Proceedings of IRC Meeting

(29 July – 01 Aug., 13-14 Aug.,
18 Aug., 27 Aug., and 04 Sept., 2020)

ICAR-Indian Institute of Soil Science

Nabibagh, Berasia Road, Bhopal – 462 038 (M. P.)

GUIDANCE AND DIRECTIONS

Dr. ASHOK K. PATRA,
Director and Chairman, IRC

Dr. M.C. Manna
HoD, Soil Biology and Member Secretary, IRC

COMPILATION AND EDITING

Dr. R. Elanchezhian
Pr. Scientist and I/c PME Cell

SECRETARIAL ASSISTANCE AND COMPUTER PROCESSING

Mr. Sanjay Kumar Kori
Stenographer Grade-III

INTRODUCTORY REMARKS OF THE CHAIRMAN, IRC

The IRC meeting was held during 29 July – 01 Aug., 13-14 Aug., 18 Aug., 27 Aug., 04 Sept., 2020 in the committee room of the institute. The member Secretary IRC welcomed the Chairman and other members of IRC and briefed about the purpose and agenda of the meeting. I/c PME Cell presented an account of the ongoing and new projects in the institute and the modalities for presentation. The Director and Chairman of the IRC also welcomed all the members of IRC present over there. He took this opportunity to congratulate the award winning scientists for their recognitions and honors. He again stressed that all scientists must submit quality research proposals. The following ongoing, concluded and new projects were presented.

- Input distribution under STC/SCSP to be done by groups

Proceedings of IRC meeting (pre RPP1, RPP1, RPP-II) to be held during 29 July – 01 Aug., 13-14 Aug., 18 Aug., 27 Aug., and 04 Sept., 2020

Date: 29 July – 01 Aug., 13-14 Aug., 18 Aug., 27 Aug., and 04 Sept., 2020 (10:30 AM to 5:00 PM through Online Zoom Platform)

Institute in-house and external funded projects (RPP-II)
Programme- I Soil Health and Input use efficiency

a) Institute in-house projects

Sl. No.	Title of Project	PI and Co-PI	Division / Unit	Period		RPP Status	Remarks
1	Long-term evaluation of integrated plant nutrient supply modules for sustainable productivity in Vertisol	Muneshwar Singh, A. K. Biswas, B. P. Meena A. B. Singh, R. S. Chaudhary	LTFE	Reconstructed April 2012	Long term	RPP-II 2014-15, RPP-II 2015-16, RPP-II 2016-17, RPP-II 2017-18 and RPP-II 2018-19 to be submitted	• Project to be continued • Progress is satisfactory • Dr BP Meena to be PI in place of Dr Muneswar Singh after the retirement of later • Dr RH Wanjari also to be included • Chickpea resistant variety to be included • SQI to be calculated • P uptake data to be verified • K to be balanced with K dose from irrigation water • FYM mineralogical study as incubation expt to be carried out
2	Evaluation of glauconite as source of potassium for crops	A.O. Shirale, Gurav Priya Pandurang, Sanjay Srivastava, B.P. Meena and A.K. Biswas	SC&F	Nov, 2017	Nov 2020	RPP-II 2019-20 submitted	• Progress is satisfactory • PI requested for extension for two years. One year extension was granted and based on results may be reviewed and extended further • Exchangeable Ca/kg concentration to be analysed • Pot culture/ micro plot to be conducted
3	Enhancing the productivity of major crops through improving the natural resource base of tribal inhabited areas of central India	Shinogi K.C., Sanjay Srivastava, A.L. Kamble, B.P. Meena, N.K. Sinha, K. Bharati, Gurav Priya Pandurang, A.K. Tripathi, Hiranmoy Das, R.L. Raut (KVK, Balaghat), Rameshwar Ahirwar (KVK, Balaghat), Aparna Jaiswal (COA, Balaghat)	SC&F	Jan 2018	Dec 2022	RPP-II to be submitted	• Progress is satisfactory • Project to be continued • KVK In-charge to be contacted and demonstration to be finalized
4	Mineralogy of Vertisols in relation K	Gurav Priya Pandurang, A.O. Shirale, B.P. Meena, B.L. Lakaria,	SC&F	June 2018	Dec 2023	RPP-II to be submitted	• Progress is satisfactory • Project to be continued

	availability in central and western India	Sanjay Srivastava, P. Chandran (ICAR-NBSS&LUP, Nagpur)					• Letter to be sent to Director, ICAR-NBSS&LUP, Nagpur for availing the XRD facilities
5	Micronutrients distribution in major soil orders of India as influenced by soil properties and land use pattern	S.K. Behera, A.K. Shukla, N.K. Sinha, J.K. Thakur, K. Kartikeyan (ICAR-NBSS&LUP, Nagpur)	MSPE	2019	2023	RPP-II to be submitted	• Progress is satisfactory • Project to be continued • High B content in samples may be verified • SOC/N data for ICAR-IISS farm may be verified
6	Enhancement of Soil Health and Livelihood of Tribals in Central India	RH Wanjari, R Elanchezhian, Prabhat Tripathi, RK Singh, KC Shinogi, MV Coumar,Vasudev Meena, AL Kamble, Utkarsh Tiwari, J Somasundaram, AO Shirale, Asit Mandal, Hiranmoy Das, AB Singh, Asha Sahu, SK Behera, AK Vishwakarma, M Mohanty, Seema Bhardwaj, Madhumonti Saha, Sanjay Srivastava, K Bharati, Priya Gurav, BP Meena, AK Tripathi, Abhijit Sarkar, NK Sinha, JK Thakur, I/c KVK Barwani (MP), I/c KVK Rajnandgaon (Chhattisgarh) and I/c KVK Betul (MP)	LTFE	2018	2021	RPP-II to be submitted	• Progress is satisfactory • Project to be continued • Arsenic data to be checked in water sample • FPOs and farmers capacity building to be conducted • Nursery/ seedling to be distributed wherever it is required • SHCs distribution of beneficiaries may be done
7	Assessment of nutrient (N & P) use efficiency in wheat genotypes for improved crop productivity	R. Elanchezhian, A.O. Shirale, B.P. Meena, Alka Rani, Sanjay Srivastava, Ajay, S. Ramana, A.K. Biswas and Renu Pandey (ICAR-IARI, New Delhi)	SC&F	October 2019	Sept 2023	RPP-II to be submitted	• Progress is satisfactory • Project to be continued • Germplasm showing more PE to be analyzed further • Fertilizer to be given plot wise

b) Externally Funded Projects

8	Network Project on Organic Farming	A. B. Singh, B.P. Meena, Brij Lal Lakaria, S. Ramana, J.K. Thakur	Soil Biology	July 2004	March 2021	Report for 2019-20 to be submitted	• Progress is satisfactory • Project to be continued • Nutrient loading in each experiment to be calculated • Spacing of maize/soybean to be maintained • Treatment to be imposed carefully with mixing with water
9	Ensuring food security, sustainability and soil health through resource conservation based farmer FIRST approach in central India	A.K. Patra, A.K. Vishwakarma, R.K. Singh, A.B. Singh, B.L. Lakaria, R.H. Wanjari, K. Bharati, Asha Sahu, Shinogi K.C. and A.O. Shirale, A.L. Kamble and Hiranmoy Das	SC&F	March 2016	March 2018	Report to be submitted	• Progress is satisfactory • Extension up to March 2021 • Dr Narayan Lal to be included • WUE to be calculated • Value addition process to be undertaken

10	Development of an automated soil nutrient sensing system funded by NASF	Sanjay Srivastava, A.O. Shirale, P.S. Tiwari (ICAR-CIAE, Bhopal), Vijay Kumar (ICAR-CIAE, Bhopal), Ramesh Kumar Sahani (ICAR-CIAE, Bhopal), Baban Kumar (CSIR-CSIO, Chandigarh), Neelam (CSIR-CSIO, Chandigarh)	SC&F	9 May 2017	8 May 2020	Report to be submitted	• Progress is satisfactory • Extension up to Dec 2020 received from NASF • Further work may be needed & explored for usable technology using ion selective electrode
11	Assessing the impact of imbalanced use of chemical fertilizer on soil health using a soil function based quantitative approach funded by DST, New Delhi	N.K. Lenka, B.P. Meena, Sangeeta Lenka, A.O. Shirale and R.H. Wanjari	SC&F	May 2018	April 2021	Report Submitted	• Progress is satisfactory • Project to be continued • Trend of imbalanced use of fertilizer over years to be calculated • P buildup to be intimated to the districts • Webinar to be arranged with state departments • In >75% of samples (hilly area) OC is 0.5% and low N • PCA to be carried out

