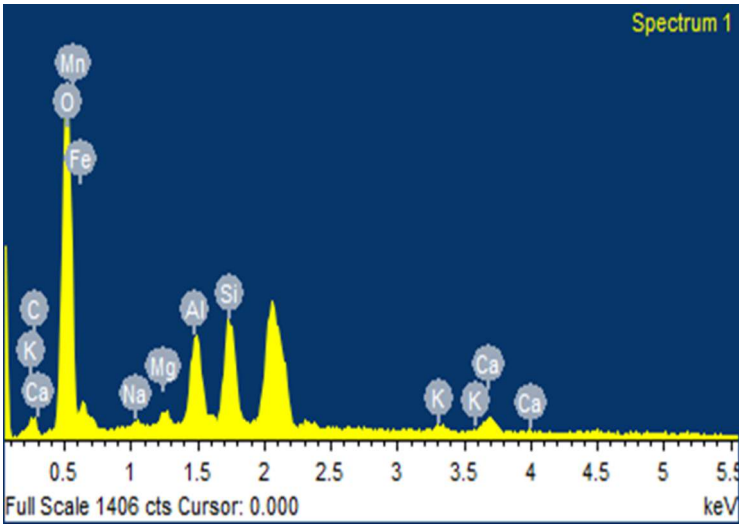
Location	Soil pH_2	Wheat yield (q/ha)		Paddy yield (q/ha)		Mustard (q/ha)	
		Without CEB	With CEB	Without CEB	With CEB	Without CEB	With CEB
Hasanganj, Unnao	8.5-9.0	35.33	38.67	31.0	34.7	16.3	19.7
Katia, Sitapur	8.4-8-8	24.2	28.5	27.3	29.5	-	-
Shivri, Lucknow	8.2-8.9	28.6	32.3	29.0	39.1	-	-
Jaitpur, Hardoi	8.9-9.2	18.7	23.6	21.5	27.2	-	-
Koni, Raebareli	8.4-9.1	23.5	27.2	27.1	32.6	-	-

Y.P. Singh, Sanjay Arora, Atul K. Singh and V.K. Mishra

Characterization of mineral components of nodules under Moringa plantations

Moringa is popularly known as sohanjna & drumstick and having tremendous uses like nutritional, medicinal, fodder, bio-pesticides, water purification, vegetable, etc. It contains more than 92 nutrients, 46 types of antioxidants and vitamins A-Z. Multifarious uses of drumstick (Moringa oleifera Lam.) made it as plant of choice for farmers. Recently, many uses of Moringa have been highlighted and farmers are taking interest to cultivate it as field crop for fodder and vegetable production in farm forestry. It falls in moderately tolerant category as far as salinity tolerance is concerned. Thus, establishment of Moringa plantations on marginal lands holds





enormous opportunities for reclamation, socioeconomic upliftment of the local people and environmental benefits as well. Nodules of brown grey and black colour were isolated from the soil collected from the Moringa plantations (Plate 1.0) in partially reclaimed sodic soils to study the mineral components through SEM (Scanning Electron Microscopy) technique. Interestingly, ball shaped micro nodules were observed upon SEM under Moringa plantations (Fig. 1.0). These are made of MnO2 as evident from the presence of higher amount of Mn (27.12% by weight and 11.59% by atom) and oxygen (41.33% by weight and 60.65% by atom) in the soils under Moringa plantations. In addition to this, the other ions like carbon (5.82% by weight and 11.37% by atom), sodium (0.48% by weight and 0.49% by atom), magnesium (0.71% by weight and 0.68% by atom), aluminium (4.37% by weight and 3.80% by atom), silica (5.66% by weight and 4.73% by atom), potassium (0.94% by weight and 0.56% by atom), calcium (2.51% by weight and 1.47% by atom) and iron (11.08% by weight and 4.66% by atom) were also observed in the samples. Higher amount of manganese (Mn) rich nodules indicates with time through biological weathering mainly root secretions, exudates of Moringa tree. There is every possibility of slow dissolution of Mn which lead to its higher availability not to plant itself but also to the companion crops grown in Moringa based agroforestry systems. This is important to highlight the role of Moringa for increasing the manganese nutrition to the growing plants. It will increase the Mn nutrition to the deeper soil layers upto which the tree roots proliferate. Trees can be better option to increase the Mn nutrition in problematic soils at large and salt affected soil in particular.

