

4.2 Land Management Systems

4.2.1 FURROW DIKES

A. Applicability

This BMP is used to reduce water runoff from agricultural row crops and is intended for use by agricultural producers that plant row crops.

B. Description

Furrow dikes are small earthen dams formed periodically between furrow ridges. Furrow dikes reduce runoff from the soil surface and increase infiltration of rain or water applied by sprinkler irrigation. Furrow dikes can be used on gently sloping land in arid and semiarid areas.

C. Implementation

Furrow dikes should be implemented in fields with row crops to capture rainfall, reduce runoff from fields, and improve uniformity of low pressure sprinkler irrigation applications.

D. Schedule

Furrow dikes are typically first installed in non-wheel traffic rows at the time the crop bedding is prepared and reinstalled or maintained as necessary during portions of the crop growing season with high irrigation demand or high probability of rainfall occurring.

E. Scope

Furrow dikes are installed using a tractor-drawn implement in non-wheel traffic rows and can be used in the following agricultural practices:

- 1) In conjunction with a conservation tillage practice, furrow dikes are installed in rows when the crop bedding is prepared to facilitate capture of rainwater or water from preplant low-pressure sprinkler irrigation and may remain in place during the entire growing season.
- 2) In conjunction with conventional tillage, furrow dikes can also be installed after the crop bed is prepared and prior to planting or after a crop is planted and prior to the crop height being such that the installation would damage the crop. The dikes must be removed prior to and replaced after mechanical cultivation of weeds.
- 3) Furrow dikes are typically removed when additional moisture from rainfall would be detrimental to production or harvest of the crop.

F. Documentation

To document this BMP, the agricultural water user shall document and maintain one or more of the following records:

- 1) Photographs of the furrow dikes installed;
- 2) Any USDA Farm Service Agency or other governmental agency evaluation and assistance reports that may relate to the project; and
- 3) Water measurement records from both the periods before and after conversion to the water efficient irrigation system.

G. Determination of Water Savings

The amount of water conserved using furrow dikes is difficult to estimate and is dependent on when the furrow dikes are installed, the amount of rainfall, rainfall intensity, the infiltration rate of the soil, the slope of the furrow, and the application rate of the sprinkler irrigation system. Measured data for a row crop field without furrow dikes in the High Plains Region of Texas showed that the quantity of runoff was equal to 12 percent of the gross quantity of water applied using sprinkler irrigation. The runoff was eliminated for the same field when the furrow dikes were installed.

H. Cost-Effectiveness Considerations

The cost for purchasing or constructing a furrow diking implement ranges from less than \$2,000 to several thousand. Cost estimates per crop season per acre range from \$5 to \$30 per acre. The quantity of water saved by installation of such varies from field to field and season to season, but a conservative estimate would be three inches per season (0.25 acre-feet per acre).

I. References for Additional Information

- 1) *The Impact of Furrow Dike, Terracing, and Contour Cultivation on Water Conservation in Texas Agriculture*, Tucker, Kevin and Sam Feagley, 1998.
- 2) *Water management studies in the Rolling Plains*, TAES, B-1321. 19 p., Gerard, C.J., D.G. Bordovsky, and L.E. Clark, 1980.
- 3) *Furrow diking to conserve moisture*, J. of Soil Water Cons. 44: 271-273. Harris, B.L., and J.H. Krishna, 1989.
- 4) *Off-Season Manager Tips Pre-Plant Irrigation Management*, S5-02/03, Texas Agricultural Extension Service, 5 p., Porter, Dana, 2003.

4.2.2 LAND LEVELING

A. Applicability

This BMP is applicable to agricultural producers that use furrow, border, or basin irrigating of agricultural crops.

B. Description

This BMP is used to increase the uniformity with which water is applied to an irrigated field. The term “Land Level” generally applies to mechanized grading of agricultural land based on a topographic survey. In only a few special situations does the final product of land leveling result in a level field. Most land leveling is done using a laser controlled scraper pulled by a tractor. The laser is set to predetermined cross and run slopes, and the scraper automatically adjusts the cut or filled land over the plane of the field as the tractor moves.

C. 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 be designed within the slope limits of the water application method used, provide for removal of excess surface water and control erosion caused by rainfall.

D. Schedule

Land leveling work falls into two general categories: 1) large scale land shaping typical to newly irrigated land or land that has never been graded, and 2) land level or floating of a field prior to preparation of seed beds or borders. The time required per acre of land to grade a field depends on the size of the land grading equipment and the quantity and distance that soil must be moved. Typically, the time required to “touch-up” 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.

E. Scope

Land leveling is typically used on mildly sloping land. 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 methods (furrow, border, or basin) to irrigate their fields or by those wishing to improve surface drainage of their non-irrigated field.

F. Documentation

The documentation may consist of the following items:

- Copies of the topographic survey of the land prior to land leveling.

- Drawings that show the design slopes and field layout after the land leveling work is complete.
- Annual records of “touch-up” land leveling work by field.

G. Determination of Water Savings

The quantity of water that may be saved from land leveling is difficult to estimate. Land leveling is critically important to improving surface irrigation uniformity and application efficiencies.

H. 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 which must 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 \$1.00 to \$2.00 per cubic yard depending largely on diesel fuel costs. Initial costs per acre for land leveling can range from \$50 to \$400. Touch up land leveling usually costs less than \$50 per acre and most commonly less than \$25 per acre.

I. References for Additional Information

- 1) *Irrigation Land Leveling*, Natural Resources Conservation Service, United States Department of Agriculture, National Conservation Practice Standards No. 464.