CIMMYT

CENTRO INTERNACIONAL DE MEJORAMIENTO DE MAÍZ Y TRIGO
INTERNATIONAL MAIZE AND WHEAT IMPROVEMENT CENTER

The Rice-Wheat Consortium for the Indo-Gangetic Plains[1]

Highlights 2001-2002

Farmers Take up Zero-Tillage

Farmers in the Indo-Gangetic Plains are rapidly adopting zero-tillage for sowing wheat after rice. From next to nothing a few years ago, zero-tillage area surpassed 200,000 hectares in 2001 (Figure 1), with farmers in possession of almost 4,000 zero-tillage planter implements made by 32 manufacturers (Figure 2). The RWC expects adoption to exceed one million hectares in the next few years, as local manufacturers meet the demand for machinery and more farmers are exposed to the technology and its benefits. The quickened uptake is simple to explain: zero-tillage allows farmers to produce more, more cheaply, and with significant savings in water, soil quality, and inputs. The drudgery of agriculture is also reduced. Net benefits in India and Pakistan average about US$150 per hectare, through higher yields and land preparation costs that are a fraction of those for conventional tillage. Surveys in adoption areas show that even resource-poor farmers without tractors found zero-tillage beneficial enough to contract someone to plant their fields.

A report by an independent agency in Australia on a project to disseminate zero-tillage in northwest India[2] calculated a return of US$238 million on the project's original cost of US$1.3 million, assuming that the project led farmers to adopt zero-tillage three years sooner than they would have otherwise. The report also projects gains of $1,800 million, in net present value terms, for the Indian economy from the adoption of zero-tillage, over the next 30 years.

Other conservation agriculture techniques promoted by the RWC are finding favor with farmers. These include seeders for 2-wheel hand tractors (483 ha planted with 250 farmers with 57 seeders in 16 EGP Districts), bed planting (4,700 ha planted with 210 bed makers cum planters with 397 farmers in 73 Districts) and surface seeding (almost 11,000 ha and 31,000 farmers in 12 Districts).

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[1] The RWC is a partnership between the national agricultural research systems of Bangladesh, India, Nepal and Pakistan; several international centers of the CGIAR (CIMMYT, IRRI, ICRISAT, CIP and IWMI) and various advanced international institutions (Cornell University, IAC, Wageningen, IACR, Rothamsted, CABI-UK, and Melbourne University) aimed at sustainably increasing the productivity of rice-wheat systems in South Asia, thereby conserving natural resources, improving livelihoods, and reducing poverty.

[2] Vincent, D., and D. Quirke. 2002. Controlling *Phalaris minor* in the Indian Rice–Wheat Belt. Impact Assessment Series. Canberra: Centre for International Economics.

Figure 1. Expansion of zero-tillage in Haryana, India, and Punjab, Pakistan.

