Salahaddin University

College of Agricultural Engineering Sciences

Soil and Water Department

Second Stage

Lecture – 1 -

Land Levelling

By

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Levelling

Levelling is used to determine the height of the given points above or below the datum line or to set the required height above or below the datum line in the given points.

Land leveling is the process of modifying the surface relief by smoothening it.

Land Levelling

It is the process of flattening or modifying existing (natural) slopes or undulations and thereby creating a level surface. Normally land leveling requires excavation and movement of earth from higher elevations to lower elevations.

Land grading

Land grading is modifying the slope of land to a planned grade (slope) and specifications for different purposes (e.g. irrigation planning). The operations are usually accomplished using special equipments to eliminate the minor irregularities but not to change the general topography of the land surface.

Land levelling is a measure used in surface irrigation, such as basin and furrow irrigation. It consists of:

1. Preparing the irrigation plot in a way that no high and/or low spots disturb the uniform distribution of irrigation water on the field.
2. Ensuring the optimal slope for water movement across a field when irrigated.

Levelling can be done manually or with machinery and corresponding equipment. Heavy earth movement should be avoided in order to keep the natural soil structure undisturbed, thus maintaining good growing conditions for the crop roots and keeping costs low. Experienced farmers often do land levelling according to visual assessment, e.g. on small plots with hoes, or with animals and equipment such as ploughs and bars. Equipment such as grading blades and hydraulically operated levellers mounted on wheels are used with tractors.

More advanced and sophisticated levelling equipment is operated with a laser emitter, a laser sensor or receiver, and a scraper pulled by a tractor. After the desired level or slope of the field and/or the difference of the high and low spots have been surveyed, the emitter is set to send a rotating laser beam creating a plane of laser light above the field surface. The laser light is used as the levelling reference. It directs the hydraulic system of the moving tractor and scraper, and thereby controls the levelling.

Benefits of land levelling

The main benefits of levelling are:

1. **Improved crop establishment.**

2. **Water coverage of the field (Better use of water).** Rice farmers using animal or 2-wheel tractors rely on water to accumulate in the field before starting land preparation. The higher the difference between the highest and lowest portions of a rice field, the more water is needed to achieve complete water coverage. Good leveling may reduce total water requirement to grow the crop by up to 10%.

3. **Crop stand and maturation**

4. **Better weed control.** Reduction of weeds by up to 40 % (thereby a 75 % decrease of labour required for weeding).

5. **Increase of farming area (Larger farming area):** Good land leveling enables larger fields by 5-7%. Larger fields increase the farming area and improve operational efficiency. Increasing field sizes from 0.1 hectare to 0.5 hectare increases the farming area by between 5% and 7%. This increase in farming area gives the farmer the option to reshape the farming area and can reduce operating times by 10% to 15%.

6. Faster seeding/Less work

Leveling reduces the time needed for transplanting and for direct seeding. Land leveling provides greater opportunity to use direct seeding. The possible reduction in labor by changing from transplanting to direct seeding is approximately 30 person-days per hectare. Within rice production, the possibility of changing from planting and transplanting to direct seeding which results in reduced labour of 30 person-days per ha.

7. **Higher yield (Average yield increase of 10- 20 %).**

   Good field leveling increases the rice yield considerably. In two experiments conducted at different localities, a strong correlation was found between the levelness of the land and crop yield.

8. **Reduction of farm operation times by 10-15 %**

Weeds under water (left) and complete eradication of weeds (right)

The major problem with land leveling is the effect of removing the topsoil and its subsequent influence on plant growth. Reduced growth may occur on the fill areas, although the exposure of subsoil in the cuts is usually a more serious problem

	Benefits	Costs (LE/fed)	Additional revenue (LE/fed)	Net profit (LE/fed)
Alternative 1 (manually operated shield)	Yield increase by 10% Saved pumping cost by 15% Saved irrigation labour cost by 15%	75	448	373
Alternative 2 (hydraulically operated shield)	Yield increase by 10% Saved pumping cost by 15% Saved irrigation labour cost by 15%	62.5	448	385,5
Alternative 3 (laser land levelling unit)	Yield increase by 20% Saved pumping cost by 20% Saved irrigation labour cost by 20%	150	864	714