Programme II: Conservation Agriculture and Carbon Sequestration vis-à-vis Climate Change

a) Institute Projects

12	Assessing greenhouse gas emission and soil carbon storage with reversal in tillage practice	Sangeeta Lenka, N. K. Lenka, and S. Bhattacharjya	ESS	June 2016	May 2020	RPP-II 2018-19 to be submitted	PI intimated that RPP-III will be presented Progress is satisfactory
13	Climate change impact on water productivity of major crops in central India	N.K. Sinha, M. Mohanty, J. Somasundaram, Pramod Jha, Alka Rani, Seema Bhardwaj, Hiranmoy Das, K.M. Hati, R.S. Chaudhary	Soil Physics	2019	2023	RPP-I & RPP-II 2019-20 to be submitted	• Project to be continued • Progress is satisfactory • Grain/straw rate in soybean to be checked • Constraints to be noted for yield
14	Impacts of conservation agriculture on runoff and soil loss under different cropping system in Vertisols	Prabhat Tripathi, R.K. Singh, R.S. Chaudhary, Seema Bhardwaj, J. Somasundaram, M. Mohanty, K.M. Hati	Soil Physics	2019	2024	RPP-I & RPP-II 2019-20 to be submitted	• Progress is satisfactory • Project to be continued • Additional scientists from ESS/Chemistry Division to be added • Run off loss to be computed for nutrients • New items to be given in RPP-I
15	Development and promotion of CA machinery (Inter-Institutional project with ICAR-CIAE, Bhopal	AK Vishwakarma, Dushyant Singh, NS Chandel	SC&F	Jan 2019	March 2020	RPP-II to be submitted	PI may present in his RPP-II Progress is satisfactory

b) Externally Funded Projects

16	Assessment of important soil properties of India	K.M. Hati, M. Mohanty, Pramod Jha, R.S. Chaudhary, N.K. Sinha,	Soil Physics	May 2015	June 2020	RPP-II 2015-16, RPP-II 2016-17, RPP-II 2017-	• Progress is satisfactory • Webinar on soil spectroscopy to be

	using mid-infrared spectroscopy	J.K. Thakur, M. V. Coumar, Pradip Dey, Muneshwar Singh, A.K. Patra, Javed Rizvi				18, RPP-II 2018-19, RPP-II 2019-20 to be submitted	conducted during Sept -Oct 2020
17	CRP-Conservation Agriculture Development, refinement and validation of conservation agriculture in Vertisols of central India and quantifying impact of CA practices on soil and environment	LCPC: Dr. A.K. Biswas and Dy LCPC: Dr. R.S. Chaudhary K M Hati (PPI), J Somasundaram, A.K. Vishwakarma, R.K. Singh, Pramod Jha	SC&F & Soil Physics	April 2015	March 2020	Report for 2015-16; 2016-17, 2017-18, 2018-19 to be submitted	• Extended up to 2025-2026 • Progress is satisfactory
	(a) Demonstration of best-bed conservation agriculture practices on farmers' fields in Vertisols of Central India	A.K. Viswakarma, R.H. Wanjari, Shinogi KC and A.K. Tripathi	SC&F	April 2015	March 2020	Report for 2015-16; 2016-17, 2017-18, 2018-19, 2019-20 to be submitted	• Progress is satisfactory • Change in weed flora to be noted • 20 Demonstrations to be conducted • Custom hiring of machinery to be recommended to curb residue burning
	(b) Fine-tuning of conservation agriculture practices for Vertisols of Central India	J. Somasundaram, S. Ramana, B.P. Meena and A.O. Shirale	Soil Physics	April 2015	March 2020	Report for 2015-16; 2016-17, 2017-18, 2018-19, 2019-20 to be submitted	• Progress is satisfactory
	(c) Development of water and nutrient management practices in conservation agriculture for Vertisols of Central India	R.K. Singh, Sanjay Srivastava, N.K. Sinha and Priya Gurav Pandurang	Soil Physics	April 2015	March 2020	Report for 2015-16; 2016-17, 2017-18, 2018-19, 2019-20 to be submitted	• Progress is satisfactory • Root growth with irrigation • Height of raiser may be increased to cover the crop canopy
	(d) Impact of conservation agricultural practices on soil health, carbon sequestration and greenhouse gas emission in different production systems	Pramod Jha, B.L. Lakaria, M. Mohanty, J.K. Thakur and K. Bharati	SC&F	April 2015	March 2020	Report for 2015-16; 2016-17, 2017-18, 2018-19, 2019-20 to be submitted	• Progress is satisfactory
18	Cropping systems and soil management effects on soil organic carbon sequestration and greenhouse gas emission in Vertisols of central India under change	M. Mohanty, Pramod Jha, Sangeeta Lenka, J. Somasundaram, N.K. Sinha, A.K. Vishwakarma, R.S. Chaudhary and Muneshwar Singh, Seema Bhardwaj	Soil Physics	February 2017	March 2020	Project report 2018-19 and 2019-20 to be submitted	• Progress is satisfactory • SOC stabilization may also be studied • RCP scenarios may be mentioned • Extension letter to be submitted to PME

	climate scenarios funded by NICRA II-Phase						
19	Hyper-spectral remote sensing approaches to evaluate soil quality and crop productivity of central India (under DST sponsored Network Project on Hyper-spectral Big Data Analytics)	M. Mohanty, N.K. Sinha, K.M. Hati, R.K. Singh, Pradip Dey, R.S. Chaudhary, A.K. Patra, Bharat Bhaskar Gaikwad	Soil Physics	April 2016	March 2019	Report for 2016-17, 2017-18, 2018-19 to be submitted	• Progress is satisfactory • Extended up to Sept 2020 • Spectral band to be specific for each nutrients • Extension letter to be submitted to PME
20	Strategies for enhancing yield of soybean (Glycine Max L) and pigeonpea (Cajanus cajan, L) in India using climate variability information and crop growth simulation models in collaboration with ICAR-IISR, Indore funded by IITM	M. Mohanty, B.S. Bhatia, N.K. Sinha, Prabhat Tripathi, R.S. Chaudhary, Seema Bhardwaj and A.K. Patra	Soil Physics	July 2018	June 2021	Report 2018-19 and 2019-20 to be submitted	• Progress is satisfactory
21	Sustainable adaptive water management resilient to variable climates in Madhya Pradesh funded by ICARDA	M. Mohanty, N.K. Sinha, A.K. Patra	Soil Physics	April 2018	March 2021	Report 2018-19 and 2019-20 to be submitted	• Progress is satisfactory • Data on water productivity to be checked
22	Vulnerability and impact assessment of climate change on soil and crop production in Madhya Pradesh funding Agency: UNDP-GEF-MoEFCC	Sangeeta Lenka, N. K. Lenka, M. Mohanty, R. H. Wanjari and A. K. Patra	ESS	Dec 2017	June 2019	Report 2017-18, and 2018-19	• Progress is satisfactory • PI intimated that RPP-III will be presented
23	Assessing the potential impact of climate smart technologies on soil health and nutrient accounting in selected vulnerable districts of MP funded by EPCO, Bhopal	Sangeeta Lenka, N.K. Lenka, MV Coumar, M. Mohanty, Sudeshana Bhattacharjya, J.K. Saha, A.K. Patra, Dolamani Amat	ESS	August 2018	July 2021	Report 2018-19 and 2019-20 to be submitted	• Progress is satisfactory • Integrate with Dr Nishant for data on water productivity • Sampling strategy to be checked to remove outliers in data • Inorganic fertilizer use data in Rajgarh/ Sehore district to be checked • Zn/Cu in Sehore dt to be checked • Texture in Sehore dt to be checked
24	Assessing the potential	Sangeeta Lenka, N.K. Lenka,	ESS	August	July	Report 2018-19 and	• Progress is satisfactory

	impact of climate change and management on soil carbon and nitrogen storage in selected ecosystems of India funded by NASF	Vasudev Meena, Asit Mandal, Biswapati Mandal (BCKV, West Bengal)		2018	2021	2019-20 to be submitted	• Radiocarbon age in deep layer to be checked • Fraction of new carbon with range may be calculated

Programme III – Soil Microbial Diversity and Biotechnology

a) Institute Projects/ Inter-institute collaborative project

25	Effects of long term use of fertilizer and manure on soil functional diversity and nutrient supplying capacity under different soils and cropping systems (Inter-institute collaborative project with ICAR-IISR, Indore	Sudeshna Bhattacharjya, Asha Sahu, M.C. Manna, Muneshwar Singh, R.H. Wanjari, M.P. Sharma (ICAR-IISR, Indore), A.K. Patra	Soil Biology	April 2016	March 2021	RPP-II 2016-17 and RPP-II 2017-18, RPP-II 2018-19, RPP-II 2019-20 to be submitted	• Progress is satisfactory • Correlation of rubisco with crop productivity to be assessed

b) Externally Funded Projects

26	Enhancing decomposition rate and quality of bio-waste through microbial consortia for improving soil health funded by NASF	M.C. Manna, Asha Sahu, S. Bhattacharjya, A.B. Singh, A.K. Tripathi, J.K. Thakur, Dolamani Amat	Soil Biology	June 2018	Jan 2021	Report 2018-19 and 2019-20 to be submitted	• Progress is satisfactory • Model to be established in ICAR-IISS farm for demonstration • Demo plan to be included in the SFC/EFC 2021-26 for crop residues • Institutional charges to be used
27	Eco-genomics of soil microbes involved in global climate mitigation and nitrogen use efficiency in rice-wheat agroecosystem of central India under elevated CO_2 and temperature" funded by DST	S.R. Mohanty, K Bharati, S Gangil (ICAR-CIAE, Bhopal), A.K. Vishwakarma	AINP on SBB	Septemb er 2018	April 2021	Report 2018-19 and 2019-20 to be submitted	• Project is satisfactory
28	Evaluation of Soybean-rhizobia interaction under	S.R. Mohanty, Asit Mandal, K Bharati	AINP on SBB	April 2017	March 2020	Report 2017-18, 2018-19 and 2019-20 to be submitted	• Project is satisfactory

	elevated CO_2 and temperature to develop climate ready microbial inoculants for central India funded by AMAAS						
29	Exploring soil microbial community and mechanism in soil carbon sequestration under long term land uses in semi-arid sub-humid Central India funded by SERB, DST, New Delhi	Sudeshana Bhattacharjya	Soil Biology	10 August 2017	9 August 2020	Report 2017-18, 2018-19 and 2019-20 to be submitted	• Progress is satisfactory • PI intimated that RPP-III will be presented

