



Laser Land Levelling

by Raymond Chia

The economical benefits of perfectly levelled fields are enormous, especially in India. For instance, a levelled field results in substantial watersavings and an increase in yield and product quality. Rotating lasers have become essential tools for agricultural applications. They make faster work of many jobs, while eliminating costly errors for precise levelling. Once considered “nice to have,” today they are a competitive “must have” to get the job done efficiently and precisely.

Uneven soil surface has a major impact on the germination, stand, and yield of crops due to inhomogeneous water distribution and soil moisture. Therefore, land levelling is a precursor to good agronomic, soil, and crop management practices. Furthermore, resource conservation technologies perform better on well-levelled and laid-out fields.

Benefits of land levelling

Effective land levelling optimises water-use, improves crop establishment, reduces the irrigation time and the effort required to manage the crop. It reduces the work in crop establishment and crop management, and increases the yield and product quality. Research has shown an increase in rice yield of up to

24 percent due to good field levelling. A large part of this increase is realized due to improved weed control. Therefore, with the improved water coverage, resulting from proper levelling, the weeds can be reduced by up to 40 percent. In addition, land levelling frees up land for cultivation, resulting in larger fields and larger farming areas, which improves the operational efficiency. Furthermore, levelling reduces the time needed for planting and transplanting. It even gives a greater opportunity to use the much faster, direct seeding process.

Efficiency of water use

The average difference in height between the highest and lowest portions of rice fields in Asia is 160mm. This means that in an unlevelled field an extra 80mm to 100mm of water must be stored in the field to give complete water coverage. This is nearly an extra 10 percent of the total water requirement to grow the crop. Land levelling effectively terraces fields, allowing water in the higher fields to be used in the lower fields for land preparation, plant establishment, and irrigation.

Economics of land levelling

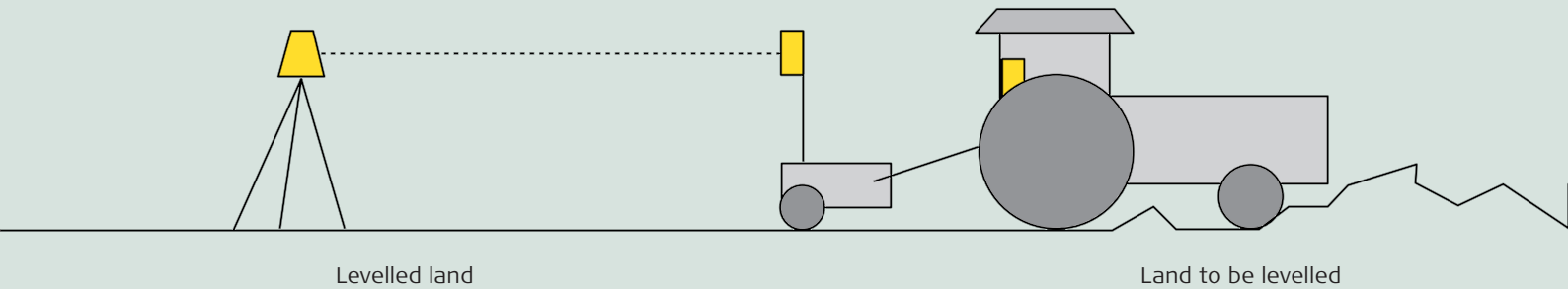
The initial cost of land levelling using contractor sand machinery is high. This cost varies with the volume of soil to be moved and the soil type. However, using

Principle of Laser Land Levelling

Leica Rugby 100LR transmits the laser beam

Leica MLS700 Sensor detects the laser beam

Leica MCP700 Control Panel helps control the level of the machine



more sophisticated equipment increases the area that can be levelled each day and several examples show that the initial costs are paid back within 1 or 2 years due to the improved yield.

Farmers recognize this and therefore devote considerable attention and resources to levelling their fields properly. However, traditional methods of levelling land are not only more cumbersome and time-consuming, but more expensive as well. For instance, rice farmers level their fields very often under ponded water conditions. Others dry level their fields and check the level by ponding water. With these methods a considerable amount of water is wasted.

Laser land levelling – the cost-effective solution

Laser levelling systems are commonly used in agricultural applications in Australia, Japan, and the United States. Increasingly, laser-guided systems are being used in less developed country as well. The advantages are obvious:

- No waste of water to check the field level
- Reduced operating time
- Increased productivity
- Precisely levelled and smooth soil surface

Before the levelling process can start, the fields must be to be plowed and a topographic survey undertaken, in most situations. Depending on the amount of soil that must be cut, it may be necessary to plow during and after the levelling operation, as well.

An optimal combination of instruments for laser land levelling exists with the Leica Rugby 100LR, the Leica

MLS700 Laser Sensor and the Leica MCP700 Control Panel. The Leica Rugby 100LR is mounted on a tripod and placed in a central point of the field. This allows the laser beam to sweep unobstructed above the tractor. As the Leica Rugby 100LR has an operating range of 1'500m in diameter, several tractors can work with the “plane of light above the field” coming from one device. The laser beam of the Leica Rugby 100LR is detected by the Leica MLS700 Laser Sensor, which is mounted on the mast attached to the drag bucket. It transmits the signals to the Leica MCP700 Control Panel, which controls the level of the machine and operates the hydraulic valves. With the hydraulic valves the levelling bucket can be raised and lowered. The desired rate at which the bucket has to be raised and lowered depends on the operating speed. The faster the ground speed, the faster the bucket will need to be adjusted.

Once a field has been levelled, plowing techniques must be changed to keep it level. Farmers are encouraged to plow from the center of the field out rather than continuing to use the traditional technique of plowing from the outside of the field into the centre. If appropriate plowing techniques are used, re-levelling the whole field should not be necessary for at least eight to ten years. ■

About the author:

Raymond Chia works as regional marketing manager in Asia Pacific for the Leica Geosystems Precision Tools Division.