

ZERO-TILL AND BED PLANTING IN SOUTH ASIA:

Plowing Less to Save Water and Slow Global Warming

Rice-wheat systems are critical to South Asian food security. More than 150 million people support themselves by growing rice in rotation with wheat, but the sustainability of these systems is under threat on several fronts. Improved tillage and crop establishment practices, especially for wheat, show real potential for improving the sustainability and productivity of these systems. Reduced and zero tillage can improve yields, raise input use efficiency, reduce the intensity of machinery use in a sustainable way, and reduce production costs. These technologies also shorten the turnaround time between rice and wheat, helping farmers to plant wheat on time, obtain better yields, and improve the efficiency of input use.

Simple Changes, Astonishing Benefits

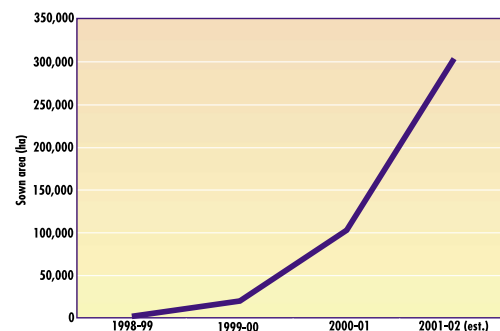
Alternative tillage practices that reduce costs and raise productivity are being tested and promoted by the Rice-Wheat Consortium for the Indo-Gangetic Plains (RWC).¹

Reduced tillage practices are catching on quickly, simply because they are so attractive to farmers. For example, in **zero-till** farmers sow wheat in a single tractor operation after the rice harvest, planting the seed directly into rice stubble. The practice saves 75% or more fuel, obtains better yields, uses about half the herbicide, and requires at least 10% less water. Farmers save at least US\$ 65/ha in production costs, which makes a big difference to their profit margins.

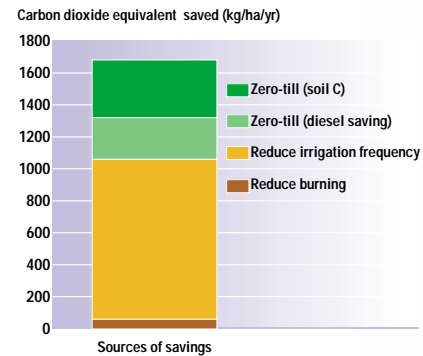
From a modest 3,000-plus hectares in 1998-99, zero-till wheat area in India and Pakistan is expected to surpass 300,000 hectares in 2001-02 (see figure). Manufacturers currently cannot make drills fast enough to meet the demand from farmers.

Another recently promoted technique—**planting wheat on raised beds**—improves yields, increases fertilizer efficiency, reduces herbicide use, saves seed, saves an average 30% water, and can reduce production costs by 25-35% when permanent beds are used. Bed planting is gaining acceptance in India for wheat, and is even being tested for rice.

¹ The RWC is an alliance of national organizations, CIMMYT, the International Rice Research Institute (IRRI), other international centers, and advanced research institutes that fosters sustainable productivity in rice-wheat farming systems of South Asia. The RWC is an ecoregional initiative of the CGIAR, with CIMMYT as the convening center.



Wheat area sown using zero-till in India and Pakistan. These figures are based on a recent, region-wide survey on the number of privately owned zero-till drills available to farmers and the fact that each drill can sow at least 80 hectares of wheat land per cropping season. The area for 2001-02 represents a conservative estimate.



Potential carbon dioxide equivalent savings from conservation tillage



Scientists in the RWC are working with farmers to help them manage crop residues, which amount to as much as 10 t/ha, producing some 13 t of carbon dioxide when burned. Eliminating burning would mitigate local pollution, reduce health hazards, and increase soil organic matter.

Saving the Environment

Widespread adoption of one or several of these reduced tillage methods will bring significant environmental benefits.

For example, current land preparation practices for wheat after rice involve as many as 12 tractor passes. Changing to a zero-till system on one hectare of land would save 60 liters of diesel and approximately 1 million liters of irrigation water.² Using a conversion factor of 2.6 kg of carbon dioxide per liter of diesel burned, this represents about a quarter ton less emissions per hectare of carbon dioxide, a principal contributor to global warming.

These benefits increase dramatically if extended across even a portion of the rice-wheat region's 12 million hectares. Adoption of zero-till on, say, 5 million hectares would represent an annual diesel fuel savings of nearly *0.3 billion liters* — equivalent to a reduction of nearly *800,000 tons in CO₂ emissions* each year — and dramatically increase the availability of water and the efficiency of its use in rice-wheat cropping zones.

² Because zero-till takes immediate advantage of residual moisture from the previous rice crop, as well as cutting down on subsequent irrigation requirements, water use is reduced by about 10 cm/hectares.



To help make seed drills and bed planting implements more widely available, RWC staff are linking and advising farmer groups, local machine shops, and agricultural engineering specialists. CIMMYT and the RWC are also developing appropriate planters and bed-shaping equipment.

CIMMYT
INTERNATIONAL MAIZE AND
WHEAT IMPROVEMENT CENTER
Contact: Peter Hobbs (p.hobbs@cgiar.org),
CIMMYT-Nepal