Rakesh Banyal and Ashim Datta

SALINITY News
Vol. 28, No. 2 एक कदम स्वच्छता की ओर July-December 2022

Pulpwood based silvipastoral system: Good alternative for livelihood security under saline Vertisols

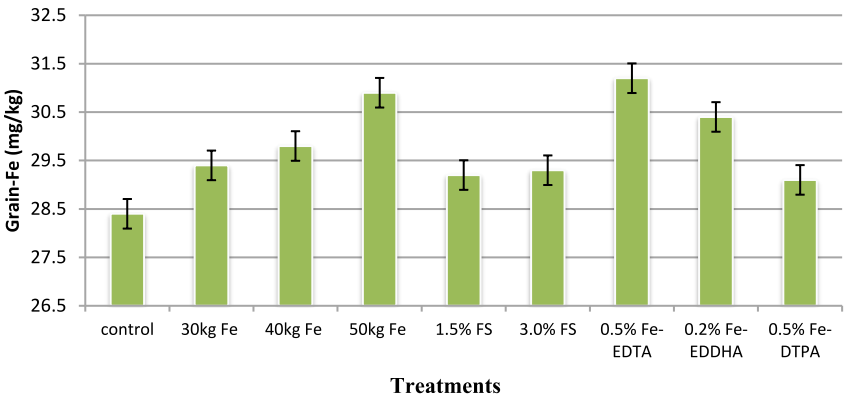
Plate 1: Intercropping of three fodder species with pulpwood

In India, saline Vertisols cover an area of 1.1 million hectares, of which Gujarat having share of 0.12 million hectares. Typical physico-chemical properties of Vertisols pose numerous problems in agricultural crop production and these problems extend with addition of salinity in the soil. For such soils, sustainability of farming can be achieved by inclusion of agroforestry. Identification of trees having commercial use in wood industry may fulfil the requirement. Gujarat has the highest share of dairy output in the country and there is always a demand and market for fodder. So marginal land like saline Vertisols can be used for fodder production in the form of Silvipastoral systems. Hence the experiment was planned for development of pulp-wood based pastoral systems for saline Vertisols. Field experiments were conducted with fodder sorghum, Dichanthium annulatum (Marvel grass) and Sorghum halepense (Johnson grass) intercropping with 2.5 years old two pulpwood species Acacia mangium and Eucalyptus camaldulensis under saline Vertisols at ICAR-CSSRI, RRS, Experimental farm, Samni. Eucalyptus and Acacia mangium were having average height of 10.40 m and 6.45 m and diameter at breast height of 20.40 cm and 16.33 cm respectively at the time of intercropping. It was found that grass/fodder crops performed better under Eucalyptus camaldulensis as compare to Acacia mangium. Fodder sorghum provided 5.82 t/ha green fodder with Eucalyptus and 4.81 t/ha green fodder with Acacia mangium; which generated additional gross revenue of Rs. 20,382 and Rs.16,827, respectively. Another fodder grass Dichanthium annulatum (Marvel grass) gave 7.69 t/ha green fodder with Eucalyptus and 5.81 t/ha green fodder with Acacia mangium and generated additional income of Rs. 15,391 and Rs. 11,624, respectively. Tallest and robust Sorghum halepense (Johnson grass) produced huge amount of green fodder; 56.12 t/ha with Eucalyptus and 43.12 t/ha with Acacia mangium and generated highest gross revenue Rs.1,96,417 and Rs. 1,50,930, respectively from both tree plantations. From study it can be concluded that all three grasses gave additional fodder production and revenue from tree plantations and maximum income can achieved by Eucalyptus + Johnson grass intercropping.

Monika Shukla, Vineeth T.V., Anil R. Chinchmalatpure, David Camus D. and Sagar D. Vibhute

Pulpwood based silvipastoral system: Good alternative for livelihood security under saline Vertisols

Iron deficiency is the most common cause of anemia globally. Cereals are mainly consumed in India and in general, they are low in Fe content. Availability of Fe in alkali soils remains low. Therefore, cereal crops, when grown on alkali soils, Fe content in grain reduces further compared to normal soils. Agronomic bio-fortification is simpler to implement compared to genetic bio-fortification. Keeping these facts in mind, a field experiment was conducted to enhance the grain-Fe in wheat with foliar and soil application of Fe sources under DSR (CSR-60)-wheat (KRL-210) cropping system in a partially reclaimed sodic soil. In case of soil application, the Fe was applied in the form of ferrous sulphate ($FeSO_4.7H_2O$) at the rate of 30, 40 and 50 kg ha^{-1} during the time of sowing, while in case of foliar application, the sprays of FeSO4 .7H2O, Fe-EDTA, Fe-EDDHA and Fe-DTPA were done at 30, 45 and 60 days after sowing. The result showed that Fe source and method of application both influenced grain-Fe. The maximum grain-Fe (31.2 mg kg^{-1}) of wheat was recorded in three foliar application of 0.5% Fe-EDTA that was 9.89% higher than the control treatment (28.4 mg kg^{-1}). The soil



