SCIENTIST PROFIL

1. Name & Designation : Dr. Pratap Bhattacharyya
   Senior Scientist
2. Date of Birth : 16th June, 1973
3. Date of joining ICAR : 14th September, 2001
4. Date of joining the present post : 29th June, 2007
5. Qualification (highest degree) : Ph.D (Soil Science and agricultural Chemistry)
6. Post Doctoral Research Experience/Training:
   - Training on GIS introduction and application at NRSA, Hyderabad on 2006 for one month.
   - Training on Soil Conservation measures at CSWCRTI, Dehradun on 2004 for 21 days
   - Training on soils and engineering, in 86th batch on 'Soil conservation & Agro-forestry' at CSWCRTI, Dehradun on 2002 for five and half months.
7. Area of Specialization/research interest:
   - Carbon dynamics in soil-plant system in rice and rice based cropping systems.
   - Resource conservation technologies and conservation agriculture in rice-fallow and rice-rice/ green gram cropping systems.
   - Greenhouse gas (GHG) emission with sophisticated Eddy covariance system and mitigation strategies for rice.
   - Soil organic carbon and nitrogen pools, microbial diversity and GHG emissions under simulated climate change conditions (elevated CO_2 and elevated temperature) in field under open top chambers (OTCs).
   - Phosphorus dynamics in low land flooded rice ecology.
   - Soil loss tolerance limits quantification for sustainable soil and water conservation measures.
8. Significant Contribution including products and patents (Five bullets):
   - Low land tropical rice ecosystem: A net CO_2 sink

     The concept that tropical low land flooded rice ecosystem in Eastern India behave as a net carbon sink was established. The concept which was unique in the sense that it was outcome of the continuous CO_2 and CH_4 flux monitoring through open path eddy covariance system and was experimentally validated for two years in low land rice ecology. It is an important concept by taken into consideration of the total gaseous carbon exchange (CO_2 and CH_4) in respect to the issue that rice is a culprit for GHG emission (particularly for methane).
   - A resource conservation technology (RCT) for soil-nutrient management in low land rice ecology

     Residue incorporation practice was modified by applying rice straw along with urea (in 1:1 nitrogen (N) basis) that could conserve 30 kg N ha^{-1} yr^{-1}, sequester 0.35 t C ha^{-1} $year^{-1}$and reduce 9% GHGs emission with a sustainable yield of 5.57 t ha^{-1} in low land rice ecology. This technique has the potential to save 1800 MJ ha^{-1} yr^{-1} energy based on fertilizer N conversion factor basis. The total soil carbon (C) increased by 29% under rice straw + urea compared to application of urea alone. The technique is also useful to cut down the GHGs emissions.

- Low carbon technology for organically grown, non-basmati aromatic rice under low land submerged soil

  A low C technology for nutrient management by combining rice straw (crop residue retention) with green manuring (*in situ*, *Sesbania aculeata*) (in 1:1 nitrogen (N) basis), that reduces global warming potential (GWP) by 26% and sustained yield for 10 years. The integration of rice straw along with green manure builds up significant amount of carbon (0.12 t C ha^{-1} $year^{-1}$) in soil with reduced gaseous carbon (methane and carbon dioxide) emission.

- Advance technology for greenhouse gas monitoring in rice and rice based cropping systems

  An advanced technology by simulating net ecosystem exchange (NEE) with high frequency chamber measurements of CH_4, N_2O and soil-plant respiration for monitoring the real time GHG emission in rice ecosystems. Site specific NEE of CO_2 through open path eddy covariance (OPEC) system along with high frequency chamber measurements of CH_4 and N_2O and soil respiration by soil respiration chamber in rice and rice based cropping system, real time GHGs monitoring could be done very precisely and accurately.

- Quantitative model for estimating soil loss tolerance limits (SLTL)

  Soil loss tolerance limit is defined as the threshold upper limit of soil erosion that can be allowed without degrading long term productivity of specific soils. In India a default soil loss tolerance limit (SLTL) of 11.2 Mg ha^{-1} yr^{-1} is followed for planning soil conservation activities but it could not be a single value as the soil and topography situation are widely varied in the country. A quantitative model was developed to estimate soil loss tolerant limits to erosion by integrating potential soil indicators such as organic carbon, infiltration rate, bulk density, water stable aggregates and fertility status was developed for suggesting location specific suitable soil conservation measures. The soil loss tolerance limits map was developed for the states of Punjab, Haryana and Himachal Pradesh (14.86 million ha land).