Programme IV: Soil Pollution, Remediation and Environmental Security
a) Institute Project:

30	Quantitative assessment of acid mine drainage affected areas in eastern and south-eastern Madhya Pradesh	Madhumonti Saha, Ajay, Abhijit Sarkar, J.K. Saha and Hiranmoy Das	ESS	Sept 2019	Aug 2022	RPP-II 2019-20 to be submitted	• Progress is satisfactory & project to be continued • Nearby adjacent area also to be surveyed

b) Externally funded projects

31	Reclamation and rehabilitation of coper mining affected land in Malanjkhand area of Madhya Pradesh (Hindustan Copper Limited)	Ajay, Tapan Adhikari, Asit Mandal, J.K. Saha	ESS	April 2016	March 2019	Report for 2016-17, 2017-18, 2018-19 to be submitted	PI intimated that RPP-III will be presented Progress is satisfactory
32	Management of Municipal Solid Waste (MSW) contaminated landfill area of Bhanpur, Bhopal funded by BMC, Bhopal	Ajay, Tapan Adhiakari, K. Bharati, Asit Mandal, J.K. Saha	ESS	Nov. 2016	Oct. 2019	Report for 2016-17, 2017-18, 2018-19 to be submitted	PI intimated that RPP-III will be presented Progress is satisfactory
33	Reclamation and management of Municipal Solid Waste	Ajay, Tapan Adhikari, K. Bharati and Asit Mandal	ESS	Feb 2019	Jan 2021	Report 2019-20 to be submitted	• Project to be continued and progress is satisfactory • Fe data of FYM/VC to be checked

	contaminated dumping area of Bhanpur, Bhopal funded by MPCST, Bhopal						
34	Exploring endophytic fungi for the phytoremediation of heavy metal contaminated soils funded by DST	Asit Mandal	Soil Biology	Sept 2018	Sept 2021	Report 2018-19 and 2019-20 to be submitted	• Project to be continued and progress is satisfactory • Pathogenic fungi may be excluded

Contractual Projects

35	Impact of viscose staple fibre industry treated effluent on soil health and crop production surroundings Nagda, M.P funded by M/s Grasim Industries Limited, Nagda, Ujjain, M.P.	Tapan Adhikari, J.K. Saha, M.V. Coumar, R.H. Wanjari, N.K. Sinha and A.K. Patra	ESS	Nov 2017	Oct 2020	Report 2017-18, 2018-19 and 2019-20 to be submitted	• Data not disclosed due to confidentiality clause • Broad achievement given • Nano composite for water purification may be explored
36	Evaluation of effect of Zeba fertilizer product on nitrate-N leaching funded by M/s UPL Limited, UPL House, 610Bl2, Bandra Village, Off Western Express Highway, Bandra-East, Mumbai-400 051	A.K. Biswas, R. Elanchezhian, N.K. Lenka, A.O. Shirale, A.K. Patra	SC&F	Dec 2018	Oct 2019	Report to be submitted for 2019-20	• Data not disclosed due to confidentiality clause • Broad achievement given • Extended up to June 2020

New project: Institute and Externally funded Projects / Inter-Institutional projects (Pre RPP1/RPP1)
New Institute / Inter-Institutional projects (Pre RPP1/RPP1)

S. No.	Project Title	PI/Co-PI	Division/Unit	Start	End	Remarks
1.	Deciphering thermophiles from hot springs of Central India for rapid decomposition of crop residues	Asha Sahu, Dolamani Amat	Soil Biology	July 2020	June 2024	• Approved to be included in a major project "Characterization and prospects of soil biota for enhancing nutrient use efficiency " • Budget to be revised • Strains to be carefully isolated
2.	Exploring endophytic microbial diversity of selected major field crops of India for nutrient supplementation	J.K. Thakur	Soil Biology	July 2020	June 2024	• Approved to be included in a major project "Characterization and prospects of soil biota for

	and biocontrol					enhancing nutrient use efficiency " • Focus on nutrient supplying capacity
3.	Assessment/quantification of soil heavy metals using spectroscopy and multi spectral remote data from industrial areas of Kanpur	Nisha Sahu	ESS			• Other than Kanpur, may also be included • Form of heavy metal to be included • Approved
4.	Impact of climate change on soil physical process in maize based cropping systems in vertisols of central India	Jitendra Kumar	Soil Physics			• Approved to be included in a major project "Impact of climate change on soil processes " • Modify the objectives as per suggestions
5.	Soil moisture estimation through remote sensing for agriculture drought monitoring and early warning	Alka Rani	Soil Physics			• Approved to be included in a major project "Impact of climate change on soil processes " • Title to be modified • robust prediction
6.	Evaluation of deficit irrigation levels and phosphorus nutrition levels for optimizing water productivity rooting behaviour and yield of wheat in semiarid climate of central India	Seema Bhardwaj	Soil Physics			• Approved to be included in a major project "Impact of climate change on soil processes " • Sub-soil moisture tapping is essential • One year pilot column study may be conducted • Physiologist to be included
7.	Development of agri-horticultural system for central India under Vertisols, its impact on soil health and improvement in productivity and quality of fruits	Narayan Lal	SCF	2020		• Approved • Dr Pradip Dey to be included
8.	Allevation of heavy metal stress in crops using silicon as amendment in metal polluted soil	Vasudev Meena	ESS	July 2020	June 2024	• Approved to be included in a major project "Heavy metal and its remediation for sustainable crop production and environmental protection " • Bring contaminated soil for evaluation • Beneficial effect of Si be delinked at present • No spike • Review again
9.	Municipal solid waste compost quality assessment for sustainable crop production and environmental protection	M.V. Coumar	ESS	July 2020	June 2024	• Approved to be included in a major project "Heavy metal and its remediation for sustainable crop production and environmental protection " • Dose of MSW to be reduced • No. of samples to be reduced • Field study to be conducted in micro plots
10.	Use of fly ash in agriculture for sustainable crop protection and environmental protection funded by NTPC, Noida	J.K. Saha, M. V. Coumar, A.K. Patra, Tapan Adhikari, Ajay, K.M. Hati, Vasudev Meena, Sangeeta Lenka, Asit Mandal, A.K. Vishwakarma, Hiranmoy	ESS	2017	2022	• PI requested that, due to non funding from NTPC, it may be considered as institute project till funding from NTPC • The project will be considered as institute project until funding is received from NTPC effective from date of funding.

		Das, S Ramana				• The institute project will be reviewed after five years of progress. • Textural analysis to be included • Water stable aggregates to be included • Soybean-wheat for five years and review after five years, if need be maize-gram cropping system may be explored • One control (T13) to be maintained
11.	Studying of climate change impact on nitrogen dynamics and water use in two contrasting cropping system of Central India	NK Lenka	SC&F	Oct 2020	Dec 2021	• Status paper may be given for further process

New Externally funded Projects (RPP1)

S. No.	Project Title	PI/Co-PI	Division/Unit	Start	End	Remarks
12.	Methanogenic bio-electrode driven conversion of CO_2 to CH_4 to enhance methanogenesis and mitigation of greenhouse gas from agro-waste based bioenergy systems" for funding from DST-JSPS programme	SR Mohanty	SBB	Jan/March 2020	2023	Approved
13.	Long-term monitoring of soil processing in forests and grasslands	Pramod Jha	SCF	2020	2025	• Approved • PME cell may request IISc to give additional manpower and institutional charges. • Additional Co-PI to be included in the project • IRC request PI to get IP share of data generated

Project and other activities

	Name	Division	Remarks
1.	Dr. Hiranmoy Das	PC (STCR)	• GIS/Facility map- Soil Health
2.	Dr. BL Lakaria including SCSP project	SCF	• Pre-IRC/Status paper for SCSP project to be submitted • AK Vishwakarma, RK Singh, Kollah Bharati, Dolamani Amat, Ajay, Asha Sahu & other
3.	Dr RS Chaudhary	SPD	• Handheld device project in collaboration with MANIT to be developed
4.	Dr. AK Tripathi	SBD	• To be presented in next meeting
5.	Dr. Kollah Bharati	SBD	• Microbial diversity with respect to CA and soil quality • Metagenomics study under CA to be conducted

			• Review again after three months
6.	Dr Dolamani Amat	SBD	• to be associated in more projects/ experiments
7.	Dr S Ramana	ESS	• Inter institutional collaborative project with rapeseed niger was proposed • Seek for external funding

1. Performance ranking of R&D labs, by PMO. Principal Scientific Advisor to GoI, CII, centre for technology innovation & economy research
   - Quality of publications- scopas/web of science
   - Project information/training
2. New project submission by scientists deadline 7/15 days
3. MoU needs to be done before actual project initiation of private university consent is required & to avoid IPR complications
4. RPP-III
5. Ithenticated (DKMA)

Concluding remarks by Chairman, IRC

1. Chairman congratulated to all awardees and PIs of externally funded projects.
2. Bulletin with RPP-III to be submitted
3. Full papers to PME Cell to be submitted. All award/project to be forwarded through PME Cell, Excluded if not forwarded through PME Cell.
4. Infrastructure facility to be shared during Division/Units
5. Communication to PME Cell
6. Young scientists meeting to be conducted
7. Project to be discussed in interactive mode
8. "Gold Coin story" Handles/Obstacles to be removed

