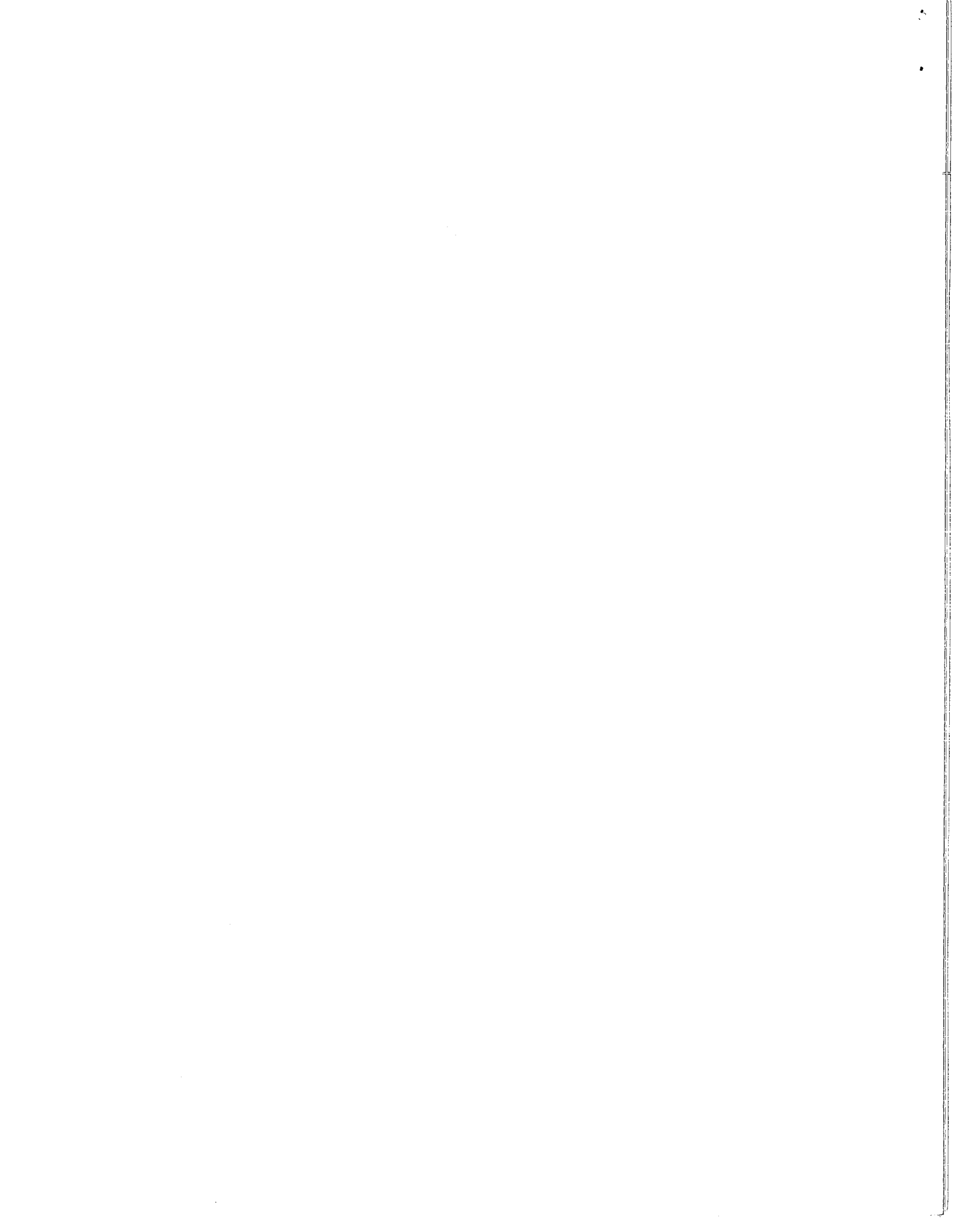


# **Irrigation Training Toolbox Irrigation System Evaluation**

## **Lesson Plan Gathering Data for Evaluating a Border Irrigation**

**National Employee Development Center  
Natural Resources Conservation Service  
Fort Worth, Texas  
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IRRIGATION WATER MANAGEMENT  
Lesson Plan No. 5

Title: Gathering Data for Evaluating a Border Irrigation.

Objective: Give each participant field experience in the mechanical procedure of gathering and recording field data for use in evaluating border irrigation.

