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Precision agriculture & sustainability in rice value chain

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Imran shehzad
Project Agronomist Rice Partners Private Limited, WAPRO project, Pakistan

Correspondence: Imran Shehzad, Project Agronomist Rice Partners Private Limited, WAPRO project, Pakistan, Email imransheikhrpl@gmail.com

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What does it take to attain global food security? This is a question for which rice provides part, if not most, of the answer. Rice-a staple food for the world's poor-is grown on more than 155 million hectares and accounts for one-fifth of the global calorie supply. In the past decade, changes such as rapid economic growth, especially in parts of Asia, rising wage rates, increasing diversification of diets, global climate change resulting water scarcity and a greater integration of the food economy with other sectors of the global economy, including both energy and financial markets, have converged to shape the way rice is produced today and will be produced in the future. Unhappy reality is that inefficient farming methods are making our cost of production higher than in most other countries, including creating difficulties for the farming communities. Rice is commonly grown by transplanting 30-day-old nursery seedlings in well-flooded and puddled fields. In this cultivation system, rice seedlings are raised on separate, well-prepared soil and then manually uprooted and shifted to main field.

Puddling destroys soil structure and even after paddy harvest, plantation of next crop (wheat) is delayed. Poor soil condition developed after continuous standing water is not favorable for better land preparation and good stand establishment. In addition, manual and random transplantation of seedlings ensures optimum plant population and are labor and water-intensive operations, increasing cost of production and resulting in low yield. Of course, poor farming techniques leading to poor crop of rice outcomes in combination with water scarcity threaten Pakistan's future food security. Alternatively, aerobic rice is a new water-saving cultivation system in which varieties adaptive to aerobic soil conditions are grown like wheat and maize crops. This system needs 30-50 per cent less water, saves labour and time, and facilitates timely plantation of next crop (wheat). Due to high nitrogen use efficiency up to 50-60 per cent, the next crop is also benefited by residual nitrogen. Growing aerobic rice neither needs seed nursery nor transplantation of seedlings. It also does not require puddling operation which reduces cost of production. Just across the border Indian Punjab boasts nearly double the rate of per acre yield of rice than our country after having embraced efficient agricultural practices and co-operative farming. After consulting farming community of basmati rice and different consultative meetings it is noted that progressive farmers are getting 70 mounds per acre - for wheat crop and 55 mounds of rice - against an average per acre production of 28 & 32 mounds respectively. The gap between the potential yield and what the small farmers manage to produce is too much large.

One of the prevalent misconceptions is that the higher use of fertilizers, pesticides and herbicides - all expensive inputs - is the only way to increase productivity, whereas variables like soil and especially crop characteristics also happen to be vital determinants. The practice also raises concerns about implications for human health. In fact, critics of chemicals-driven high yield policy in the Indian Punjab point out that a particularly worrisome side effect of the excessive use of carcinogenic elements containing chemicals is the rise in various life threatening diseases among consumers. In other words, too much reliance on artificial fertilizers or other toxic chemicals to destroy pests or unwanted vegetation without proper assessment is inadvisable. Hence the need to look for smart techniques that reduce the cost of production, increase yields, and are safer too. That is where precisions agriculture offers solutions. It may not be possible at this point in time to introduce precision engineering technologies employed by farmers in advanced countries, such as GPS equipped crop yield monitors, and sensor systems to measure plants chlorophyll levels as well as water condition. But there are other simpler, low cost techniques that can help increase productivity, like smart sprayers and controllers. Equally import is the need for better management of soil and especially crop variability.

For that the agricultural science community and relevant government departments in the provinces ought to get their respective act together. They need to address immediate issues first such as a common complaint that the seeds for various crops gradually lose quality while the experts fail to come up with newer answers. And that even though on paper officials are supposed to be on hand to conduct soil testing for its suitability to a particular crop, help is not always forthcoming. Considering the looming threat of water scarcity and food shortages in the not too distant future, it hardly needs saying that necessary precision agriculture technologies and other methods ought to be adopted before it is too late.

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Conflict of interest

The author declares no conflict of interest.