Division wise/Co-coordinating Unit-wise Number of Projects

Sl. No.	AICRP/ Division	Sl. No. of Project	Total
1.	AICRP on LTFE	1, 6	2
2.	AICRP on STCR	-	-
3.	AICRP on MSPE	5	1
4.	AINP on SBB	27, 28	2
5.	Soil Chemistry and Fertility	2, 3, 4, 7, 9, 10, 11, 15, 17, 174(a), 17(d), 36	12
6.	Soil Physics	13, 14, 16, 17, 17(b), 17(c), 18, 19, 20, 21	10
7.	Soil Biology	8, 25, 26, 29, 34	5
8.	Environnemental Soil Science	12, 22, 23, 24, 31, 32, 33, 35	8

Division-wise no. of Externally Funded Projects

Sl. No.	Centre/Co-coordinating Unit	Sl. No. of Project	Total
1.	AICRP LTFE	-	-
2.	AICRP STCR	-	-
3.	AICRP MSPE	-	-
4.	AINP SBB	-	-
5.	Soil Chemistry and Fertility	36	1
6.	Soil Physics	-	-
7.	Soil Biology	34	1
8.	Environmental Soil Science	31, 32, 33, 35	4

New Projects Approved

Sl. No.	Division/Co-coordinating Unit	Sl. No.	Total
1	AICRP LTFE	-	-
2	AICRP STCR	-	-
3	AICRP MSPE	-	-
4	AINP SBB	12	1
5	Soil Chemistry and Fertility	7, 11, 13	3
6	Soil Physics	4, 5, 6	3
7	Soil Biology	1, 2	2
8	Environmental Soil Science	3, 8, 9, 10	4

Project (serial numbers) with individual scientist

S. No.	Name of Scientist	Designation	Sl. of projects		
			PI	Co-PI	
1	Dr. A.K. Patra	Director	9	16, 19, 20, 21, 22, 23, 25, 35, 36	10
AICRP on LTFE					
1	Dr. Muneshwar Singh	Project Co-coordinator	1	16, 25	3
2	Dr. R. H. Wanjari	Pr. Scientist	6	9, 11, 17a, 22, 25, 35	7
AICRP on STCR					
1	Dr. Pradip Dey	I/c Project Co-ordinator	-	16, 19	2
2	Dr. Hiranmoy Das	Scientist	-	3, 6, 9, 13, 30	5
AICRP on MSPE					
1	Dr. A.K. Shukla	I/c Project Co-ordinator	-	5	1
2	Dr. S.K. Behera	Sr. Scientist	5	6	2
AINP on BF					
1	Dr. S.R. Mohanty	I/c Project Co-ordinator	27, 28	-	2
Soil Chemistry and Fertility					
1	Dr. A. K. Biswas	Pr. Scientist & I/c Head of Division	17, 36	1, 2, 7	5
2	Dr. Sanjay Srivastava	Pr. Scientist	10	2, 3, 4, 6, 7, 17c	7
3	Dr. Brij Lal Lakaria	Pr. Scientist	-	4, 8, 9, 17d	4
4	Dr. R. Elanchezhian	Pr. Scientist	7	6, 36	3
5	Dr. N.K. Lenka	Pr. Scientist	11	12, 22, 23, 24, 36	6
6	Dr. A.K. Vishwakarma	Pr. Scientist	17a	6, 9, 17, 18, 27	6
7	Dr. Pramod Jha	Pr. Scientist	17d	13, 16, 17, 18	5
8	Dr. B.P. Meena	Scientist	-	1, 2, 3, 4, 6, 7, 8, 11, 17b	9
9	Dr. Shinogi K.C.	Scientist	3	6, 9, 17a	4
10	Dr. A.O. Shirale	Scientist	2	4, 6, 7, 9, 10, 11, 17b, 36	9
11	Dr. Gurav Priya Pandurang	Scientist	4	2, 3, 6, 17c	5
12	Dr. Narayan Lal	Scientist	-	-	-
Soil Physics					
1	Dr. R.S. Chaudhary	Pr. Scientist & I/c Head of Division		1, 13, 14, 16, 17, 18, 19, 20	8
2	Dr. K.M. Hati	Pr. Scientist	16	13, 14, 17, 19	5
3	Dr. R.K. Singh	Pr. Scientist	17c	6, 9, 14, 17, 19	6
4	Dr. J. Somasundaram	Pr. Scientist	17b	6, 13, 14, 17, 18	6

5	Dr. Prabhat Tripathi	Pr. Scientist	14	6, 20	3
6	Dr. M. Mohanty	Pr. Scientist	18, 19, 20, 21	6, 13, 14, 16, 17d, 22, 23	11
7	Dr. N.K. Sinha	Scientist	13	3, 5, 6, 16, 17c, 18, 19, 20, 21, 35	11
8	Dr. Seema Bhardwaj	Scientist	-	6, 13, 14, 18, 20	5
9	Dr. Jitendra Kumar	Scientist	-	-	-
10	Miss Alka Rani	Scientist	-	7, 13	2
Soil Biology					
1	Dr. M.C. Manna	Pr. Scientist & Head of Division	26	25	2
2	Dr. A.B. Singh	Pr. Scientist	8	1, 6, 9, 26	5
3	Dr. A.K. Tripathi	Pr. Scientist	-	3, 6, 17a, 26	4
4	Dr. S.R. Mohanty	Pr. Scientist	27, 28	-	2
5	Dr. K. Bharati	Pr. Scientist	-	3, 6, 9, 17d, 27, 28, 32, 33	8
6	Dr. Asit Mandal	Scientist	34	6, 24, 28, 31, 32, 33	7
7	Dr. Asha Sahu	Scientist	-	6, 9, 25, 26	4
8	Dr. J.K. Thakur	Scientist	-	5, 6, 8, 16, 17d, 26	6
9	Dr. Sudeshana Bhattacharjya	Scientist	25, 29	12, 23, 26	5
10	Dr. Dolamani Amat	Scientist	-	23, 26	2
Environmental Soil Science					
1	Dr. J.K. Saha	Pr. Scientist & I/c Head of Division	-	23, 30, 31, 32, 35	5
2	Dr. Ajay	Pr. Scientist	31, 32, 33	7, 30	5
3	Dr. Tapan Adhikari	Pr. Scientist	35	31, 33	3
4	Dr. S. Ramana	Pr. Scientist	-	7, 8, 17b	3
5	Dr. M. V. Coumar	Scientist	-	6, 16, 23, 35	4
6	Dr. Sangeeta Lenka	Scientist	22, 23, 24	11, 18	5
7	Dr. Vasudev Meena	Scientist	-	6, 24	2
8	Dr. Abhijit Sarkar	Scientist	-	6, 30	2
9	Dr. Madhumonti Saha	Scientist	30	6	2
10	Dr. Nisha Sahu	Scientist	-	-	-
Scientists from other Institutes					
1.	Mr. R.L. Raut	KVK, Balaghat	-	3	1
2.	Mr. Rameshwar Ahirwar	KVK, Balaghat	-	3	1
3.	Miss Aparna Jaiswal	COA, Balaghat	-	3	1
4.	Dr. P. Chandran	ICAR-NBSS&LUP, Nagpur	-	4	1
5.	Dr. K. Kartikeyan	ICAR-NBSS&LUP, Nagpur	-	5	1
6.	Dr. Renu Pandey	ICAR-IARI, New Delhi	-	7	1
7.	Dr. P.S. Tiwari	ICAR-CIAE, Bhopal	-	10	1
8.	Mr. Vijay Kumar	ICAR-CIAE, Bhopal	-	10	1

9.	Mr. Ramesh Kumar Sahani	ICAR-CIAE, Bhopal	-	10	1
10.	Mr. Baban Kumar	CSIR-CSIO, Chandigarh	-	10	1
11.	Miss Neelam	CSIR-CSIO, Chandigarh	-	10	1
12.	Mr. Javed Rizvi	-	-	16	1
13.	Mr. Bharat Bhaskar Gaikwad	-	-	19	1
14.	Dr. M.P. Sharma	ICAR-IISR, Indore	-	25	1
15.	Dr. S Gangil	ICAR-CIAE, Bhopal	-	27	1
16.	Dr. Biswapati Mandal	BCKV, West Bengal	-	24	1

