



**GOVERNMENT OF THE PUNJAB**  
Agriculture Department

# LASER LAND LEVELLING



**TECHNICAL BRIEF**

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## BACKGROUND

A significant amount of irrigation water (20 to 25%) is lost during its application to the crops because of uneven fields and inappropriate farm designing. This leads to excessive application to low-lying areas and under-irrigation of higher spots. Over-irrigation leaches soluble nutrients from the crop root zone and on the other hand, under-irrigation of elevated parts of the fields results yield loss due to insufficient water besides accumulation of salts in such patches. This ultimately results in less crop productivity, degrades groundwater quality, causes water stress, and restricts efficient application of agricultural inputs.

## LASER LAND LEVELLING BENEFITS

- ❑ **Increases productivity of land and water resources**
- ❑ **Improves agricultural incomes**
- ❑ **Enhances cultivated area by reducing dikes and ditches**
- ❑ **Reduces production costs by enhancing cultivation efficiency and minimizing labor for irrigation**
- ❑ **Makes effective use of utilize every drop of water and each inch of agricultural land**
- ❑ **Alleviates poverty in rural areas through better farm returns and employment generation**

Moreover, traditional farm layouts consist of a number of ditches traversing over two kilometers in an area of one "square" (25 acres) serving numerous small flood basins called "Khal Kiari System". The fields being not properly leveled, cause excessive wastage of land, water, and other agricultural inputs (fertilizers, pesticides etc.), which result in lower crop yields. Water Management wing of Agriculture Department has developed a cost effective and sustainable solution in the form of LASER land leveling to address all these problems. The technology is well adopted by the farmers resulting in significant amount of water savings and enhancing crop productivity.



Unleveled Field



LASER Leveled Field





## INTRODUCTION

Use of LASER technology in the precision land leveling was introduced in the Punjab during 1985 through on farm water management (OFWM) program. It was difficult, costly, and cumbersome to achieve the required degree of precision in leveling unlevelled fields by the famous “rope operated bucket” scraper. The use of this scraper is, however, necessary for bulk earth movement to make the LASER leveling operation cost effective.

The LASER land leveling technology has been proved to be highly beneficial because it saves irrigation water, curtails irrigation time, improves efficiency of agricultural inputs, ascertains uniform seed germination and resultantly enhances crop yields.



## LASER LAND LEVELLING SYSTEM

The LASER controlled land leveling system comprises of a transmitter that transmits the LASER beam about 2 to 3 meters above the ground level in a circle. These signals are intercepted by a receiver mounted on the leveling blade attached to the tractor. The control panel fitted on the tractor interprets the signals from the receiver and opens or closes the hydraulic control valve that raises or lowers the leveling blade to level the field.



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## LASER LAND LEVELING PROCEDURE

1. The leveling process starts with formation of survey (cut/fill) map of the field to fully understand locations of cut and fill locations. The areas from where soil is to be cut is chiseled/plowed to loosen the surface for easy movement of earth. All the vegetations and crop residues are also taken out from the field to remove hurdles during leveling operation.
2. It is ensured that tractor, scraper, hydraulic, electrical components etc. are in proper working order before starting the leveling process. The receiver is mounted on the scraper and all connections to the control panel on the tractor as well as hydraulic valves are tightly connected. The LASER transmitter is setup properly to ensure that it is transmitting a horizontal plan of light over the entire operational area.
3. The transmitter is turned on and the correct field level is established by taking rod reading at the bench mark.





- Two pieces of timber/brick are firmly set about one meter apart and are dug into the soil so that blade of scraper can rest on them in level position. Their top level is set equivalent of the designed field level by taking ready from the bench mark and scraper is moved over these pieces and its blade is fully lowered onto them. The mast is then moved in upper or lower directions until the "on grade" light is blinked on the control panel. The LASER unit is now ready for the land leveling operation.



