Herbicides Essential for Zero-Till Wheat on the Indo-Gangetic Plains

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The Indo-Gangetic Plains (IGP) consists of the Indus and Ganges River systems covering parts of India, Pakistan, Nepal and Bangladesh. The climate of the IGP consists of a wet monsoon summer and a dry, cool winter. This allows rice and wheat to be grown in a double cropping pattern in one calendar year: rice in the summer and wheat in the winter. Both crops are irrigated. The IGP is one of the most fertile and productive agricultural areas in the world. The rice-wheat rotation occupies about 13.5 million hectares on the IGP and provides food for about 400 million people.

In the 1990s, evidence accumulated that the rice-wheat system was showing signs of fatigue with yields at a plateau or in decline, soils in deterioration, the groundwater table declining, cultivation costs increasing, and profit margins for farmers decreasing [1]. These concerns led to research into technologies that could improve production.

Late planting of wheat was identified as a major problem. To improve productivity, the wheat crop must be planted at the optimal time at the end of November followed by a decline in yield of 1 to 1.5%/day after that date. Most farmers plant wheat late because of multiple tillage operations (6-12) after the rice harvest. Farmers believed the tillage was necessary for good germination, weed control, proper aeration and moisture conservation [2].

Research demonstrated that zero-tillage in which wheat is directly seeded into undisturbed soil after rice harvest enhanced farm income by about US$100 per hectare as a result of increased wheat yield(5-7% higher) and savings in fuel costs(36 L less diesel per hectare) [3]. Zero-tillage allows reduction in tractor trips from 6-12 to 1 and enabled farmers to sow wheat earlier. It was determined that zero-tillage helps to reverse soil degradation and leads to improved soil structure and higher soil organic matter. Zero-tillage takes immediate advantage of residual moisture from the previous rice crop, as well as cutting down on irrigation requirements, so it reduces water use by about one million liters per hectare [3]. By 2008, the zero/reduced tillage wheat area amounted to 1.76 million hectares and was used by 620,000 farmers [3]. The cost savings effect is the main driver behind its spread.

In zero-till wheat, herbicides are sprayed to kill all weeds that emerge following rice harvest and before wheat seed planting [4][5][1]. Weeds that emerge in the wheat crop are effectively controlled with a single herbicide application[5][1]. Surveys have shown that farmers practicing zero-till in wheat fields rely exclusively on herbicides for weed control [6]. The introduction of herbicides with different chemistry together with no-till cultivation restored the confidence of wheat growers and wheat yields have shown signs of increasing [1].

Studies have reported zero-tillage to be scale neutral with both large and small landholders adopting. This is facilitated by smallholders contracting zero tillage drill services [3].

References