LIST OF PARTICIPANTS

S. No.	Name of Scientist	Designation
1.	Dr. A. K. Patra	Director & Chairman, IRC
2.	Dr. Muneshwar Singh	Project Co-ordinator, LTFE
3.	Dr. A.K. Shukla	Project Co-ordinator, MSPE
4.	Dr. Pradip Dey	Project Co-ordinator, STCR
5.	Dr. R.S. Chaudhary	Principal Scientist & I/c Head of Division
6.	Dr. A.K. Biswas	Principal Scientist & I/c Head of Division
7.	Dr. M.C. Manna	Principal Scientist & Head of Division and Member Secretary, IRC
8.	Dr. J.K. Saha	Principal Scientist & I/c Head of Division
9.	Dr. A.B. Singh	Principal Scientist
10.	Dr. Ajay	Principal Scientist
11.	Dr. A.K. Tripathi	Principal Scientist
12.	Dr. Sanjay Srivastava	Principal Scientist
13.	Dr. Brij Lal Lakaria	Principal Scientist
14.	Dr. Kuntal M. Hati	Principal Scientist
15.	Dr. R. Elanchezhian	Principal Scientist & I/c PME Cell
16.	Dr. Prabhat Tripathi	Principal Scientist
17.	Dr. S. Ramana	Principal Scientist
18.	Dr. NK Lenka	Principal Scientist
19.	Dr. R.K. Singh	Principal Scientist
20.	Dr. R.H. Wanjari	Principal Scientist
21.	Dr. A.K. Vishwakarma	Principal Scientist
22.	Dr. J. Somasundaram	Principal Scientist
23.	Dr. S.R. Mohanty	Principal Scientist
24.	Dr. Pramod Jha	Principal Scientist
25.	Dr. K. Bharati	Principal Scientist
26.	Dr. M. Mohanty	Principal Scientist
27.	Dr. SK Behera	Senior Scientist
28.	Dr. Sangeeta Lenka	Senior Scientist
29.	Dr. M.V. Coumar	Scientist
30.	Dr. Hiranmoy Das	Scientist
31.	Dr. N.K. Sinha	Scientist
32.	Dr. Asit Mandal	Scientist
33.	Dr. Asha Sahu	Scientist

34.	Dr. JK Thakur	Scientist
35.	Dr. Shinogi K C	Scientist
36.	Dr. Bharat Prakash Meena	Scientist
37.	Dr. Sudeshana Bhattacharjya	Scientist
38.	Dr. AO Shirale	Scientist
39.	Dr. Gurav Priya Pandurang	Scientist
40.	Dr. Dolamani Amat	Scientist
41.	Dr. Seema Bhardwaj	Scientist
42.	Dr. Vassudev Meena	Scientist
43.	Dr. Abhijit Sarkar	Scientist
44.	Dr. Madhumanti Saha	Scientist
45.	Dr. Narayan Lal	Scientist
46.	Dr. Nisha Sahu	Scientist
47.	Dr. Jitendra Kumar	Scientist
48.	Miss Alka Rani	Scientist
49.	Dr. Immanuel Chongboi Haokip	Scientist
50.	Dr Mayanglambam Homeshwari Devi	Scientist
51.	Dr Dhiraj Kumar	Scientist

Research Achievements (2020)

Sl. No.	Title of Project
1	**Long-term evaluation of integrated plant nutrient supply modules for sustainable productivity in Vertisol**
	Crop productivity and soil properties improved with the diverse integrated nutrient management (INM) practices in long term fertilizer experiment. The average grain yield of maize and chickpea and system productivity was considerably higher with STCR based integrated nutrient management module i.e. 75% NPK of STCR along with FYM at 5 Mg ha^{-1} and followed by integration of 75%NPK + poultry manure at 1 Mg ha^{-1} as compared to recommended fertilizer management practices and 100% STCR based NPK fertilizers. Whereas, application of organic modules (the integration urban compost, maize residue and *Glyricidia* loppings) did not influenced the maize yields as good as FYM and poultry manure based INM modules. The application of 5 tonne farmyard manure in every season to chickpea and residual fertility of 20 t FYM (every season) improved the chickpea yields. Increase in chickpea yield might be due to residual fertility effect of organic manures in maize. Application of organic module alone, yields were significantly lower. Though exclusive application of organic modules maintained the soil properties but could not achieve the targeted yields. Apparent nutrient balance was negative for N and K in all treatments except higher level of FYM treatment (FYM at 20 Mg ha-1) while P balance was positive under balanced and complete nutrition through organic and inorganic treatments. Significant positive increasing trend of total organic carbon (TOC) content and nitrogen concentration were observed under FYM at 20 Mg ha^{-1} and STCR based 75% NPK + FYM at 5 Mg ha^{-1}. Similarly, application of INM modules enhanced the micronutrients (Zn, Mn, Fe, and Cu) concentration in soil as compared chemically mediated modules and initial levels. Application of FYM based INM modules significantly reduced the bulk density in surface soil as compared recommended dose of fertilizers.
2	**Evaluation of glauconite as source of potassium for crops**
	Pot experiments were conducted in red (Alfisol) and black (Vertisol) by using maize and wheat as a test crop. The treatment constitute of application of glauconite, calcined glauconite, acidulated glauconite alone or along with FYM in comparison with waste mica and muriate of potash. The results of the experiment revealed that the application of MOP recorded highest biomass yield and uptake of K in maize and wheat crops followed by calcined glauconite along with FYM. The effect of application of glauconite was more pronounced in Alfisol over Vertisol. The post harvest analysis of soil samples revealed that there was improvement in water soluble K, ammonium acetate extractable K and exchangeable K due to application of glauconite.
3	**Enhancing the productivity of major crops through improving the natural resource base of tribal inhabited areas of central India**
	To identify the villages with more than 90% tribal population in Balaghat district a pilot survey was carried out in eight villages and three villages viz., *Kaweli, Kulpa,* and *Sarra* were identified to implement the project activities. Surveys and farmer-scientist interface meetings were carried out in the three villages and documented various ITK in soil and water management. Soil samples were collected from the three villages from nine locations at first stage for the analysis of physical, chemical and biological properties. Also, farmer field schools on "soil sampling for soil testing" were organized for the tribal farmers of the project location.
4	**Mineralogy of Vertisols in relation K availability in central and western India**
	• Collected soil samples from kheri soil series Jabalpur, Madhya Pradesh, Nabibagh Soil Series, Bhopal, Madhya Pradesh and Jalawara, Baran, Rajasthan. • Drying and processing of soil samples are done • Collection of remaining soil series samples is in process. • Analysis of soil samples is in process.
5	**Micronutrients distribution in major soil orders of India as influenced by soil properties and land use pattern**
	• Three fertilizer products namely NPS-1, NPS-2 and NPSZn containing sulphur and zinc were evaluated under soybean-wheat system at IISS, Bhopal. • Application of sulphur and zinc either in the form of direct fertilizers or through NPS-1, NPS-2 and NPSZn produced higher seed/grain yield in soybean and wheat crops at both the locations. • Higher crop responses under NPKSZn treatments over NPK treatment were reordered for both the crops. • Application of S and Zn along with NPK enhanced S and Zn uptake by the crops respectively compared to NPK application alone. The uptake of S and Zn by the crops under direct fertilizer application was at par with S and Zn uptake of the crops obtained under application of NPS-1, NPS-2 and NPSZn.

	• Two foliar supplements namely zinc metalosate and boron metralosate were tested for their efficacy in maize-wheat system at IISS, Bhopal, against the standard sources of fertilizers. • Application of Zn either through soil or foliar application (either through $ZnSO_4$ or Zn metallosate or Zn-EDTA) enhances grain yield of both the crops. • Application of B either through soil or foliar application (either through B metallosate or Boric acid) enhances grain yield of both the crops. • Under AICRP-MSPE, studied the spatial distribution pattern of micronutrients in a deccan plateau region of India and derived micronutrient management zones for site-specific micronutrient management • Accomplished duties and responsibilities such as compilation of AICRP material for cabinet/DARE report, regional committee report, annual report and newsletter of Institute, as and when assigned by the Project Coordinator • Assisted Project Coordinator in compilation of achievements of AICRP for RAC, QRT and DG review meeting • Prepared proposal for new research project
6	**Enhancement of Soil Health and Livelihood of Tribals in Central India**
	The TSP (STC) project entitled "Enhancing Soil Health and Livelihood of Tribals in Central India" is going on in three districts i.e. two Aspirational (Barwani in Madhya Pradesh and Rajnadgaon in Chhattisgarh) and a tribal district (Betul in Madhya Pradesh). During 2019-20, various capacity building programmes in the form of training, training-cum-workshop and Kisan Sangoshthi were organized to make the farmers aware of improved agricultural technologies. Through these programmes in total about 657 farmers got benefitted in Barwani, Rajnadgaon and Betul districts. The focus of these capacity programmes was on soil health management (physical, chemical and biological aspects), conservation tillage practices, use of biofertilizers for enhancing soil health, soil sample collection, raising of horticultural crops and crop protection etc. Kisan Sangoshthi was organised on the topic soil health cards and its uses in agricultural input management. Agricultural inputs (seed, fertilizers, biofertilizers, sprayers) were also distributed through training/ training-cum-workshop in tribal areas to improve their livelihood.
7	**Assessment of nutrient (N & P) use efficiency in wheat genotypes for improved crop productivity**
	A study was conducted to evaluate the nutrient use efficiency in 121 wheat genotypes in vertisols. The diverse wheat germplasm were screened under recommended dose of fertilizers and 50% of the recommended levels of N and P. Agro-morphological, physiological and biochemical traits were recorded in the germplasm. Leaf area, chlorophyll content and relative water content of the wheat plants varied with different fertilizer doses. Higher leaf area and RWC% was recorded with plants treated with 100%NPK and 50%P& 100%NK at 30 DAS. Variation in the total chlorophyll content in the wheat varieties were also recorded. The grain yield and yield related and NUE traits were being analysed.
8	**Network Project on Organic Farming**
	• Soybean performed better under all the cropping systems (100 % organic was better than 75 % organic + innovative). Among the copping systems soybean-wheat /chickpea performed better than soybean-mustard/linseed cropping system. System productivity was found to be higher in Soybean – chickpea cropping system. • Higher yields of all rabi season crops were found with 100% organic and 75 % organic + 25 % inorganic dose of nutrients which were statistically at par with each other. • The highest SOC, available NPK, soil enzyme activity like DHA, FDA hydrolysis and alkaline phosphatase were recorded in 100% organic and 75%org+25% inorganic/innovative management. • Maize grain yield was significantly influenced by non-chemical weed management practices. Incorporation of cotton seed cake + one hand weeding was recorded significantly highest grain yield (4313 kg ha^{-1}) followed by intercropping with cowpea treatment, two hand weeding at 25 and 50 DAS, one mechanical weeding at 25 DAS + one hand weeding at 50 DAS as compared to control. • Total factor productivity reveals efficiency with which the factors inputs are converted into output within production processes. TFP is calculated (kg grain per kg NPK and kg grain per kg manure). The highest TPF was recorded under 100% organic treatment followed by 75% organic + inorganic, 75% organic + innovative, 100% inorganic and least in state recommendation treatment. The TFP index were noticed in different crops in the order of Chickpea > Wheat > Mustard >Linseed > Soybean. Whereas, the total factor productivity (kg grain per kg manure) was highest in 100% inorganic treatment as compared to 100% organic treatment. • The energy input and out- put, energy use efficiency and energy productivity of different crops (soybean, wheat, mustard, chickpea and linseed) were calculated. The highest energy use efficiency and energy productivity were recorded under the application of 100 % organic treatment followed by 75%organic + innovative, 75 % organic + 25% inorganic as compared to 50% organic + 50 % inorganicand 100 % inorganic. Among the different crops wheat recorded the highest energy use efficiency. • Nutritional quality constituents such as protein, ash and tryptophan content were determined in grains of different varieties of maize. Protein, ash and tryptophan

