

INTEGRATING AGRICULTURAL MACHINERY RENTING INDIVIDUALS INTO AGRICULTURAL EXTENSION



In this blog, Subash Surendran Padmaja discusses the context in which laser land levelling is used in north-western India, [the role of private individual service providers in adopting this technology](#), and why and how extension agents could incorporate them into the extension landscape.

CONTEXT

If we travel across the northwestern states of Punjab, Haryana, and Uttar Pradesh in India during April–May at night, we can see tractors guzzling dust across the flat plains. Look closer, and you'll notice red or green dots from a machine attached to the tractor. During the day, it's clearer that the machines are levelling the land—an operation done before sowing crops. One might wonder what those machines are and why farmers operate tractors both day and night. These machines are laser land levellers.



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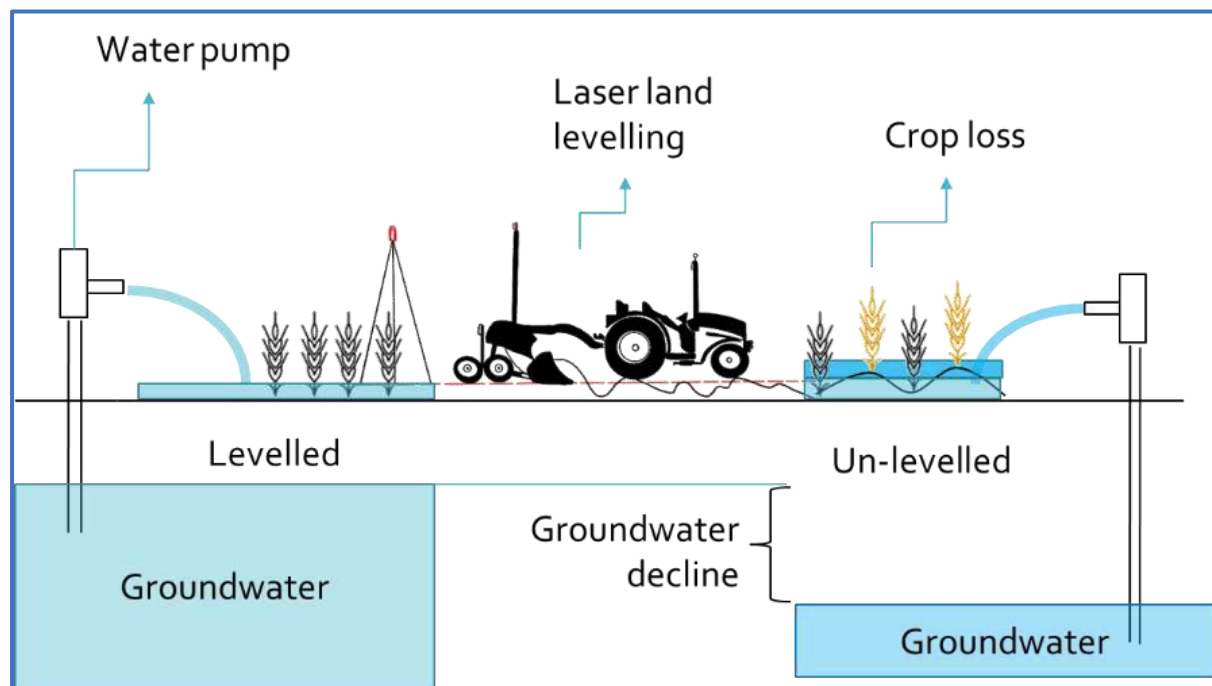
Laser land levelling technology operated at night in northwest India.

Note: The technology consists of a tractor-mounted bucket scraper with a receiver, a control box in the tractor, and an independent transmitter on a tripod. The transmitter emits a laser beam (hence the name "laser land leveller") to the receiver attached to the bucket scraper, which removes or adds soil using a hydraulic system. The tractor operator can adjust the levels using the control box. For a video animation, see [this video](#).

LASER LAND LEVELLERS

Traditionally, land levelling is done using a flat wooden or iron plank attached to the tractor. The laser land leveller is an advancement over this and helps level land with a precision of ± 2 cm. In north-western India, particularly in regions with rice–wheat cropping systems, there is a two-month window (April–May) after wheat harvest to prepare the land for rice. Due to this short timeframe and high demand, levelling is done round the clock with tractor operators working in shifts.

Key benefits of this technology include more uniform land, reduced water requirements for irrigating rice crops, and minimized crop loss from inundation or dry patches due to uneven fields. These benefits are visually evident when comparing levelled and unlevelled fields (see figure below).



