

SUMMARY



The Niche Area of Excellence Programme on **“Sustainable Soil, Water and Plant Nutrient Management for Rainfed Cropping System”** was initiated at the Birsa Agricultural University, Ranchi in 2007 with the following objectives:

- To support and strengthen post-graduate research on the subject.
- To develop & disseminate knowledge on optimal utilization of natural resources.
- Creation of awareness among the stake holders on the efficient management of agricultural inputs.
- Nutrient and water balance studies for dominant cropping systems in rainfed areas.

The Technical programme was discussed each year and reviewed. Based on suggestions and comments of Education Division of ICAR, New Delhi, changes were made for improvement and meeting the objectives.

The present report is a compilation of work done during 2007 to 2012 on soil, water and plant nutrient management issues confronting Indian Agriculture, in general and Jharkhand Agriculture, in particular. Major issues addressed were:

- GIS based district and block level soil nutrient mapping.
- Soil quality, crop productivity & sustainability of important rainfed cropping systems.
- Temporal and axial variability of nutrients in Litchi leaves.
- Water quality & water balance studies.
- Site specific nutrient management studies in Maize-Wheat System.

The outcome of the Niche Area Excellence Programme has been very encouraging in enhancement of knowledge in five major areas:

- ✓ Development of GIS based soil nutrient maps for district & block level for promoting balanced nutrient use, use of soil amendments and input supply management in the State as per location specific needs.
- ✓ Knowledge enhancement of soil testing staff & extension functionaries on Integrated Plant Nutrient Management in rainfed areas.
- ✓ Providing insight on soil & water quality related to crop productivity and sustainability.
- ✓ Plant nutrient balance in cropped & fertilized soil in rainfed areas.
- ✓ Site specific nutrient management promoting for bringing a synergy between crop requirement & plant nutrient use.



With ICAR support, excellent laboratory & instrumentation facilities have been developed, which will help the Post-graduate students in their curricular research for several years. Capacity building programmes, collaborations with State, national and international agencies have helped immensely in fostering an integrated approach in soil & water management. Socio-economic benefits to farmers by ensuring quality soil testing service across the state and supply of microbial inoculants have been acknowledged by the State Department of Agriculture as a major breakthrough.

But, lot needs to be done to promote further the cause of natural resources management. The problem of soil degradation, soil acidity, poor soil organic matter, secondary & micronutrient deficiencies, inadequate and unreliable irrigation systems need a closer look by promoting the local resources, local needs and location specific technologies, participation of local people and awareness creation.

1.0 : NAME OF THE UNIVERSITY :

Faculty of Agriculture
Birsa Agricultural University
Ranchi - 834006 (Jharkhand)

2.0 : NAME OF THE NICHE AREA :

Sustainable Soil, Water and Plant Nutrient Management for Rainfed Cropping System (ICAR Sanction No. F10 (10)/2006 EP & D dated 18.9.06)

3.0 : YEAR OF START : 2007

3.1 : PERIOD OF REPORT : 2007 - 2012

4.0 : NAME OF PI :

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5.0 : GOAL :

Addressing soil and water management issues in rainfed areas for sustainable and profitable agriculture.



6.0 : OBJECTIVE AND INVESTIGATORS :

OBJECTIVES

- To support and strengthen post-graduate research on the subject.
- To develop & disseminate knowledge on optimal utilization of natural resources.
- Creation of awareness among the stake holders on the efficient management of agricultural inputs.
- Nutrient and water balance studies for dominant cropping systems in rainfed areas.

INVESTIGATORS

- Dr. R. P. Singh (Soil Science)
- Dr. B. K. Agarwal (Soil Science)
- Dr. Rakesh Kumar (Soil Science)
- Dr. P. Mahapatra (Soil Science)
- Dr. Arvind Kumar (Soil Science)
- Dr. S. Kumar, HARP (ICAR)
- Dr. M. S. Yadav (Agronomy)
- Dr. A. K. Jha (Soil Science, KVK)
- Dr. Devkant Prasad (Agronomy, KVK)
- Dr. Pragya Kumari (Agril. Physics)

7.0 : FUNDS RELEASED BY ICAR AND ITS UTILIZATION :

Rs. in lakh

| S.N. | Year | Grants released by ICAR | Grant Utilized | Balance |
|------|---------|-------------------------|----------------|---------|
| 1. | 2006-07 | 74.36 | 74.39 | -0.03 |
| 2. | 2007-08 | 55.00 | 54.39 | +0.61 |
| 3. | 2008-09 | 44.42 | 44.98 | -0.56 |
| 4. | 2009-10 | 45.00 | 44.98 | +0.02 |
| 5. | 2010-11 | 60.00 | 59.91 | +0.09 |
| 6. | 2011-12 | 34.93 | 34.93 | NIL |



8.0 : APPROVED TECHNICAL PROGRAMME AND ACHIEVEMENTS :

- Assessment and mapping of some important soil parameters including Macro and Micronutrients for State.
- Soil quality, crop productivity and sustainability of some important rainfed cropping systems.
- Temporal and axial variability of nutrients in Litchi leaves.
- Water quality and water balance studies.
- Site specific nutrient management studies in Maize-Wheat System.