	content in maize grain influenced significantly among various varieties of maize. The higher values of protein and tryptophan were recorded in Proagro-4212 variety.
9	**Ensuring food security, sustainability and soil health through resource conservation based farmer FIRST approach in central India**
	Conservation agriculture based 70 demonstrations were conducted during Kharif season 2019-20 (60 Soybean and 10 Rice). Soybean productivity ranged between 15.60 to 17.45 q/ha in different villages with an average of 16.47 q/ha. Similarly Rice crop also recorded seed yield varied between 38.35 to 40.22 q/ha with an average of 39.43 q/ha under farmers field condition in the selected villages. Conservation agriculture based low cost, energy saving sustainable management for improving crop productivity and improving soil health based 72 demonstrations were conducted during *rabi* season 2019-20 (52 Wheat and 20 Gram) under farmers field condition in the selected villages.
10	**Development of an automated soil nutrient sensing system funded by NASF**
	To automate the whole process of soil testing starting from sample collection to analysis, an auto soil sampler fixed with tractor has been developed in collaboration with ICAR-CIAE. This can automatically collect the soil samples through tractor thus reducing the time for soil sample collection. For developing methodology of quick analysis, the soil samples from vertisols, Bhopal and inceptisols, Chandigarh were collected and analysed for fertility parameters using standard lab procedures and ion selective field effect transistors (ISFET). The good calibration curves for the estimation of nitrate, phosphate and potassium ions have been successfully prepared. The use of ISFET is expected to simplify and expedite the process of soil analysis
11	**Assessing the impact of imbalanced use of chemical fertilizer on soil health using a soil function based quantitative approach funded by DST, New Delhi**
	In intensive agriculture areas, effect of high quantity of fertilizer use on soil and water quality has been debated at both scientific and at policy levels. A study thus was taken up collecting georeferenced soil and water samples from Udham Singh Nagar district of Uttarakhand at 10×10 km grids. Consumption of chemical fertilizers in the study district was at 545 kg per hectare with rice-wheat and sugarcane-wheat as the major cropping systems. Soil samples from 0-15 and 15-30 cm depths were analyzed for key parameters including pH, EC, soil organic carbon, available N, P, K and S, labile carbon and activity of key soil enzymes. Ground water samples were analyzed for NO_3-N content. The content of SOC varied from 0.20 to 1.44% in the surface layer (0-15 cm depth) with about 44% of samples was found in the medium range. However, 79% samples were found low in available N content (<250 kg ha^{-1}). On the other hand, all the samples were rated high in available P content (>25 kg ha^{-1}). About 60% samples were deficient in available S content. The activity of soil enzymes was satisfactory, with about 69% samples showed dehydrogenase activity in the range of 100-200 µg TPF/24 hr. The nitrate-N content in the analyzed water samples varied from 5 to 25 mg L^1 with about 66% water samples containing more than the permissible limit of 10 mg L^{-1} of NO_3-N. Results indicate water quality is more affected than soil quality parameters because of high fertilization in the studied district
12	**Assessing greenhouse gas emission and soil carbon storage with reversal in tillage practice**
	After three growing periods of converting 8 years long experiment under conservation tillage in soybean-wheat system, the results revealed that the NT system had the highest SOC content in the surface 0-5 cm layer only. The relative increase in SOC concentration for 5-15 cm soil depth was observed with reversal of no tillage (NT) and reduced tillage (RT) to conventional tillage (CT); this could be attributed to increased decomposition and mineralization of incorporated crop residue in NT-CT and RT-CT treatments. The soil nutrient content (N and P) was not significantly affected by interactive effect of tillage and fertilizer on surface soil layer (0-5 cm). Interactive effect of tillage and fertilizer was found significant on available P content at 5-15 cm soil depth. In contrast to N, soil available P relatively increased with reversal of tillage in NT and RT. In comparing the tillage systems, tillage reversal (NT-CT, RT-CT) and RT had significantly higher available potassium than NT in 0-5 and 5-15 cm soil layers.
13	**Climate change impact on water productivity of major crops in central India**
	• The DSSAT crop models were satisfactorily calibrated and validated for three soybean cultivar viz. JS-335, JS-9560 and JS-9752 and one wheat cultivar-sujata. • A multi-location and multiyear validation Apsim model was done chickpea cultivar JG-11, maize cultivar –Kanchan and wheat cultivar sujata and Annapurna. • Model simulated Maize and wheat water productivity varies from 0.6 to 1.9 kg/m3 and 0.6 to 1.2 kg/m3, respectively over the Madhya Pradesh state.
14	**Impacts of conservation agriculture on runoff and soil loss under different cropping system in Vertisols**
	The project was started with twin objectives i.e determination of run off and soil loss and its effect on soil properties and productivity. The experiment site was prepared as per study requirements during the kharif season 2019. During rabi 2019 wheat and chickpea were sown as per work plan. Growth parameters as well yield of wheat and chick pea was recorded with non significant difference in their respective cropping systems. Initial soil parameters such as bulk density, pH, E.C. P and K content was done. Rest analysis is going on.
15	**Development and promotion of CA machinery (Inter-Institutional project with ICAR-CIAE, Bhopal**
	New Project

16	**Assessment of important soil properties of India using mid-infrared spectroscopy**
	• Soil spectral library in the Mid-infrared region of more than 450 soil samples were developed for Inceptisols from the Indo-gangetic plains and determined the particle size distribution, soil water retention at field capacity (FC) and permanent wilting point (PWP) • Different chemometric prediction models for estimation of soil physical properties like, particle size distribution, soil water retention at field capacity & permanent wilting point and available water capacity were developed for Inceptisols and the models were validated with independent dataset. • Validation of the model showed that the predictability of soil properties varied among the different soil types and properties tested. • Attempts were made to identify the spectral zones significantly contributing the prediction of clay, sand, SOC and pH of soils
17	**CRP-Conservation Agriculture**
	The experiment on soybean and wheat were conducted with different tillage system and different nutrient doses in soybean and wheat with different tillages, different nutrient doses with different irrigation methods during 2018-2019. Based on data of soybean and wheat crops, it can be concluded that the conservation tillage system can save energy in respect of fuel charge and about 25 % fertilizer can be saved with adoption of conservation tillage system.
18	**Cropping systems and soil management effects on soil organic carbon sequestration and greenhouse gas emission in Vertisols of central India under change climate scenarios funded by NICRA II-Phase**
19	**Hyper-spectral remote sensing approaches to evaluate soil quality and crop productivity of central India (under DST sponsored Network Project on Hyper-spectral Big Data Analytics)**
	• Development of software called SQICAL for rapid calculation of soil quality index. • The surface map of soil physicochemical properties including pH, EC, SOC, Av-P, Av-K, sand, silt, clay, FC water content, PWP water content and MWD and the micronutrients were generated using ordinary kriging. • Spectral based soil health assessment is being done.
20	**Strategies for enhancing yield of soybean (Glycine Max L) and pigeonpea (Cajanus cajan, L) in India using climate variability information and crop growth simulation models in collaboration with ICAR-IISR, Indore**
	• Multilocational validation of two pigeon pea cultivar. For the TJT-501 cultivar, the value of R2, RMSE and MF were 0.70, 0.12 and 0.66, respectively. For ICPL-87119, the value of R2, RMSE and MF were 0.68, 0.25 and 0.65, respectively. • The primary, secondary and tertiary production zones for pigeon pea crops was identified based on area of cultivation in different district of India. • The yield gap of pigeon pea in primary, secondary and tertiary production zone were estimated. Yield gap in primary, secondary and tertiary production zones are 1594, 1539, and 1769 kg ha-1, respectively. • In primary production zone, pigeon pea yield was significantly and negatively correlated with average maximum temperature ($R2= 0.51$, $p <0.01$). The pigeon pea yield was also negatively correlated with average minimum temperature ($R2= 0.10$, $p<0.05$) and average temperature ($R2 =0.39$, $p <0.01$), respectively. However, positive and significant relation was observed with the seasonal rainfall ($R2= 0.25$, $p <0.01$) • In the secondary production zone, the R2 between the pigeon pea yield and maximum average temperature, minimum average temperature are 0.40** ($p<0.01$), 0.12 ($p<0.05$) and 0.32** ($p< 0.01$), respectively. However, long term pigeon pea yield was positively and significantly correlated ($R2=0.19$*, $p<0.05$) with seasonal rainfall distribution. • In tertiary production zones, The R2 between the pigeon pea yield and maximum average temperature, minimum average temperature are 0.44** ($p<0.01$), 0.02 (ns) and 0.31** ($p< 0.01$), respectively. However, long term pigeon pea yield was positively and significantly correlated ($R2=0.30$*, $p<0.05$) with seasonal rainfall distribution.
21	**Sustainable adaptive water management resilient to variable climates in Madhya Pradesh funded by ICARDA**
	• Validation of APSIM model for validation of soybean, maize, wheat, chickpea and pigeon pea crops has been completed from different ongoing and completed experimentsand alsofrom multi-locational and multiyear cultivar data were collected from AICRP-pigeonpea. • APSIM model has been calibrated for soil water balance • Scenarios analysis for different water management strategies to improve water use efficiency and development of DSS under progress.
22	**Vulnerability and impact assessment of climate change on soil and crop production in Madhya Pradesh funding Agency: UNDP-GEF-MoEFCC**
	The overall climate vulnerability of the Madhya Pradesh districts is projected to increase towards mid-and end-century as compared to the current conditions for both

