4.5 Land Leveling

Applicability
This Best Management Practice is applicable to agricultural producers who use furrow, border, basin, or flood irrigation of agricultural crops.

Description
This Best Management Practice is used to increase the uniformity with which water is applied to an irrigated field. The term "Land Leveling" generally applies to mechanized grading of agricultural land based on a detailed engineering survey, design, and layout. In only a few special situations does the final product of land leveling result in a level field. Normally final slopes are up to three percent for furrow irrigation and up to two percent for border irrigation. Most land leveling is done using a laser-controlled scraper pulled by a tractor. The laser is set to pre-determined cross and run slopes, and the scraper automatically adjusts the cut or filled land over the plane of the field as the tractor moves.

Implementation
All leveling work should be designed based on measurement of land elevations (topography). If more than one irrigation method or more than one kind of crop is planned, the land must be leveled to meet the requirements of the most restrictive irrigation method and crop. The leveling work must adhere to the slope limits of the water application method, provide for removal of excess surface water, and control erosion caused by rainfall.

Scope and Schedule
Land leveling is typically used on mildly sloping land, whereas contour farming is used to farm on modest slopes and terrace farming is used for steeply sloping land. Land leveling is primarily used by agricultural producers using surface irrigation methods (furrow, border, basin, or flood) or by those wishing to improve surface drainage of their non-irrigated field.

Land leveling work falls into two general categories:

1. Large scale land shaping prior to cultivating newly irrigated land or land that has never been graded; or
2. Floating of a field prior to preparation of seed beds or borders.

The time required to grade a field depends on the size and type of land grading equipment, the quantity of soil to be moved, and the complexity of the existing field surface. Typically, the time required to "touchup" a field prior to planting is measured in hours per acre, whereas initial grading of a field may take one or more days per acre.

Measuring Implementation and Determining Water Savings

The documentation may consist of:

1. Copies of the topographic survey of the land prior to land leveling;
2. Drawings that show the design slopes and field layout after the land leveling work are complete; or
3. Annual records of "touch-up" land leveling work by field.

The quantity of water that may be saved from land leveling is difficult to estimate. A recent study for the Lower Colorado River Authority evaluated water savings for precision leveled rice fields across an entire irrigation district near the Texas Gulf Coast.[2] Direct savings attributable to leveling were at least 0.3 acre-feet per acre for first-crop rice. Land leveling is critically important to improving surface irrigation uniformity and application efficiency.

Cost-Effectiveness Considerations

The cost of land leveling for new irrigation fields is usually estimated based on the soil type, the cut to fill ratio, and the total number of cubic yards to be cut. Touch-up land leveling is usually based on a "per acre" or "per hour" rate. Cost per yard of cut varies from approximately $1.50 to $2.50 per cubic yard depending largely on diesel fuel costs. Initial costs per acre for land leveling can range from $150 to $500. Touch-up land leveling usually costs less than $50 per acre and most commonly less than $25 per acre.

References for Additional Information

1. *Conservation Practice Standard for Irrigation Land Leveling (Acre)*, Code 464, USDA - Natural Resources Conservation Service, Temple, TX, March 2011.
2. Ramirez, A.K. and Eaton, D.J. *Statistical Testing for Precision Graded Verification*, a report from the University of Texas at Austin to the Lower Colorado River Authority, Austin, TX, September, 2012.

Determination of Impact on Other Resources

The impact of this practice on other resources is generally slight. The uniform surface that results from this practice increases infiltration by increasing the time water is standing on the soil surface and reduces the potential for transport of nutrients and other pollutants to surface water.