No-till technology: a no-till system with crop residue management for medium scale wheat and barley farming

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Morocco

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Sustainable Development Goals
Life on land and industry, innovation and infrastructure

Summary
The following describes the development of a special no-till drill with the purpose of simultaneously planting seed and fertilizing annual crops. Information is given on how to drill cuts, how to plants seeds, special herbicide application, and tillage replacement. The advantages of using such a technology, which include low cost, improved resource use and higher yields, are also given.

Description
1. A no-till system

The following describes a no-till system with crop residue management for medium scale wheat and barley farming. This no-till technology (NTT) system, with direct seeding and crop residue management, was designed by the National Institute of Agricultural Research (INRA) in Settat, Morocco. A special no-till drill was developed to simultaneously seed and fertilize annual crops. The drill cuts through residue, opens a 20 cm wide slot which, after seed and N/P-fertilizers are dropped into it, is closed firmly to encourage contact between seed and soil. Seeding is earlier than in the case of conventional tillage which requires seedbed preparation.

Spacing between rows is adjusted according to crop type: 20 cm for wheat or barley, and 40 cm for lentils and chickpeas. Tillage depth is between 5 to 12 cm depending on soil workability and moisture content.

Crops, planted in rotation with a fallow period, are barley, wheat, legumes (lentils and chickpea) and also fodder species. Application of special herbicides replaces tillage for weed control, and enables the farmer to have an 18-month fallow period (a ‘chemical fallow’) after two crops have been taken over a six-month period.

Fallowing is essential for water conservation in this semi-arid area. NTT reduces passes with heavy machines to three times per year. Residue management involves maintaining the soil partially covered with stubble and straw. Overall, yields are higher and costs are lower than under conventional tillage. NTT reduces soil erosion and soil compaction while conserving water in the soil. Optimum use of scarce and low rainfall to stabilise/increase crop yields is essential in this area.

The use of the special no-till drill ensures both minimal working of the soils, and
precise incorporation of phosphate fertilizer beneath seeds. Depending on the specific site, residue management is adjusted from low residue maintenance (stubble/controlled grazing) to medium surface cover (stubble/straw maintenance, forage crops and exclusion of grazing). Erosion and evaporation suppression/ control are the main impacts of the system. Runoff and concentrated flow in watersheds are reduced. Chemicals are applied for weed control, but this takes into account the environment, and can be reduced over time. Maintaining crop residues in the fields, increases soil organic matter and thus the amount of carbon sequestered, as well as nutrient levels. Hence application of inorganic fertilizers can be reduced.

2. Agro-ecological zones
   • Tropics, warm

3. Objectives fulfilled by the project
   3.1 Labour-saving technology (LST)
   The technology requires minimal soil work through precise steps and techniques.

   3.2 Resource use efficiency
   The technology reduces soil erosion and compaction. It also increases water conservation. It also improves crop residue maintenance, increases soil organic matter and reduces carbon dioxide emissions.

   3.3 Pro-poor technology
   The technology provides higher yields and lower costs.