

## TRADITIONAL SYSTEMS

# REHABILITATING THE SOIL: WHAT FARMERS CAN DO

**Years of overuse have left soils compacted, eroded and depleted of nutrients. What can small-scale farmers do to restore the soil?**

**F**armers are usually well aware that their soil is degrading. They can see rills and gullies forming in their fields. They count fewer bags of grain at harvest-time each year. But what can they do about it?

Over the centuries, smallholder farmers throughout the world have come up with many ingenious ways to grow crops while conserving the soil on steep slopes, and to restore soil that has been degraded. In Ethiopia, for example, farmers traditionally use a wide repertoire of measures: stone bunds and terraces, vegetation strips, ridges and basins, stone mulch, multiple cropping and planting shade trees. Newer approaches have added to this repertoire, often by adapting the traditional systems. The remedies fall into four broad types: agronomic, vegetative, structural and management.

Agronomic measures involve changing how the crop is grown. Ploughing and planting along the contour instead of up and down the slope can reduce erosion. Intercropping or rotating cereals with legumes restores soil fertility and reduces the need for nitrogen fertilizer. Applying mulch, com-

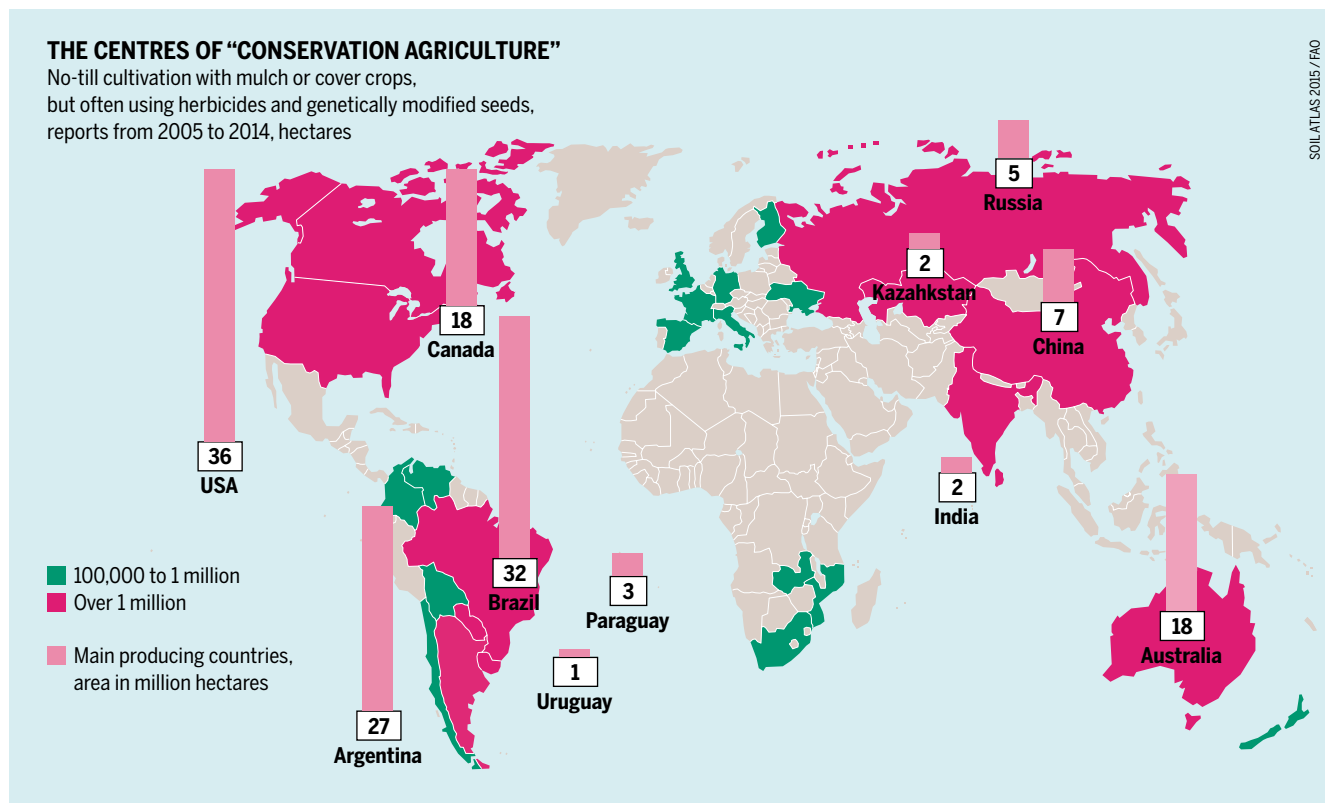
post and manure adds nutrients and organic matter to the soil and stimulates earthworms and other soil life. Adding lime cuts acidity.

Conservation agriculture is a combination of agronomic measures: it eliminates ploughing, protects the soil with mulch or cover crops, and rotates crops to maintain fertility and control pests and weeds. This approach is common in the Americas and Australia, but it often uses herbicides to suppress weeds, along with crop varieties that have been genetically modified to resist the herbicide.

In Africa and Asia, smallholder farmers sow and weed by hand or using special animal-drawn implements that disturb the soil as little as possible. But switching from ploughing to conservation agriculture can be difficult: farmers may need to learn new skills, change the crops they grow, invest in new equipment and put more effort into controlling weeds.