Grain-Fe (mg kg^{-1}) of wheat influenced by Fe fertilizers

Wheat under foliar application of 0.5% Fe-EDTA

application of 50 kg Fe ha^{-1} was equally effective as 0.5% Fe-EDTA. However, the 50 kg Fe ha^{-1} required huge quantity of ferrous sulphate (i.e. 250 kg^{-1} $FeSO_4.7HO_2$) and increased grain-Fe by 8.97% over control. The foliar application of 0.2% Fe-EDDHA gave 7.16% higher than the control treatment. Fe concentrations in grain of wheat were only slightly affected by soil application of Fe at the rate of 30 and 40 kg ha^{-1} and foliar application of ferrous sulphate and Fe DTPA fertilizers. It is concluded that spraying of Fe-EDTA thrice was equally effective as application of ferrous sulphate @ 250 kg ha^{-1} for increasing Fe concentration in grain of wheat crop under partially reclaimed sodic soils.

BL Meena, MJ Kaledhonkar, RK Fagodiya, RL Meena and PC Sharma

CSR 65 (CSR B31): A potential donor for sodicity tolerance in basmati background

Line CSR 65 (CSR B 31) is a basmati, high-yielding, and long slender grained line that developed from the cross TRY / Pusa Basmati 1. This dwarf culture has a medium duration (130–135 days), green foliage, slender grains, and full panicle exertion. It has a powerful aroma, HRR (64.1%), ASV (7), AC (24.4%), GC (25mm), and high basmati quality attributes. During 2018, CSR 65 (CSR B 31) showed a superiority yield advantage of 32.35%, 47.29%, 48.15%, and 31.22% and during 2019, it showed 25.45%, 57.14%, 69.60%, and 39.10% over Pusa Basmati-1 (Yield Check), Pusa Basmati-1121 (Yield Check & Quality Check), Taroari Basmati (Quality Check), and Local Check, respectively (Figure 1). The line CSR 65 (CSR B 31) was found superior in yield over Pusa Basmati-1 (Yield Check), Pusa Basmati-1121 (Yield Check & Quality Check), Taroari Basmati (Quality Check), and Local Check by 28.89%, 51.93% , 57.88%, and 34.95%, respectively across the two years (2018 and 2019). In sodic soils of Uttar Pradesh, line CSR 65 (CSR B 31) showed a yield advantage over CSR 36 (National check) and CSR 30 (Figure 2). Therefore CSR 65 (CSR B 31) was promising basmati line with sodicity tolerance. The CSR 65 (CSR B 31) could be used in further improvement in increasing basmati rice yields under salt-affected soils.