9.0 : ACTIVITY MILESTONES

| Sl. No. | Milestone | % Achievement |
|---------|---|---------------|
| 1. | Assessment and mapping of soil parameters at district level | 100 |
| 2. | Block level soil nutrient mapping | 20 |
| 3. | Soil quality studies | 80 |
| 4. | Leaf nutrient analysis in fruit trees | 50 |
| 5. | Water quality and water balance studies | 80 |
| 6. | SSNM studies | 70 |

10.0 : MONITORABLE TARGETS & ACHIEVEMENTS

| Sl. No. | Milestone | % Achievement |
|---------|--|---------------|
| 1. | Programme Planning, Implementation & Coordination | 90 |
| 2. | Collaborations & Linkages | 80 |
| 3. | Strengthening curricular research on the subject | 70 |
| 4. | Data base generation | 70 |
| 5. | Technologies developed | 60 |
| 6. | Quality of Research/Training & Capacity building | 70 |
| 7. | Socio-economic benefits | 70 |
| 8. | Infrastructure and Instrumental facilities created | 90 |



11.0 : MAJOR EQUIPMENT/FACILITIES CREATED

11.1 LABORATORIES

- ✓ UG & PG laboratory renovated
- ✓ Plant clinic and Leaf tissue analysis laboratory strengthened.
- ✓ Strengthened soil testing laboratory
- ✓ Strengthened Biofertilizer Production Unit for Mass production.
- ✓ Facilities for curricular research improved
- ✓ New Soil Testing Laboratories established at Garhwa, Chatra, Godda & Pakur districts.

11.2 INSTRUMENTAL FACILITIES

| S. N. | Equipment | Cost (Rs. in lakhs) | Firm | Year of procure-ment |
|-------|--|---------------------|---|----------------------|
| 1. | Pressure Plate Apparatus | 13.00 | Soil Moisture Equipment Corp. USA | 2006-07 |
| 2. | Ion analyzer with Ion selective electrodes | 1.50 | pH Products Co., Hyderabad & Elico, Hyderabad | 2006-07 |
| 3. | Nitrogen Analyser (Kelplus) | 6.20 | Pelican Equipments, Chennai | 2006-07 |
| 4. | Digital pH meter | 0.23 | Elico Ltd., Hyderabad | 2006-07 |
| 5. | NIR Grain Analyzer (Zeltex Inc. USA) | 7.15 | Tara International, Mumbai | 2006-07 |
| 6. | Delta-T Image Analyser | 7.32 | Concord International, Chennai | 2007-08 |
| 7. | CCM 200 Chlorophyll Content Meter | 1.48 | ADC Bio Scientific Ltd., Furlong Way, England | 2007-08 |
| 8. | Digital pH meter with printer | 0.20 | M/S Elico, Ahmedabad | 2008-09 |
| 9. | Automatic Scanning Visible Spectrophotometer | 0.50 | M/S Elico, Ahmedabad | 2008-09 |
| 10. | Microprocessor based water quality analyzer | 0.50 | M/S Elico, Ahmedabad | 2008-09 |
| 11. | Microprocessor based Flame Photometer | 0.45 | M/S Elico, Ahmedabad | 2008-09 |
| 12. | Digital Conductivity meter | 0.12 | M/S Elico, Ahmedabad | 2008-09 |
| 13. | Arsenic Testing Kits (2) | 0.50 | MERCK | 2008-09 |
| 14. | 5 KVA silent generator | 1.90 | | 2009-10 |
| 15. | 5 KVA on-line UPS | 1.50 | | 2009-10 |
| 16. | Inductivity coupled Spectrometer* (ICP) Model-Quantima | 81250 US\$ | GBC Scientific Equipment, Australia | 2010-11 |
| 17. | Microwave Digestion System (Start D) | 21000 EURO | Milestone, Italy | 2010-11 |

*Funds made available by State Govt. under RKVY



12.0 : BUDGETARY REQUIREMENT FOR XIIITH PLAN (If approved)

| Sl. No. | Particulars | Amount (Rs. in lakh) |
|---------|-------------------------|-------------------------|
| 1. | Contractual Service | 50.00 |
| 2. | Equipment & Accessories | 25.00 |
| 3. | Contigencies | 50.0 |
| | Total (for five years) | 125.00 |

13.0 : ACHIEVEMENTS

Innovation/Product/Technology

- ✓ GIS based district level soil fertility maps developed for the State.
- ✓ GIS based block level soil nutrient maps developed for 3 districts – Dumka, Jamtara & Hazaribagh.
- ✓ Plant clinic & Leaf tissue analysis Laboratory developed.
- ✓ Excellent infrastructure & instrumentation facilities developed for curricular research .
- ✓ Research on soil, water and plant nutrient management in rainfed areas strengthened.

Research Programmes completed/in operation

| Sl. No. | Programme | Status |
|---------|---|---------------------|
| 1. | District level soil nutrient maps | Completed |
| 2. | Block level soil nutrient maps | 75% to be completed |
| 3. | Water balance studies | 50% completed |
| 4. | Water quality studies | 80% completed |
| 5. | SSNM studies | 60% completed |
| 6. | Leaf nutrient status/DRIS | 60% completed |
| 7. | Soil quality assessment in cropped & fertilised soils | To continue |
| 8. | Nutrient Expert studies | To continue |
| 9. | Carbon management in soil | To continue |
| 10. | Conservation Agriculture | To continue |