Time: 4 hours

Location: Field

Method: Group Activity

Key Points: (Agricultural Handbook No. 82)

1. Make field layout.
  - a. Choose site. (Obtain Data and fill out-  
Exhibit-IWM-3)
  - b. Install stakes at measured stations for length of border.
  - c. Run profile survey of border strips, using stakes for reference points.
  - d. Determine measuring devices or methods to be used for measuring inflow and outflow from the border strip.
2. Make Intake Measurements.
  - a. Install a bank of cylinders in border adjacent to irrigated strip.
  - b. Run cylinder tests and properly record data on form SCS-322.
3. Determine moisture content of the soil profile before irrigation.
  - a. Estimating.
    - (1) Obtain soil sample from each significant layer of the root zone by use of an auger.
    - (2) Use the procedure of the feel chart and estimate the moisture content of each sample.
    - (3) Record information on Exhibit-IWM-4 (ref. Exhibit-IWM-20)
  - b. Measuring and Computing
    - (1) Obtain soil sample from each significant layer of the root zone by use of the Ely Volumeter.

- (2) Determine moisture content of the sample by use of Speedy Moisture Tester.
- (3) Record information on Exhibit-IWM-1
4. Determine the moisture content of the soil profile at field capacity.
  - a. Estimating - Obtain from chart, EXHIBIT - IWM - 20 (based on soil texture). Record on form Irr-1.
  - b. Measuring - Make Speedy Moisture tester measurements on sample of soil at field capacity. (EXHIBIT - IWM - 1)
5. Obtain Inflow and Outflow Measurements.
  - a. Install measuring devices at inlet and outlet to the border strip.
  - b. Obtain gage readings versus time at time intervals from the beginning of flow into and out of the border strip to the completion of test.
  - c. Record information in EXHIBIT - IWM - 5.
6. Obtain Rates of Advance and Recession.
  - a. Observe and record the time flow reaches each station (IWM - 5).
  - b. Observe and record the time flow recedes from each station, (IWM - 5).
7. Field check of depth and uniformity of penetration.

Equipment and Materials:

1. Stakes.
2. Marking crayon or pencil.
3. Chain.
4. Level, rod and tripod.
5. Measuring devices.
6. Cylinders.
7. Stop watch.
8. Field notebook.
9. Forms for recording inflow and outflow, advance and recession, soil moisture content, available water holding capacity of soil, cylinder trial.

Quizes:

## BORDER IRR. DATA

Farm		Date
SCD or SWCD	County	State
Legal Description		Technician
Soil Type	Mapping Symbol	
Crop	Stage of Growth	
Border Width	Length of Border	
Length of Set (Hrs)		
No. Days since last irrigation		
Irrigation Frequency (Days)		

Additional Information:

CYLINDER INFILTRMETER TEST DATA

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

SCS-322  
8-56

FARM	COUNTY	STATE	LEGAL DESCRIPTION	DATE
SOIL MAPPING SYMBOL	SOIL TYPE	SOIL MOISTURE: 0' - 1' . % OF AVAILABLE 1' - 2' . % OF AVAILABLE		
CROP	STAGE OF GROWTH			

GENERAL COMMENTS

ELAPSED TIME	CYLINDER NO. 1			CYLINDER NO. 2			CYLINDER NO. 3			CYLINDER NO. 4			CYLINDER NO. 5		
	TIME OF READING	HOOK GAGE READING	ACCUM. INTAKE	TIME OF READING	HOOK GAGE READING	ACCUM. INTAKE	TIME OF READING	HOOK GAGE READING	ACCUM. INTAKE	TIME OF READING	HOOK GAGE READING	ACCUM. INTAKE	TIME OF READING	HOOK GAGE READING	ACCUM. INTAKE
MIN.	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES
0															
5															
10															
20															
30															
45															
60															
90															
120															
180															
240															

A METHOD TO ESTIMATE THE AMOUNT OF WATER NEEDED TO REFILL THE SOIL TO ITS MOISTURE HOLDING CAPACITY ( $D_{fc}$ )

FARM \_\_\_\_\_ CROP \_\_\_\_\_

TYPE OF IRRIGATION SYSTEM \_\_\_\_\_ TECH. \_\_\_\_\_ DATE \_\_\_\_\_

1	2	3	4	5	6	7	8	9	10
Depth of soil layer (ins.)	Soil texture <sup>1</sup>					Available moisture holding capacity <sup>2</sup> (ins.)	Soil moisture <sup>3</sup> before irrigation		Moisture deficiency $D_n$ (ins.)
	V	H	M	L	C		%	(ins.)	
Total							////// //////		