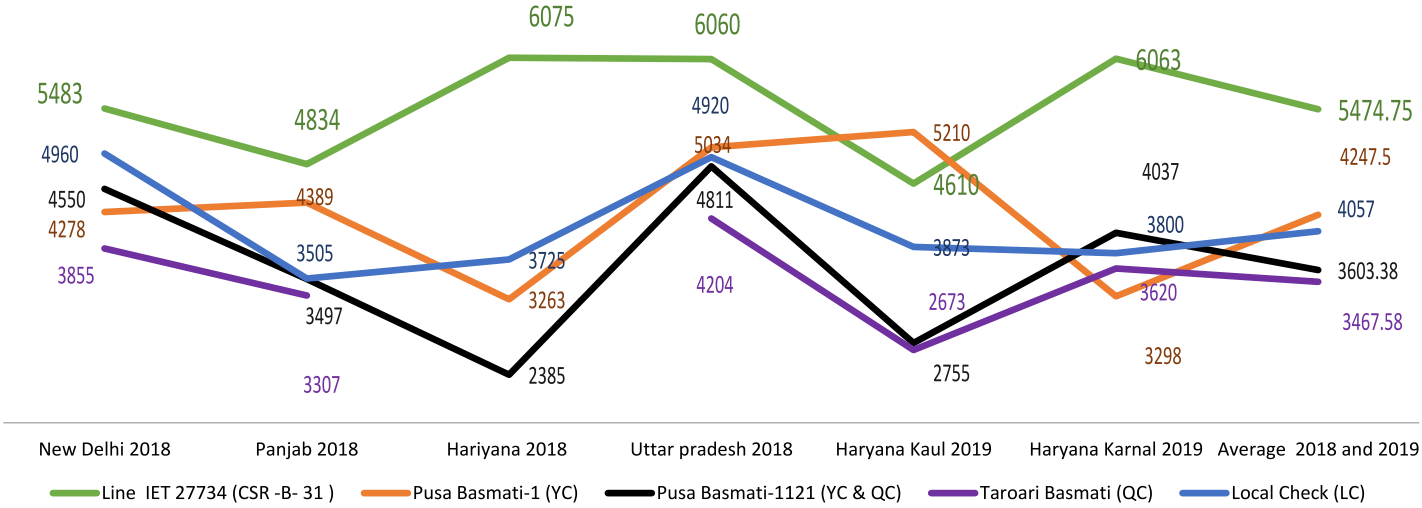


Fig1. Performance of CSR 65 (CSR B 31) across the seasons (2018-2020) and across Basmati growing locations for grain yield (kg/ha)

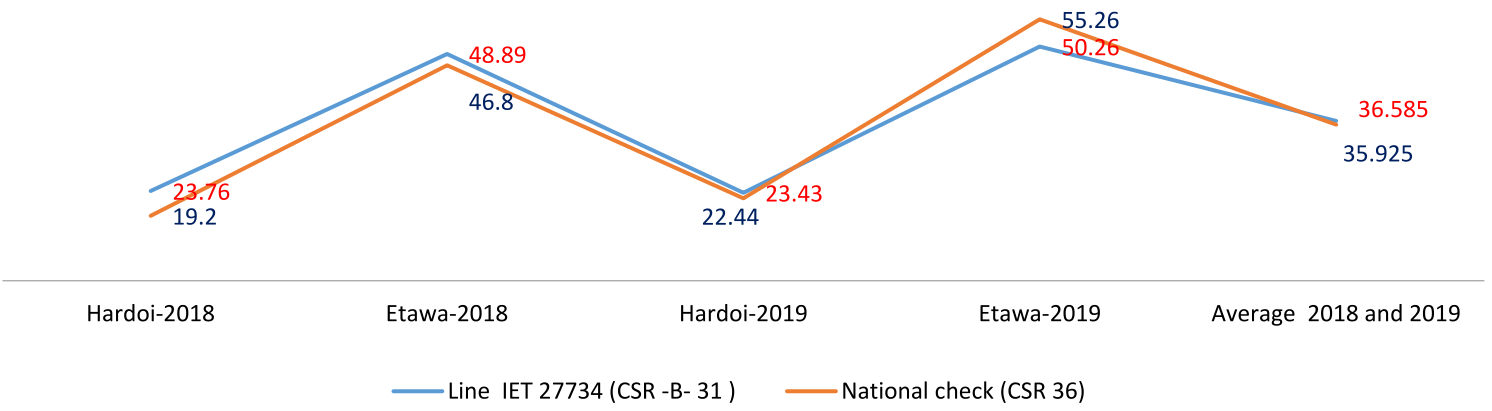


Fig2. Performance of CSR 65 (CSR B 31) under sodic soils of Uttar Pradesh for grain yield (kg/ha)during 2018 to 2020

SL Krishnamurthy, BM Lokeshkumar, Suman Rathor, A S Warraich and PC Sharma

Swachhata Abhiyan programme 2022

ICAR-Central Soil Salinity Research Institute, Karnal organized Swachhata Abhiyan programme during 16-31 December, 2022. In the closing ceremony of the programme, Sh. Yogender Rana, District President BJP, Karnal graced the occasion as the Chief Guest and Sh. Sanjay Bathala, representative H'ble Chief Minister, Government of Haryana as the Guest of Honour. Sh. Yogender Rana, in his address, emphasized the role of peoples' participation and their individual duties for keeping the nation clean, and also underlined the progress and achievements made in clean India campaign through various programmes implemented by the Government of India. On this occasion, Sh. Sanjay Bathala shared his vision and valuable experience of last 8 years being a part of Swachh Bharat Mission. Further, he laid emphasis on positive and favourable changes occurred in the attitude of people vis-à-vis cleanliness, which he considered as a great step forward to achieve the objectives of clean India. Further, he called for taking cleanliness as fundamental duty of every citizen as this would help fulfilling the aspirations of India. Dr P. C. Sharma, Director, ICAR-CCSRI, Karnal highlighted the various activities and programmes conducted during 16-31, December, 2022 as part of Swachhata Abhiyan programme at the Institute and in its vicinity including that in the 50 villages adopted by the Institute. He pointed out that in programmes conducted by the Institute, farmers including children and women were sensitized about the multiple aspects of cleanliness using various technologies. He also highlighted the significant achievements of the Institute in reclamation and management of salt-affected soils in different parts of the country. In his concluding remark, he emphasized the role and importance of salt-tolerant varieties of rice, wheat and mustard developed by the Institute in harnessing the potential of salt-affected soils, and thereby sustaining the livelihood of farmers.