	emission scenarios of RCP 4.5 and RCP 8.5. Districts vulnerability under RCP8.5 scenario is projected to be higher as compared to RCP 4.5 scenario. The projected increase in vulnerability towards end-century is higher than that of mid-century for RCP 8.5 scenario while the projected increase in vulnerability towards end-century is relatively lower than that of mid-century for RCP 4.5 scenario. Factors contributing to projected increase in climate vulnerability of districts include projected increase in rainfall variability and higher sensitivity to heat stress. The overall agriculture vulnerability of the Madhya Pradesh districts is projected to decrease towards mid-and end-century as compared to the current conditions for both emission scenarios of RCP4.5 and RCP8.5. Districts vulnerability under RCP8.5 scenario is projected to be lower as compared to RCP4.5 scenario.
23	**Assessing the potential impact of climate smart technologies on soil health and nutrient accounting in selected vulnerable districts of MP funded by EPCO, Bhopal**
	• Project sanctioned in July 2018 • SRF appointed • Instruments purchased • Grid based (1 X 1 Km) soil and plant samples collected from 20 climate smart villages in vulnerable districts of Sehore and Rajgarh. • Recorded basic site characteristics, land use, cropping history, quantity and types of fertilizer and manure use, etc • The soil samples were processed and stored in containers for further analysis The analysis of soil samples for different physico-chemical and biological properties using standard method is in progress
24	**Assessing the potential impact of climate change and management on soil carbon and nitrogen storage in selected ecosystems of India funded by NASF**
	Lead Centre (ICAR-IISS): • SRFs appointed. • Project launching workshop organized and held from 25th to 27th Oct., 2018 to finalize the experimentation and methodology, trained the SRFs of both centres to follow a common and uniform protocol. • Participated in the 5th Annual Review Meeting of the project under NASF on 30th January, 2019 at NASC Complex, PUSA, New Delhi. • Procured the instruments BOD incubator (2 no.), FTIR (1 no.) and Gas Chromatograph (1 no.). • The soil samples collected from 0-15, 15-30, 30-60 and 60-90 cm soil depths from three long-term experiments in soybean based cropping systems from different agro-ecosystems of Vertisol viz, Bhopal, Jabalpur, Indore. • Soil samples were processed and incubation experiment set up Characterization basic/initial soil properties was done following standard methods
25	**Effects of long term use of fertilizer and manure on soil functional diversity and nutrient supplying capacity under different soils and cropping systems (inter-institute collaborative project with ICAR-IISR, Indore)**
	• Microbial autotrophy in soil has been reported to contribute about 4% of the total CO2 fixed by terrestrial ecosystems each year. It involves RuBisCO enzyme activity, which controls the first rate limiting step of Calvin-Benson-Bassham cycle. Thus, RuBisCO enzyme activity has been attempted to find out the status of microbial autotrophic contribution in soil C fixation. Increasing trend of RuBisCO enzyme activity and autotrophic C-fixation potential was noticed in 100% NPK +FYM in LTFE Palmpur and LTFE Barrackpore, but not in LTFE Parbhani. • Continuous balanced fertilization and INM resulted in enrichment of Exch-K and NonExch-K in LTFE Barrackpore where Microbial biomass K is well correlated to Exch-K, NonExch-K and WSK. No application of K fertilizer for long time reduced NonExch-K storage and increased Exch-K in 100% N treatment in LTFE Palampur. Highest WSK is found in INM treatment. No correlation of MBK with other farctions. Similarly, No application of K fertilizer for long time reduced NonExch-K storage and increased Exch-K in 100% N treatment in LTFE Parbhani. Highest WSK is found in INM treatment. Microbial biomass K is well correlated to WSK only and highest under INM treatment. • Soil microbial community showed preference to supply P from organic source through mineralization as compared to inorganic source through solubilisation. The P supply power has been found in the following order Inositol>TCP>AL-P> Fe-P in all the LTFE centres. • Enumeration of enzyme stoichiometry has been reflected that significantly higher C limitation on soil microbial community under imbalanced fertilizer application based on vector length calculation and higher P limitation as compared to N under imbalanced fertilizer application based on vector angle calculation. • In case of nitrification activity, it is well perceived the major contributor of soil nitrification was from autotrophic nitrification activity (ANA), however in the present study it has been noticed that heterotrophic nitrification activity (HNA) also had significant contribution. ANA contributed 55.0 – 80 % of total NA in

	different treatments whereas; HNA contributed 19.6 – 49.6 % of total NA. The INM treatment (100% NPK+FYM) had significantly higher NA as compared to control, 100 % N and 100% NP treatment. ANA ranged from 0.49-0.87 µg g-1 soil day-1 whereas the HNA ranged from 0.14-0.59 µg g-1 soil day-1. The highest HNA was found in 100% NPK+FYM and fallow treatment.
26	**Enhancing decomposition rate and quality of bio-waste through microbial consortia for improving soil health funded by NASF**
	• Bio-wastes have been collected from vegetable market, horticultural based farm waste, agrobased inductrial waste and from domestic waste. • The chemical composition of these waste have been analysed for C/N ratio, Lignin/cellulose ratio, CEC/TOC ratio, water soluble carbon and carbohydrates. • For rapid decomposition of organics, six fungi, eight thermophilic bacteria possessing cellulose and lignin degradation ability were isolated which could thrive and work at 50-60ºC temperature, from city waste, and fresh cowdung. Using these isolates, bio-waste like city waste (Kitchen waste), vegetable waste, horticultural waste and farm waste were subjected for decomposition and maturity and stability indices were assessed. The loss rate kinetics study revealed that the increased loss rate (*K*) of about 1.36 to 2- fold greater in kitchen, vegetable and horticultural waste compost than crop residue compost. Further the potential loss percentage was maximum (95.68%) in vegetable waste compost. • Maturity parameters such as C/N ratio,L/C ratio, CEC/TOC ratio and degree of polymerisation reached much earlier in vegetable waste compost (20 days) followed by kitchen waste (25 days), horticultural waste compost (35 days) and farm waste compost (45 days). Point sources of segregation of domestic waste (Kitchen waste), vegetable waste substantially reduce the content of heavy metals and improve the quality of compost. • Thermophilic microbes enhance the decomposition process at 50- to 60 0C. Microbial community has been studied at different stages of decomposition and it was found that thermophilic bacterial community increased with increase the temperature.
27	**Eco-genomics of soil microbes involved in global climate mitigation and nitrogen use efficiency in rice-wheat agroecosystem of central India under elevated CO2 and temperature" funded by DST**
	• Effect of Elevated CO2 on soil processes - Study defined how elevated CO2 influenced CH4 consumption and nitrification. • A process of methane (CH_4) fertilization in soil to enhance soil biological function - Soil consumes about 600 Tg of CH_4 per year. However, it is not clearly understood, how such high methane consuming potential of soil influences soil processes those are key for soil function.Experiments carried out to define linkage between methane consumption potential andkey soil microbial processes.A positive correlation found between CH_4 consumption rate and soil microbial processes including terminal electron accepting process (TEAPs). Methane feedback increased denitrification, iron reduction, and sulfate reduction. Methane feedback cycle influenced composition of the methanotrophs community and also microbial community regulating other soil processes. Technology suggests that a source of CH_4 including atmospheric CH_4 can be used as an input to soil. This can substantially enhance soil microbial processes.
28	**Evaluation of Soybean-rhizobia interaction under elevated CO2 and temperature to develop climate ready microbial inoculants for central India funded by AMAAS**
	• Elevated CO2 influences soybean yield and nodule microbial community – Elevated CO2 inhibited soybean yield by affecting nodule numbers. Microbial community of nodule altered under elevated CO2. Bacillus and archaea dominated under elevated CO2. • Differential role of bacteria and archaea in nitrification – Archaea are known to have functional traits in extreme environment. However, the role of archaea in nitrification in not known. Experiments conducted by exploring archaeal population in soil undergoing redox process. Result revealed that ammonia oxidizing bacteria are active in aerobic soil but ammonia oxidizing archaea carry out nitrification under flooded soil ecosystem. Both archaea and bacteria vary in their role towards nitrification. To reveal the differential effect sulfadizine was added to block AOB. Archaea contributes equally to the nitrification in soil. This process is useful to develop new nitrification inhibitors targeting archaea.
29	**Exploring soil microbial community and mechanism in soil carbon sequestration under long term land uses in semi-arid sub-humid Central India funded by SERB, DST, New Delhi**
	• Specific enzyme activity of phenol oxidase in terms of unit of total organic carbon (TOC) had reflected carbon sequestration potential in integrated nutrient management treatment (100% NPK + FYM) as compared to imbalanced fertilizer application (100% N, 100% NP) in LTFE Raipur. Similarly, specific enzyme activity of phenol oxidase indicated that the horticulture and grassland system has potential of more carbon sequestration in upper soil depth whereas agro-forestry and Palash based black forest soil has higher carbon sequestration potential in lower depth. These findings are well corroborated with the TOC content where the highest TOC content was noticed in 100% NPK + FYM treatment (9.35 g kg-1) which was significantly higher than 100% N (6.54 g kg-1), 100% NP (7.81 g kg-1) and 100% NPK (7.95 g kg-1) treatment. • Specific activity of Glucosidase and Galactosidase which indicate labile carbon cycling/ Oligomer degrading activities are found to be significantly lower in