9. Awards/Honours:
   - Best Scientist Award of Central Rice Research Institute, Cuttack, Odisha on April 23rd, 2013.
   - Best Poster Award in 75th Annual Convention of the Indian Society of Soil Science (ISSS 75). Bhopal, India on 14-17th November, 2010.
   - Best Poster Award in the 72nd Annual convention of ISSS. Ranchi on 2-5 November, 2007.

10. Publications (10 best):
    i. **Bhattacharyya P,** Roy KS, Neogi S, Dash PK, Nayak AK, Mohanty S, Baig MJ, Sarkar RK and Rao KS (2013). Impact of elevated CO_2 and temperature on soil C and N dynamics in relation to CH_4 and N_2O emissions from tropical flooded rice (*Oryza sativa* L.). **Science of the Total Environment** 461-462C: 601-611 (DOI: 10.1016/j.scitotenv.2013.05.035).

    ii. **Bhattacharyya P**, Roy KS, Neogi S, Manna MC, Adhya TK, Rao KS and Nayak AK (2013). Influence of elevated carbon dioxide and temperature on belowground carbon allocation and enzyme activities in tropical flooded soil planted to rice. **Environmental Monitoring and Assessment** (DOI: 10.1007/s10661-013-3202-7).

    iii. **Bhattacharyya P,** Neogi S, Roy KS, Dash PK, Tripathi R and Rao KS (2013). Net ecosystem CO_2 exchange and carbon cycling in tropical lowland flooded rice ecosystem. **Nutrient Cycling in Agroecosystems** 95: 133-144.

    iv. **Bhattacharyya P,** Nayak AK, Mohanty S, Tripathi R, Mohammad Shahid, Anjani Kumar, Raja R, Panda BB, Roy KS, Neogi S, Dash PK, Shukla AK and Rao KS (2013). Greenhouse gas emission in relation to labile soil C, N pools and functional

microbial diversity as influenced by 39 years long-term fertilizer management in tropical rice. **Soil and Tillage Research** 129: 93-105.

v. **Bhattacharyya P,** Neogi S, Roy KS and Rao KS (2013). Gross primary production, ecosystem respiration and net ecosystem exchange in Asian rice paddy: An eddy covariance based approach. **Current Science** 104(1): 67-75.

vi. **Bhattacharyya P,** Sinhababu DP, Roy KS, Dash PK, Sahu PK, Dandapat R, Neogi S, Mohanty Sangita (2013). Effect of fish species on methane and nitrous oxide emission in relation to soil C, N pools and enzymatic activities in rainfed shallow lowland rice-fish farming system. **Agriculture Ecosystem & Environment** 176: 53-62.

vii. **Bhattacharyya P,** Roy KS, Neogi S, Adhya TK, Rao KS and Manna MC (2012). Effects of rice straw and nitrogen fertilization on greenhouse gas emissions and carbon storage in tropical flooded soil planted with rice. **Soil and Tillage research** 124: 119-130.

viii. **Bhattacharyya P,** Roy KS, Neogi S, Chakravorti SP, Behera KS, Das KM., Bardhan S and Rao KS (2012). Effect of long term application of organic amendment on C storage in relation to global warming potential and biological activities in tropical flooded soil planted to rice. **Nutrient Cycling in Agroecosystems** 94: 273-285.

ix. Roy KS, **Bhattacharyya P,** Neogi S, Rao KS and Adhya TK (2012). Combined effect of elevated CO_2 and temperature on dry matter production, net assimilation rate, C and N allocations in tropical rice (*Oryza sativa* L.). **Field Crops Research** 139: 71-79.

x. **Bhattacharyya P**, Bhatt VK and Mandal D (2008). Soil loss tolerance limits for planning of soil conservation measures in Shivalik- Himalayan region in India. **Catena** 73: 117-124.