Glimpse of Cleanness Drive in Institute Campus

SALINITY News
Vol. 28, No. 2 एक कदम स्वच्छता की ओर July-December 2022

Kisan Diwas Celebration

As per the directives of the Council, the Institute organized Kisan Diwas on 23rd December, 2022 at village Dabri of Karnal district to honour the farmers having extra-ordinary achievements in the farming sector. This programme is organized every year to commemorate the birth anniversary of former Prime Minister of India Ch. Charan Singh. In this programme, Dr S.K. Chaudhari, DDG (NRM), ICAR was the Chief Guest and Dr A. Velmurugan, ADG (SWM), ICAR was the Guest of Honor. Addressing the gathering of around 200 farmers, Dr SK Chaudhari apprised them about different government schemes for the benefits of the farmers and the steps to take advantage of them. He emphasised the need for enhancing the soil fertility by adopting conservation agriculture including the proper management of crop residues in the rice-wheat cropping system. On this occasion, Dr A. Velmurugan shared his experiences with the farmers adopting traditional practices for sustainable agriculture in Andaman and Nicobar Islands and elsewhere which could be replicated by the farmers of Haryana State. Earlier, Dr P C Sharma, Director of the Institute apprised the gathering about the technologies developed by the Institute for management of salt-affected soils and for use of poor-quality water for irrigation. He shared that the Institute has developed 23 salt-tolerant crops varieties of rice, wheat, mustard and chickpea, which are playing important role in increasing the income of the farmers having slat-affected soils. He also called upon the farmers to take the advantage of the services by the Institute like soil and water testing, availability of quality seeds and extension services offered for the farmers. On this occasion, some of the progressive farmers and farm women of self-help groups also shared their experiences in achieving success in farm related endeavours. The programme ended with vote of thanks by Dr Anil Kumar, Head, Division SSR of the Institute.

Dabri Village farmer interacting with scientists

Mini STL Training

Training on "Mini STL kit based Soil and Water Testing" sponsored by State Department of Agriculture and Farmers' Welfare, Govt. of Haryana was organized by ICAR-CSSRI, Karnal. The training was provided to 19 Assistant/Associate Professors from different Govt. Colleges of Haryana State during 05-07 July 2022 and to 36 GSSS Science teachers from different Govt. Schools of Haryana State during 12-14 July 2022. In these training programs, major aspects of soil and water testing viz., scope and importance of soil and water testing in India, salinity and its impact on nutrients and water availability, orientation to mini STL kit and other instruments used for soil and water testing were covered. Practical's on preparation and processing of soil/water samples for analysis, preparation of solution/reagent for mini STL kit, estimation of EC, pH, Carbon, Phosphorus, Potassium, Sulphur, Calcium, Magnesium, and micronutrients of soil using mini STL kit were organized. Pre- and post-training evaluation of all trainees was also carried out which showed that the percentage increase in knowledge from pre training evaluation test to post training evaluation test was found to be 27% for Assistant/Associate Professors and 33 % for GSSS Science teachers.

Mini STL Training 05-07 July, 2022

Mini STL Training 12-14 July, 2022

SALINITY News
Vol. 28, No. 2 स्वच्छ भारत एक कदम स्वच्छता की ओर July-December 2022

Awards

Dr. P.C. Sharma, Director, ICAR-CSSRI was presented with prestigious Rafi Ahmed Kidwai Award for outstanding research in agricultural sciences at 94th ICAR Foundation Day Celebration at A P Shinde Symposium Hall, NASC, PUSA, New Delhi on 16th July 2022.

Dr. Parvender Sheoran, Principal Scientist, ICAR-CSSRI was presented with Swami Sahajanand Saraswati Outstanding Extension Scientist Award 2021 at 94th ICAR Foundation Day Celebration at A P Shinde Symposium Hall, NASC, PUSA, New Delhi on 16th July 2022.

Published by :
Director
ICAR-Central Soil Salinity Research Institute, Karnal

Edited by :
Dr. P.C. Sharma
Dr. Madhu Choudhary

Compiled by :
Er. Y. S. Ahlawat