	integrated management and balanced fertilizer application treatment as compared to imbalanced fertilizer application in LTFE Raipur soil (Vertisol). Among other land use system, agroforestry system has the highest Specific activity of Galactosidase activity and grassland soil has the lowest activity. However, specific activity of β-glucosaminidase activity was found to be highest in forest soil. • Microbial autotrophy in soil has been reported to contribute about 4% of the total CO2 fixed by terrestrial ecosystems each year. It involves RuBisCO enzyme activity, which controls the first rate limiting step of Calvin-Benson-Bassham cycle. Thus, RuBisCO enzyme activity has been attempted to find out the status of microbial autotrophic contribution in soil C fixation. RuBisCO enzyme activity analysis revealed that grassland system maintained for long term under different management (anthropogenically managed) had higher RuBisCO activity at both soil depths (0-15 and 15-30 cm) than natural grassland system. Comparison among these two land use systems reflected that grassland system had more potential for microbial autotrophic fixation of atmospheric CO_2 as compared to natural forest system in semi-arid to sub-humid central India.
30	**Assessment of acid mine drainage affected areas in Madhya Pradesh**
	• Visited two coal mine (Singrauli and Amlai, M.P.) and one metal (copper) mine (Mlanjkhand, M.P.) areas.For primary investigation, collected information from NCL (Northern Coalfields Ltd.), SECL (South Eastern Coalfield Ltd.) and HCL (Hindustan Copper Ltd.) office of these mine areas. Collected soil and water samples from the mines and adjacent areas and also took in-situ measurement of water quality parameter. • Singrauli coal mine area water medium to strongly alkaline in nature, oxidation reduction potential 75-250 mV, dissolved oxygen ≤ 4 mg/L and electrical conductivity 400-4500 µS/cm. Singrauli coal mine area soil strong to slightly acidic in nature based on pH dependent acidity, total acidity, exchangeable acidity and electrical conductivity ranges between 350-824µS/cm. • Amlai coal mine area water medium to very strongly alkaline in nature, oxidation reduction potential 150-300 mV, dissolved oxygen ≥ 4.5 mg/L and electrical conductivity 100-4000 µS/cm. Amlai coal mine area soil very strong to slightly acidic in nature based on pH dependent acidity, total and exchangeable; and EC varies from 105-210 µS/cm. • Malanjkhand copper mine water extremely to slightly acidic and water in nearby villages acidic to slightly alkaline in nature, oxidation reduction potential 150-480 mV, dissolved oxygen ≤ 5.8 mg/L and electrical conductivity 250-4250 µS/cm. Malanjkhand copper mine area soil extremely to slightly acidic in nature based on pH dependent acidity, total acidity and exchangeable acidity; and EC ranges between 176-802µS/cm.
31	**Reclamation and rehabilitation of coper mining affected land in Malanjkhand area of Madhya Pradesh (Hindustan Copper Limited)**
	• Analysis of soil, water, plant are underway. • Physiological parameters have been completed. • Vetiver plantation has been established in 35ha. • Microbial observations are underway.
32	**Management of Municipal Solid Waste (MSW) contaminated landfill area of Bhanpur, Bhopal funded by BMC, Bhopal**
	• Analysis of soil, water, plant are underway. • Physiological parameters have been completed. • Green cover has been established.Microbial observations are underway.
33	**Reclamation and management of Municipal Solid Waste contaminated dumping area of Bhanpur, Bhopal funded by MPCST, Bhopal**
	• Analysis of soil, water, plant are underway. • Physiological parameters have been completed. • Green cover has been established. • Microbial observations are underway.
34	**Exploring endophytic fungi for the phytoremediation of heavy metal contaminated soils funded by DST**
	• Isolation of endophytic fungi from the root of vetiver grass • The isolated fungi were tested for heavy metal tolerance
35	**Impact of viscose staple fibre industry treated effluent on soil health and crop production surroundings Nagda, M.P funded by M/s Grasim Industries Limited, Nagda, Ujjain, M.P.**
	• Survey and collection of soil water samples: Soil and effluent samples were collected from different sites surroundings Nagda town. Soil samples in particular collected from adjoining effluent irrigated fields as well as tube-well irrigated fields. Physico-chemical properties of the effluent and bore-well water were

	estimated including heavy metals by different standard methods. The results revealed that electrical conductivity in soil (recorded maximum 5.75 dS/m) was the critical problem for crop cultivation. As the E.C in irrigation water was also recorded high (7.28 dS/m), more number of irrigation will convert the land barren after few years. Heavy metal (cadmium, nickel, cobalt, lead, chromium etc.) content was not so high in water samples. The colour of bore well and river water was red. • Green House Experiment: Bulk soil samples from different sites were collected for green house study. Pot culture study was conducted to identify suitable crops along with management practices using the treated effluent. • Field Experiments: Parallel to laboratory experiments, field experiments with different doses of FYM (0, 5, 10, 20 t/ha) were conducted at Atlawda, Nenawatkheda, Banbana, BCI Farm and Bheelsuda. Soybean (*Glycine max)* was taken as a test crop. In case of BCI Farm, due to bird and cattle menace crop was not grown. Green manuring through Dhaincha and Sunhemp was practiced in BCI Farm. It was found that the highest yield was recorded in Banbana Farm (Normal Soil). Due to salinity effect poor yield was recorded at Atlawda and particularly in Nenawatkheda village and soybean seeds were shrunken and small in size whereas soybean seed in normal soil was bold in size.
36	**Evaluation of effect of Zeba fertilizer product on nitrate-N leaching funded by M/s UPL Limited, UPL House, 610Bl2, Bandra Village, Off Western Express Highway, Bandra-East, Mumbai- 400 051**
	An incubation column experiment with Zeba coated fertilizer on N leaching was carried out in red and alluvial soil. Two different application methods *viz*, surface application and incorporation was studied with simulated rainfall and saturated condition. The arrangement of N leached from the soil was being analyzed in the Zeba fertilizer in caparison with normal neem coated urea.
37	**Deciphering thermophiles from hot springs of Central India for rapid decomposition of crop residues**
	New Project
38	**Exploring endophytic microbial diversity of selected major field crops of India for nutrient supplementation and biocontrol**
	New Project
39	**Assessment/quantification of soil heavy metals using spectroscopy and multi spectral remote data from industrial areas of Kanpur**
	New Project
40	**Impact of climate change on soil physical process in maize based cropping systems in vertisols of central India**
	New Project
41	**Soil moisture estimation through remote sensing for agriculture drought monitoring and early warning**
	New Project
42	**Evaluation of deficit irrigation levels and phosphorus nutrition levels for optimizing water productivity rooting behaviour and yield of wheat in semiarid climate of central India**
	New Project
43	**Development of agri-horticultural system for central India under Vertisols, its impact on soil health and improvement in productivity and quality of fruits**
	New Project
44	**Allevation of heavy metal stress in crops using silicon as amendment in metal polluted soil**
	New Project
45	**Municipal solid waste compost quality assessment for sustainable crop production and environmental protection**
	New Project
46	**Use of fly ash in agriculture for sustainable crop protection and environmental protection funded by NTPC, Noida**
	A field experiment was conducted at IISS farm to investigate the impact of fly ash application on soybean and wheat productivity. Contents of plant nutrients P, K, Zn as well as heavy metals in the fly ash were low. Growth and yield of soybean was unaffected by fly ash application. Grain yield of wheat increased up to 40 t-ha. Also, growth and yield of both soybean and wheat were not affected by fly ash even highest application rate.
47	**Studying of climate change impact on nitrogen dynamics and water use in two contrasting cropping system of Central India**
	New Project
48	**Methanogenic bio-electrode driven conversion of CO_2 to CH_4 to enhance methanogenesis and mitigation of greenhouse gas from agro-waste based bioenergy systems" for funding from DST-JSPS programme**

	New Project
49	**Long-term monitoring of soil processing in forests and grasslands**
	New Project

****