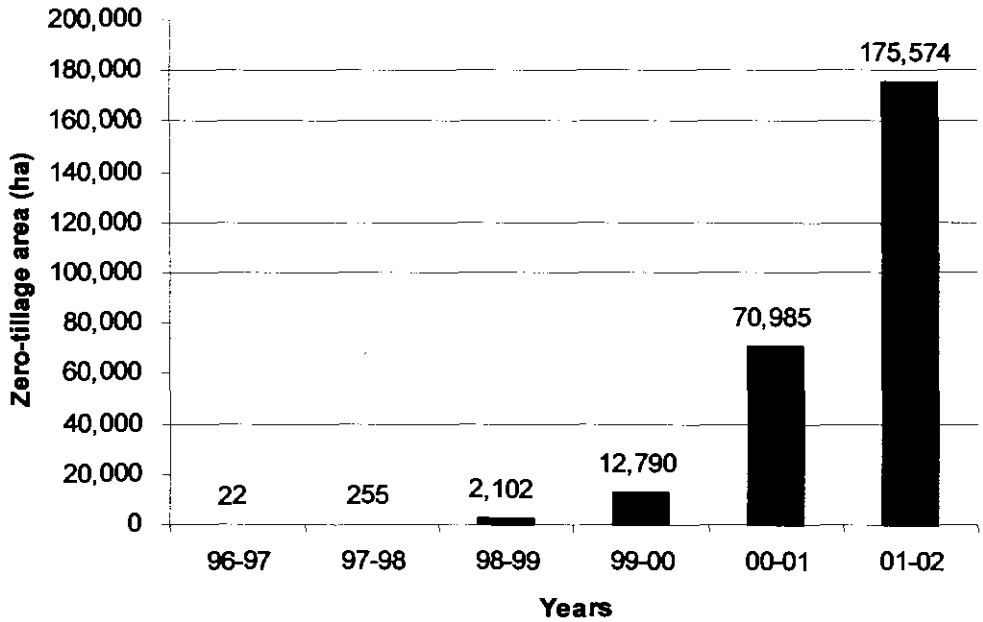
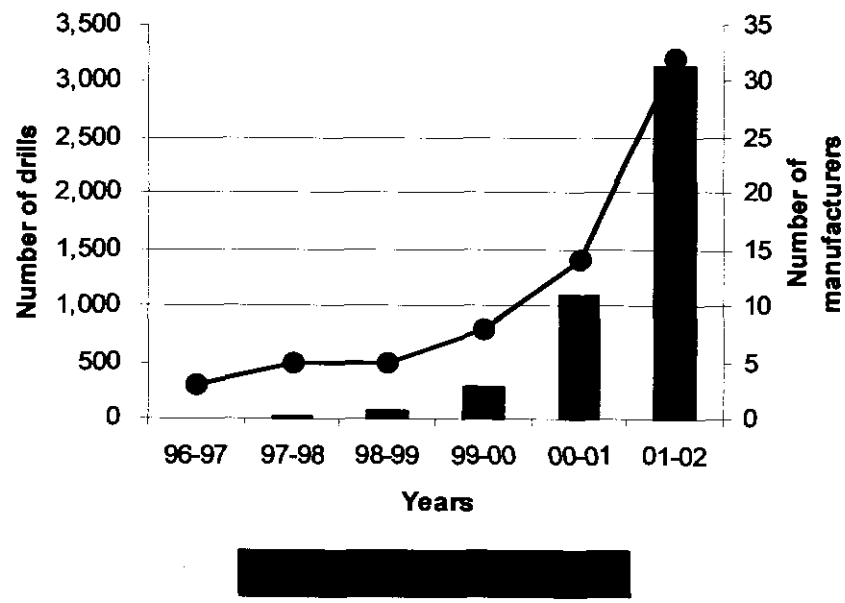


Figure 2. Increase in the number of drills and drill manufacturers in Haryana, India, and Punjab, Pakistan, since 1996.



Environmental Benefits

Zero-tillage cuts greenhouse gas emissions and reduces the need to use of herbicides and pesticides. Water is also a major constraint to agriculture in the region and will become dramatically scarcer in the next decade. There is now a severe drought in Pakistan, Afghanistan, and northwest India; water tables are declining fast and reservoirs drying up. A single hectare of wheat sown using zero-tillage requires up to 1 million liters less irrigation water than the same crop grown under conventional tillage. Work is under way to look at water balances across irrigation systems and determine, among other things, if field-level savings from zero-tillage translate into more water available at the command level.

Resource-Conserving Technologies

The RWC studies and promotes a basket of resource-conserving cropping practices—zero-tillage, direct seeding, sowing on raised beds, small-scale mechanization, rotations, among others—helping farmers to test them and providing follow-up support. These technologies can be (and normally are) adopted partially at first, but provide their maximum benefit when used throughout the cropping system. Thus, building on their success with wheat, Consortium scientists are working with farmers to test resource-conserving alternatives for growing rice: without puddling, on beds, and under zero-tillage. Early results show increased yields and significant savings in water. One farmer in the Indian Punjab who sowed rice on raised soil beds reported yields of 9 tons per hectare—a 17% increase over yields for the crop on the flat—and a 65% water savings.

Bed planting, especially permanent beds, are gaining acceptance, as more farmers receive equipment to experiment and see the benefits for themselves. Data from India suggest that use of permanent beds saves even more water (average 31%) than zero-tillage. The practice also improves yields (24%) across an array of crops, increases input-use efficiency, and cuts costs (see table). Finally, soil physical and biological properties improve under permanent beds.

Crops	Yield on beds (t/ha)	Yield on flat (t/ha)	Water savings (% over flat)	Yield increase (% over flat)