Laser Land Leveller mechanism for saving groundwater

The technology was introduced in northwestern India in 2001 by the International Maize and Wheat Improvement Centre (CIMMYT) and the International Rice Research Institute (IRRI), in collaboration with national partners including the Indian Council of Agricultural Research (ICAR) and state agricultural universities. It is one of the most successful agricultural technologies in terms of area covered and number of adopters in the region. [Approximately 93% of farmers are aware of the technology, and 84% have used it at least once.](#)

ROLE OF PRIVATE INDIVIDUAL SERVICE PROVIDERS

Among agricultural technologies, the adoption of machinery is generally lower. One key reason is the indivisible nature of machinery. Inputs like seeds and fertilizers can be scaled to land size, but machinery cannot, making it difficult for small farmers to experiment. [Renting machinery becomes an effective alternative.](#)

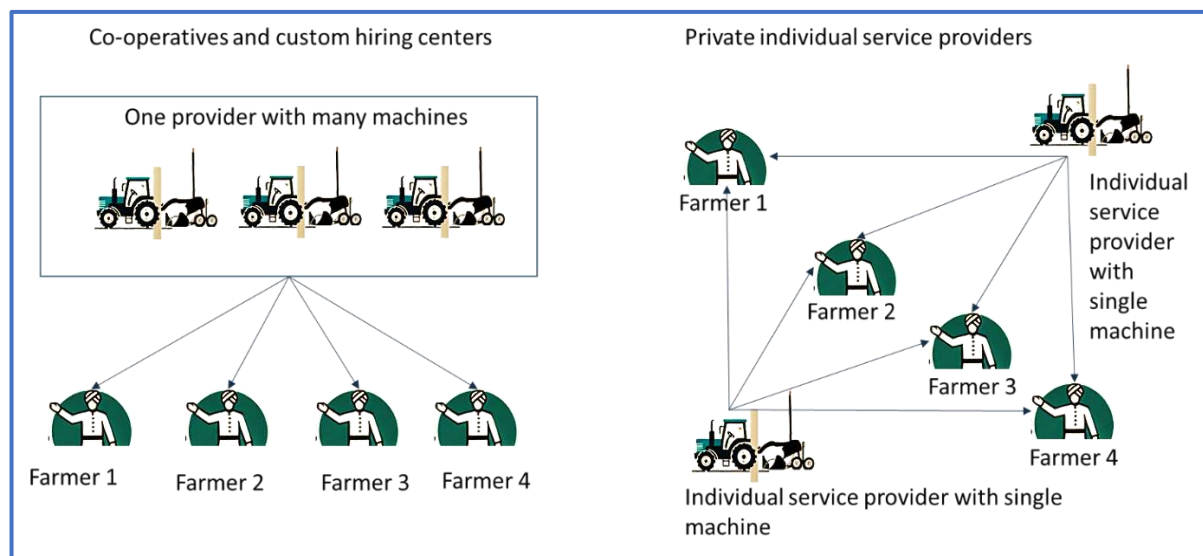
Although literature discusses [cooperatives](#) or [custom hiring centres](#) as institutional mechanisms for technology dissemination, private individual service providers are often seen as [informal actors](#).

[A recent study found that 99% of adopters rent laser land levelling services from private individual service providers within or outside their villages.](#) The same study estimated that about 45,000 such

service providers exist in the 8 districts surveyed (4 each in Punjab and Western UP). On average, two such providers exist per village or nearby. The study also noted that more service providers improve accessibility, boosting adoption among smallholders. These individuals outperform cooperatives and hiring centres due to their decentralized nature (see figure below). Farmers contact them via mobile phones, often on a first-come, first-served basis.

A cooperative leader remarked, "... first we provide laser land levelling services to the members of the co-operative, then to others if there is time left... there is not much time left... you see we need to do it in a period of two months..."

This highlights the need for more machines locally to support broader adoption.



Comparing institutional mechanisms for renting: From a centralized to a decentralized supply

INCORPORATING PRIVATE INDIVIDUAL SERVICE PROVIDERS INTO EXTENSION LANDSCAPE

The agricultural extension landscape includes various methods, stakeholders, and challenges in supporting and informing farmers. Traditionally, extension followed a top-down approach, transferring knowledge from researchers directly to farmers or farmer organizations.

However, the [Agricultural Innovation Systems \(AIS\) framework](#)—now increasingly used for extension interventions—recognizes a broader range of actors across various domains and emphasizes engaging these stakeholders. These newer perspectives have yet to significantly reshape extension practices in Punjab.

Given the evolving extension landscape, there's a need to shift from traditional tech transfer to integrated approaches that consider local needs, market systems, and sustainability. This also means recognizing and leveraging a broader group of stakeholders to drive innovation and impact.

Currently, the extension system in Punjab promotes laser land levelling mainly through bulletins and [field demonstrations](#). Only [limited efforts](#) have been made to train tractor drivers. This reveals a gap and an opportunity for building the capacity of service providers and encouraging rental services as viable enterprises.

The [Sub-Mission on Agricultural Mechanization \(SMAM\)](#) supports financial aid and training for purchasing and using agricultural machinery. One private provider shared, "Yes, there is a subsidy, but I didn't apply for it because I wasn't aware of the procedure... Perhaps the company representatives

(referring to the seller) handled that.” This underscores the need for better information dissemination, particularly through mechanization service providers.

Finally, adoption is not a one-time event. It requires ongoing support and coordination among multiple agencies. By building the capacity of private service providers, we can foster broader adoption, boosting both agricultural productivity and sustainability.

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