- 1 Check proper space to indicate soil texture. V = Very heavy; H = Heavy M = Medium; L = Light; C = Course.
- 2 Available Moisture soil will hold, in inches of water per food depth of soil. Under average conditions, the amounts for various soils are about as follows:
 

Very heavy (V) - 2.00	Medium (M) - 2.00	Coarse (C) - 0.75
Heavy (H) - 2.20	Light (L) - 1.25	
- 3 Use "Practical interpretation chart" for soil moisture determination. (See Table 1-6) Estimate percentage of available moisture in the soil by the "feel" method and multiply Column 7 and Column 8 to determine Column 9.
- 4 Soil Moisture Deficiency ( $D_n$ ) is Column 7 minus Column 9 or the total available moisture holding capacity of the soil minus moisture already in the soil before the irrigation. This is the amount of water needed to bring the moisture up to the water holding capacity of the soil in the root zone.

Table 1-6.--Practical interpretation chart of soil moisture for various soil textures and conditions

Available moisture in soil	Feel or appearance of soil				Fine and very fine textured soils
	Coarse-textured soils	Moderately coarse textured soils	Medium-textured soils		
0 percent----	Dry, loose, and single-grained; flows through fingers.	Dry and loose; flows through fingers.	Powdery dry; in some places slightly crusted but breaks down easily into powder.	Hard, baked, and cracked; has loose crumbs on surface in some places.	
50 percent or less.	Appears to be dry; does not form a ball under pressure. <sup>1</sup>	Appears to be dry; does not form a ball under pressure. <sup>1</sup>	Somewhat crumbly but holds together under pressure.	Somewhat pliable; balls under pressure. <sup>1</sup>	
50 to 75 percent.	Appears to be dry; does not form a ball under pressure. <sup>1</sup>	Balls under pressure but seldom holds together.	Forms a ball under pressure; somewhat plastic; slicks slightly under pressure.	Forms a ball; ribbons out between thumb and forefinger.	
75 percent to field capacity.	Sticks together slightly; may form a very weak ball under pressure.	Forms weak ball that breaks easily; does not slick.	Forms ball; very pliable; slicks readily if relatively high in clay.	Ribbons out between fingers easily; has a slick feeling.	
At field capacity (100 percent).	On squeezing, no free water appears on soil but wet outline of ball is left on hand.	Same as for coarse-textured soils at field capacity.	Same as for coarse-textured soils at field capacity.	Same as for coarse-textured soils at field capacity.	
Above field capacity.	Free water appears when soil is bounced in hand.	Free water is released with kneading.	Free water can be squeezed out.	Puddles; free water forms on surface.	

<sup>1</sup> Ball is formed by squeezing a handful of soil very firmly.



FORM FOR RECORDING  
DATA FROM BORDER IRRIGATION FIELD TRIAL

Farm \_\_\_\_\_ Border Strip No. \_\_\_\_\_ Date \_\_\_\_\_  
 Inflow \_\_\_\_\_ (gpm)(cfs)  
 FIELD \_\_\_\_\_ CROP \_\_\_\_\_

SCD

Elev.	Time water is on the land				Opportunity Time To	Depth Infiltrated Fo
	Advance of water sheet		Recession of water sheet			
	Time <u>1/</u>	Elapsed Time <u>2/</u>	Time <u>1/</u>	Elapsed Time <u>2/</u>		
<u>Ft.</u>		<u>Min.</u>		<u>Min.</u>		

1/ Use a 24-hour clock reading, i.e. 1:30 p.m. should be recoded as 13:30  
 2/ After water is turned on at head of field.

## PHYSICAL PROPERTIES OF SOILS

SOIL TEXTURE	APPARENT SPECIFIC GRAVITY AS	FIELD CAPACITY % FC	PERMANENT WILTING POINT % PW	TOTAL AVAILABLE MOISTURE	
				DRY WEIGHT %	INCHES PER FOOT
Sand Avg.	1.55-1.80 1.65	6-12 9	2-6 4	4-6 5	0.8-1.2 1.0
Sandy Loam Avg.	1.40-1.60 1.50	10-18 14	4-8 6	6-10 8	1.1-1.8 1.4
Loam Avg.	1.35-1.50 1.40	18-26 22	8-12 10	10-14 12	1.7-2.3 2.0
Clay Loam Avg.	1.30-1.40 1.35	23-31 27	11-15 13	12-16 14	2.0-2.6 2.3
Silty Clay Avg.	1.25-1.35 1.30	27-35 31	13-17 15	14-18 16	2.2-2.8 2.5
Clay Avg.	1.20-1.30 1.25	31-39 35	15-19 17	16-20 18	2.8-3.0 2.7