**LASER technology reduces cost of land leveling and increases efficiency**



- The tractor is then moved in the field towards cut area. If the receiver is above the LASER beam, the red light at the control panel turns "ON" indicating cut area and scraper starts cutting the soil. The operator moves the tractor towards fill area where yellow light is turned "ON" and blade lifts itself up and starts dropping the collected earth. The tractor is again moved to the high (cut) area and shifts, soil to low (fill) areas. This process is repeated time and again till entire field becomes at one level and the green light turns "ON" all over the area indicating that the field has now leveled.

**LASER land leveling increases efficiency of agricultural machinery and curtails 35 percent of labour**



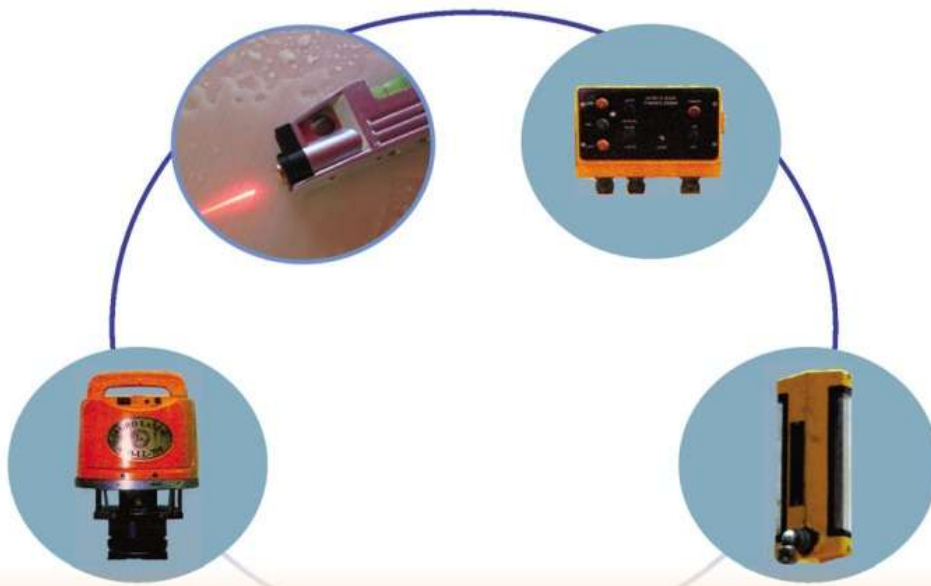
- The green light indicates achieving the desired field level. The leveling operation is concluding by moving the scarper across the field to give it final finish.





The present water shortages in the country demand efficient utilization of this scarce resource for its most efficient utilization.

About 20 to 25 percent of irrigation water is lost due to uneven fields and inappropriate designing of agricultural fields.





## BENEFITS OF LASER TECHNOLOGY

- a) Saves 50 percent of irrigation water
- b) Increases crop yields upto 25 percent
- c) Enhances irrigated area upto 40 percent
- d) Improves cropping intensity from 35 to 40 percent
- e) Raises fertilizer use efficiency by 15 to 35 percent
- f) Decreases land under ditches and dikes by 60 percent and results increase in cropped area by 2.5 percent
- g) Reduces water logging and salinity upto 42 percent
- h) Ascertains uniform seed germination
- i) Makes farm machinery operations more efficient







## LASER LAND LEVELLING IN PUNJAB

- ❑ The first LASER land leveler was imported in the Punjab during 1985 and cost of unit was Rs. 600,000 (US\$ 37,500 @ 1US\$ = Rs.16)
- ❑ Now 80 percent of LASER unit is manufactured locally
- ❑ The current price of LASER unit is Rs. 600,000 or US\$ 6,000 (1US\$=Rs.90)
- ❑ About 4,000 LASER units, presently working in private sector, are carrying out precision leveling of about 1.2 million acres annually in the province
- ❑ The LASER land leveling activity has created employment opportunities for over 8,000 persons (drivers and mechanics)
- ❑ The repair facilities for LASER units are available throughout the province



# WATER MANAGEMENT ACTIVITIES



LASER Land Leveling



Watercourse Improvement



Sprinkler Irrigation



Drip Irrigation



Bed & Furrow Technology



Solar Water Pump



Hydro Flume Irrigation



Flexible Pipe Irrigation

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