

An Interview with 2017 IPNI Science Award Winner - Dr. Abdul Rashid

Dr. Abdul Rashid, Fellow & Editor-in-Chief with the Pakistan Academy of Sciences, was recently named as the recipient of the International Plant Nutrition Institute (IPNI) Science Award for 2017. The IPNI Science Award recognizes outstanding achievements in research, extension, or education—focusing on efficient management of plant nutrients and their positive interaction in fully integrated cropping systems that enhance yield potential.

During his formative years in research (1973-79), Dr. Rashid contributed towards identification, establishment, and mechanisms of zinc deficiency in rice, wheat, and corn. In 1979, he became coordinator of *Micronutrients Project* in Pakistan. Then, he obtained Ph.D. from the University of Hawaii by determining crop zinc requirement in acid soils of Hawaii and calcareous soils of Colorado. Abdul returned to Pakistan in 1986 and led a well-conceived soil fertility and crop nutrition program at the National Agricultural Research Center. Dr. Rashid's farmer-friendly fertilizer use technologies have been formally recommended and widely adopted throughout Pakistan.

Can you take us back to the mid 1980s ...coming out of graduate school and establishing a new national research program...any unique challenges or obstacles faced at that time?

For my doctoral research at University of Hawaii, USA, under able guidance of Professor Robert Fox, I purposely worked on a micronutrient problem of importance to my country (zinc deficiency in crops). Once I returned to National Agricultural Research Center in Islamabad in 1986, I was well prepared to embark upon a comprehensive soil fertility and plant nutrition research program. When I look back, the major challenges of that time included meager research funding and a socio-economic environment within in Pakistan that was not conducive for scientific research. I think the major credit for eventual success of my research group's consistent efforts goes to my employer (Pakistan Agricultural Research Council) and my colleague scientists within the research group.

Can you describe the story behind the discovery of extensive boron deficiencies in Pakistan?

Our identification and establishment of boron deficiency in many crops, in the face of a general perception of high



Dr. Abdul Rashid

boron availability in calcareous soils, was not a matter of chance. I was conscious that in Pakistan the first-ever crop yield increase with boron fertilization was observed as early as in 1970, but R&D on boron did not receive enough attention due to inadequate facilities and expertise for laboratory analysis of boron. Therefore, initially, we acquired competence in soil and plant boron analysis. Then, by systematic nutrient indexing, my research group diagnosed macro- and micronutrient deficiencies in farmer-grown crops. Identification of boron deficiency in various crops was verified in greenhouse studies. Thereafter, remedial measures were developed and

demonstrated in extensive farmer field trials in the major crop growing areas—including 3 million (M) ha cotton during the 1990s and over 2 M ha of flooded rice during the 2000s.

Since 2008, Dr. Rashid has addressed micronutrient malnutrition by enriching staple cereals with zinc and iodine. This multi-country research under the *HarvestZinc Project* has established that wheat and rice grains can be enriched by foliar feeding, that foliar zinc fertilizer can be mixed safely with pesticide spray solutions, and that high-zinc wheat grains used as seed result in denser crop stand and higher yield. He is co-author of papers on agronomic biofortification of staple cereals with zinc, and the first-ever paper reporting wheat grain enrichment with iodine by fertilization.

His extensive field research demonstrated that balanced nutrient management leads to carbon sequestration. His advocacy for soil-plant analysis-based fertilizer use has helped avoid overuse of nitrogen and phosphorus in high-input cotton, potato, corn, and vegetables, has enhanced crop use efficiency of fertilizer nutrients, and has reduced the risk of nutrient losses to the environment. His *Soil-Plant Advisory Service* backstopped crop production as well as environmental concerns, like heavy metal contamination.

Can you describe your general philosophy to research? What works best? What should be one's focus?

Right from the beginning, I believed that the developing country soil fertility and plant nutrition research must aim at developing farmer-friendly nutrient management technologies for enhancing crop productivity and sustaining soil productivity in a cost-effective manner. In countries like ours, the research program must encompass diagnosis/prognosis

of nutrient disorders, field verification of the disorders, development of its cost-effective and practically feasible corrective measures, extensive field demonstration of the developed technologies, and, finally, formal recommendation for adoption of the technologies by growers.

Any thought on the future challenges for soil fertility/crop nutrition research? Specific challenges faced for Pakistani Ag?

Though more prominent plant nutrition challenges in calcareous soils are of low use efficiency of nitrogen and phosphorus fertilizers and the dilemma of potassium nutrition, my R&D emphasis – throughout – has been on integrated nutrient management, inclusive of micronutrients. Though micronutrients are recognized as ‘mighty’, these eight equally essential nutrients have received lesser than required R&D attention – around the globe. In the presence of any micronutrient deficiency, optimum crop productivity can’t be realized even with adequate catering of all other nutrients. However, micronutrient fertilizer use is much less than required. For instance, my recently prepared status report “Micronutrient Fertilizer Use in Pakistan: Historical Perspective and 4R Nutrient Stewardship” reveals that potential fertilizer requirement for boron is 22-times and for zinc 5-times of their current use levels in the country. Also, optimizing micronutrient nutrition of crops has gained much greater importance with relatively recent realization of their alarming malnutrition in vast segments of the resource-poor across the world. Thus, the apparent future challenges in calcareous soils of the world appear to be optimizing use of nitrogen, phosphorus and potassium fertilizers and enhancing micronutrient fertilizer use in the context of 4Rs.

Dr. Rashid has publicized his research effectively, locally and globally, through journal papers, books, conferences, advisory materials, and field demonstrations—addressing researchers, educators, extension service, farmers, and policy makers. He has lectured extensively in Pakistan and around the world.

Can you describe your passions or commitments now after your “retirement”?

My group’s consistent R&D and effective advocacy, since mid-1980s, resulted in creating a ‘pull force’ for micronutrient fertilizers in Pakistan. Though I retired from formal service in 2011, my passion and commitment for micronutrient R&D continues. Since 2008, I am involved in HarvestPlus-sponsored R&D to address micronutrient malnutrition (‘hidden hunger’) by enriching staple cereals with zinc and iodine. This multi-country research, under the leadership of Professor Ismail Cakmak, has established that wheat and rice grains can be enriched with zinc and iodine by foliar feeding, and that foliar zinc fertilizer can be mixed safely with pesticide spray solutions. And high-zinc wheat grains used as seed result in denser crop stand and higher yield. It is a pleasure in being able to contribute for such a noble cause.

Dr. Rashid is an IFA Norman Borlaug Laureate, Pakistan’s Dr. Norman Borlaug Laureate, East-West Center Distinguished Alumnus, Fellow of Indian Society of Soil Science, Fellow of Soil Science Society of Pakistan, PARC Silver Jubilee Laureate, Pakistan Scientist of the Year, National Book Foundation Awardee, and J. Benton Jones Laureate. **BC**