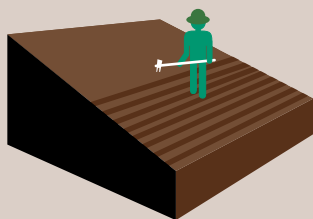
Vegetative measures mean planting grass, bushes or trees to slow down the flow of water, trap soil and cut the wind speed. Hedges and trees planted around fields keep

*Big industrial farms use some conservation agricultural practices, but combine monocultures with genetically modified seed*

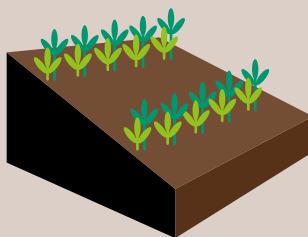


## NEW IDEAS FOR OLD SYSTEMS

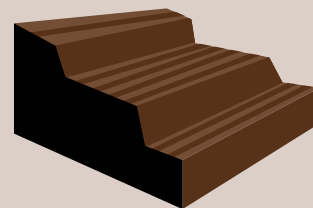
Measures against soil degradation



**Agronomic measures:** Contour cultivation across the slope, without changing the shape of the slope

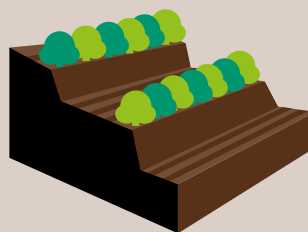
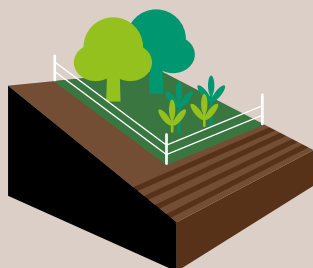


**Vegetative measures:** Grass, hedges and trees planted in strips, long-lasting, suited to small fields



**Structural measures:** Terraces, dams and similar structures, time-consuming investment, long-lasting if maintained

**Management measures:** Changing use by fencing off, rotational grazing, less-intensive cropping



**Combined measures:** For example, growing a mix of crops on small, terraced fields with grasses and leguminous shrubs on the bunds

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straying animals away from crops and produce fruit and firewood. Grass strips along contours can be a valuable source of fodder; they can trap enough soil to build up a series of terraces. Trees and grass planted along waterways can restore existing gullies and prevent new ones from developing.

Structural measures involve moving earth and stones to build physical barriers. In many parts of the tropics, spectacular terraces make it possible to grow crops on steep slopes. In China, the Himalayas and Southeast Asia, centuries-old earthen terraces are used to grow rice. In the Andes, stone terraces are used for potatoes; in Konso, in Ethiopia, they are planted with cereals, coffee and cotton. Other structural measures include contour bunds, cut-off drains, check-dams in gullies, and reservoirs to harvest water.

The final category, management measures, involves changing the land use. An example is to fence off an area of degraded land to keep grazing animals out, giving the vegetation a chance to recover. Farmers can cut and carry forage to feed to livestock. Rotational grazing, growing fodder crops rather than allowing animals to roam freely also allow grass and trees to regrow on bare land. By moving their herds in search of grass and water, pastoralists avoid denuding a particular area of vegetation.

The most appropriate soil-conservation measures depend on the particular situation. Contour bunds are fine on shallow slopes, but are ineffective on steeper hills. Grass strips do not grow in dry areas, or if livestock are allowed to graze and trample on them.

Individual farmers can apply some measures on their own – such as ploughing and planting along the contour.

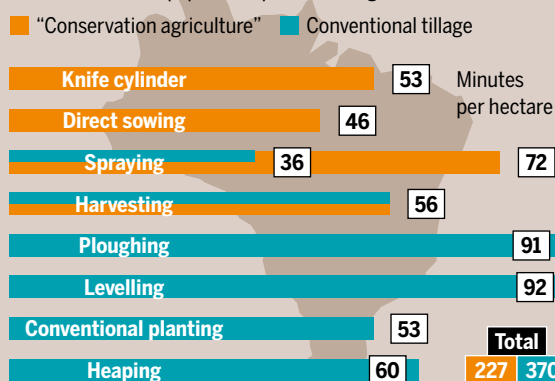
*Conventional cultivation uses ploughing to kill weeds. "Conservation agriculture" often uses herbicides instead. That saves time but risks poisoning the environment*

*A mix of measures is generally the best solution. Even smallholders with few options can significantly improve their yields*

But other measures require all the farmers in a particular area to cooperate. Terraces and other structural measures take a lot of labour to build and have to extend across a hillside in order to be effective. Planning, constructing and repairing them are usually a community effort. Where such a tradition of mutual help does not exist, building such structures may need outside support. Even so, the investment may not be worthwhile given the value of crops that can be grown on the rehabilitated land, and the need to maintain structures once they are built. Often a combination of agronomic, vegetative, structural and management measures is best, for example building terraces to grow a mix of crops, and planting the risers with fodder grasses and trees. ●

### TIME SAVER: SPRAYING PESTICIDES

Time needed for equipment/operations to grow beans in Brazil



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