Resource Conservation Technologies in Pulses: Smart Farming for a Better Harvest

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ABSTRACT

Pulses such as chickpea, lentil, moong, urad, and arhar serve as essential crops for many Indian farmers. Pulses require less water and fertilizer compared to others and contribute to soil enrichment. Despite the advantages, many farmers continue to employ traditional practices, including deep ploughing, field flooding, and heavy reliance on chemical inputs. Over time, such methods degrade soil quality and increase production costs. Resource Conservation Technologies (RCTs) offer practical solutions that enable farmers to conserve land, reduce water usage, lower expenses, and minimize labour requirements, while maintaining or enhancing crop yields. Examples of RCTs include zero tillage, raised beds, land laser levelling, foliar application of nutrients, biofertilizers, and intercropping. Research conducted by ICAR and ICRISAT indicates that adoption of these technologies can reduce cultivation costs by 15–30%, decrease water usage by 40–50%, and sustain healthy yields. The following sections provide a detailed overview of each technology to facilitate their practical implementation by farmers.

INTRODUCTION

Pulses are cultivated on over 25.90 million hectares in India. However, their average yield remains only 921 kg per hectare, which is significantly below their potential (DA&FW, 2025-26). The primary limitation is not the crop itself but the agricultural practices employed. Practices such as repeated deep ploughing degrade soil structure, flood irrigation leads to water wastage, and burning crop residue eliminates beneficial soil organisms. Although pulses possess the unique ability to fix atmospheric nitrogen into the soil through Rhizobium bacteria in their roots, conventional farming methods undermine this benefit. Resource Conservation Technologies, developed by IIPR, ICRISAT, and state agricultural universities, provide validated, low-cost solutions to these challenges that smallholder farmers can implement without financial risk.

Different Resource conservation technologies (RCTs) for pulses:

Resource conservation technology (RCT), refers to any management technique or technology that increases factor productivity, which includes land, labour, capital, and inputs. RCTs increase productivity with little effort and save resources. Resource and conservation are the two words that make up RCT. Followings are some technologies adopted for conserving resources-

Zero Tillage: Stop Ploughing So Much

When you use a Zero-Till Seed Drill to sow seeds directly into unploughed soil, you don't have to plough the soil first. Every time a farmer ploughs, the soil structure breaks down, moisture is lost, and beneficial organisms such as earthworms die. Research from IIPR found that lentils grown without tillage produced 1,180 kg per hectare, while those grown with conventional ploughing produced only 1,050 kg per hectare. Farmers also saved ₹1,500 to ₹2,500 per acre on tractor and fuel costs. Krishi Vigyan Kendras are renting out zero-till drills for a low price.

Raised Bed Planting: Better Ground for Your Crop

In raised bed planting, seeds are planted in rows of soil that are a little higher than the ground around them, with drainage channels between them. Pigeon pea and black gram are examples of pulse crops that are very sensitive to waterlogging. Even two to three days of standing water can permanently damage their roots. Field tests show that crops grown on raised beds produce 10–20% more than crops grown on flat beds. This is because irrigation is only used in the channels, which cuts water use by 25–30%.

Foliar Application of Nutrients: Feed the Crop Through Its Leaves

Even after applying soil fertilizers, a pulse crop may still have yellowing leaves, poor flowering, or weak pod development. This happens because the roots can't get some nutrients from the soil very well, especially micronutrients like iron, boron, molybdenum, and zinc. Foliar nutrition is the quickest and best way to solve these problems. Foliar application is when you spray a weak solution of nutrients directly on the crop's leaves. The plant then absorbs the nutrients right away through tiny pores. For pulse crops, spraying a 2% DAP solution (1 kg of DAP in 50 litres of water) during flowering and pod formation stages greatly increases the amount of grain that fills and the amount of yield. Boron spray at 0.2% concentration at the pre-flowering stage prevents flower drop in pigeonpea and black gram, directly improving pod setting and final yield (Sharma and Pathak, 2019). It has

been shown that spraying molybdenum at 0.5 kg per hectare on lentils and chickpeas works.

Laser Land Levelling: Make Your Field Perfectly Flat

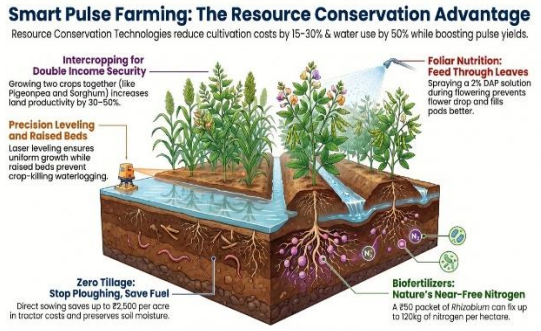
Laser land levelling uses a machine scraper that is guided by a laser to make the field surface almost perfectly level. Water collects in low spots in many farmers' fields, while crops dry out in high spots. Poor germination, crop growth, and irrigation water waste are all caused by uneven water distribution. Laser land levelling fixes all of these problems at once. When the field is level, the water distributes out uniformly, each seed gets the same amount of moisture, and the crop stands evenly. Laser land levelling cuts down on the amount of water used for irrigation by 20–25%, makes water use more efficient by 30%, and increases agricultural output by 10–15% in the Indo-Gangetic Plains (Jat et al., 2009). Laser levelling offers pulse crops like chickpeas and lentils a good start since they are picky about how water is spread out. You can rent laser levelling for about ₹1,000 to ₹1,500 per acre at custom centres. This one-time investment will help the field for several seasons.

Biofertilizers: Nature's Own Free Fertilizer

Farmers can buy biofertilizer packets with Rhizobium and Phosphate Solubilizing Bacteria (PSB) for only ₹30–₹50 at any agricultural store. Farmers coat their seeds with this mixture before planting. The bacteria attach to the roots of pulses and take in 40–120 kg of nitrogen per hectare from the air at almost no cost. In lentil trials, the combination of Rhizobium, PSB, and vermicompost increased yield by 18–22% over chemical fertilizer alone (Sharma and Pathak, 2019). This is the easiest and cheapest thing any pulse farmer can do right now.

Intercropping: Two Crops, Double Security

Intercropping is when you grow two different crops in the same field, like two rows of pigeon pea and then one row of sorghum. If one crop dies because of pests or drought, the other one still makes money. A Land Equivalent Ratio of 1.3 to 1.5 in pigeon pea-sorghum intercropping means that the same land can produce 30–50% more. Intercropped fields also have fewer pest attacks, which saves a lot of money on pesticides (Yadav and Lal, 2017).



CONCLUSION

Resource conservation technologies give every pulse farmer a clear way to make more money, spend less, and protect their land for the future. Research in India's major farming regions has shown that zero tillage lowers the cost of tillage, raised beds stop waterlogging, biofertilizers replace expensive chemical nitrogen, and intercropping doubles income security. You don't need to spend a lot of money to get started. A farmer can start this season by either coating seeds with Rhizobium biofertilizer. It's not about working harder; it's about working smarter. These technologies are the smartest tools that every Indian pulse farmer has access to right now.

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