TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE Boise, Idaho SOIL CONSERVATION SERVICE

TN - ECONOMICS AND COST RETURN - 4 June 24, 1976

RESOURCE EVALUATION PROCEDURE FOR DEVELOPMENT OF NEW IRRIGATED LAND

Periodically the Soil Conservation District and Service are called upon to help analyze the economic feasibility of new irrigated land. This may be on an individual ownership basis or large project type development. The procedure outlined in this note will help the technician become familiar with a proposed irrigation project. He will have an opportunity to analyze resources, development costs, and expected returns. These items should be of concern to the developer and he should have a complete understanding of the plus and minus factors of the development before proceeding.

1. Map the soils of the project area.

2. Inventory the source of water and type of irrigation possible. Most new land in Idaho will require pumping of water. Sprinkler systems probably will be the preferred method of irrigation unless the land would need only minimal land treatment for a surface system.

3. Develop an amortized per acre cost estimate of putting the irrigation system on the land. (Exhibit 4)

4. Group similar soils according to the treatment needs and potential production (Exhibit 1). Continue with this step to develop productivity indexes for each soil group. (Refer to Suggested Procedure for Utilizing Soil Surveys in Evaluation of Agricultural Land by Tom Priest, September 1971.)

5. Using the long term crop rotation and expected yields in the productivity index as a base, estimate the annual return over variable cost of production for each productivity index. (Exhibit 2)

6. Estimate the amortized annual costs of putting the land into a condition for farming. Example - surface rock removal, present vegetation removal, fencing, roads, etc.

7. Estimate the weighted per acre returns over cost of production for each productivity index. This is determined by taking the annual returns over variable cost of production (item 5) and subtracting the cost of preparing the land for farming (item 6) and subtracting the cost of the irrigation system (item 3), (Exhibits 3 and 5).

8. For each farm unit, measure the acres of each productivity index soil that will be farmed or be under an irrigation system.

9. Multiply the acres of each productivity index in a farm unit (item 8) by the weighted per acre returns over cost of production (item 7). Add for a total weighted return over cost of production for the farm unit.

10. List and estimate the fixed costs needed to farm the land on a continuing basis. Some will be amortized such as farmstead and machinery. Others are annual costs such as taxes, insurance, interest on land investment, family living, repairs, and risk (Exhibit 6). Total these for the farm unit. This is the annual cost to the developer whether he farms the land or not.

11. Feasibility of developing irrigated land may be estimated by comparing the annual fixed costs (item 10) with the annual returns over costs of production (item 7). Where the returns are greater than the fixed costs, it would be feasible to develop the farm unit. Where the reverse is true, the development would be questionable.

Note #1: The annual fixed costs may be reduced under certain situations common in Idaho.

a. The developer may have a home or headquarters within commuting distance and does not need to build on the new land.

b. The developer may be farming now with the needed machinery on hand.

Note #2: It is best to make this analysis with an interdisciplinary approach.

a. The DC with advice and data from the soil conservation district, Extension Service, and many others can develop items 2, 4, 7, 8, 9 and 11.

b. With assistance of an engineer, items 3 and 6 may be developed.

c. Assistance from an economist will be needed for items 5 and 10.

d. Soil scientists may help on item 1.

Note #3: This procedure is applicable when dry cropland is being considered for conversion to irrigated cropland. However, it will require a separate analysis of the dry cropland to develop a present annual return over variable cost of production. In this case, the present annual returns would be subtracted from

the total weighted annual returns under irrigated conditions in item 9.

Other items that need to be considered in any analysis would be the erosion and water quality potential in the land's present condition versus the new land use. Also, the value of the land as wildlife habitat in the present versus new land use.

CALCULATION OF SOIL-PRODUCTIVITY INDEX (PI)

SOILS	MAP SYMBOL
Colthorp stony loam, 0 to 2 percent slopes	CsA*
McCain very stony silt loam, 0 to 2 percent slopes	MsA*
Power-McCain silt loam, stony, 0 to 2 percent slopes	PnA*
Purdam-Power silt loam, 0 to 2 percent slopes	PuA
Purdam-Power silt loam, 2 to 4 percent slopes	PuB
Elijah silt loam, 2 to 4 percent slopes	EhB
Elijah silt loam, basalt substratum, 0 to 2 percent slopes	EjA
Elijah silt loam, basalt substratum, 2 to 4 percent slopes	EjB
McCain silt loam, 0 to 2 percent slopes	McA
McCain silt loam, 2 to 4 percent slopes	McB
Minidoka silt loam, 2 to 4 percent slopes	MkB
Purdam silt loam, 0 to 2 percent slopes	PdA
Purdam silt loam, 2 to 4 percent slopes	PdB
Power-McCain silt loams, 0 to 2 percent slopes	PmA
Power-McCain silt loams, 2 to 4 percent slopes	PmB
Power-Potratz silt loams, 2 to 4 percent slopes	PpB
Potratz silt loam, 0 to 2 percent slopes	PrA
Potratz silt loam, 2 to 4 percent slopes	PrB

* These soils in their present condition are Capability IVs and if farmed as such would be in Productivity Index 75. They are stony on the surface and the stones may be removed at an estimated cost of $400 per acre. When the stones have been removed, the soil has a Productivity Index of 111.

CROP	Estimated Yield/Ac. (1)	Base Yield (100) (2)	Relative Yield (&) (3) = (1) ÷ 2	Acreage Ratio (4)	Crop Contribution (5) (3) x (4)
Alfalfa hay	5.5 tons	5.5 tons	100	.20	20
Corn silage	24 tons	20 tons	120	.10	12
Potatoes	300 cwt.	280 cwt	107	.10	11
Mixed grain	90 bu.	80 bu.	113	.20	23
Sugar beets	22 tons	22 tons	100	.15	15
Pasture	16 aums	16 aums	100	.05	5
Corn grain	95 bu.	80 bu.	119	.15	18
Alfalfa seed	700 lb.	500 lb.	140	.05	7

Soil - Productivity Index = Sum of crop contribution = 111

RETURNS OVER THE VARIABLE COST OF PRODUCTION
FOR CORN SILAGE PER ACRE *

SOIL INDEX RATING	75	95	111	130
Crop Yield in Tons	16	18	24	26
Receipts @ $13.20/ton	$211.20	$237.60	$316.80	$343.20
Variable Cost Pre Harvest	91.36	91.36	91.36	91.36
Harvest (custom @ $3.50/ton	56.00	63.00	84.00	91.00
Total Variable Cost	147.36	154.36	175.36	182.36
Returns	63.84	83.24	141.44	160.84

RETURNS OVER THE VARIABLE COST OF PRODUCTION
FOR CORN GRAIN PER ACRE

SOIL INDEX RATING	75	95	111	130
Crop Yield in Bushels	70	80	95	100
Receipts @ $2.43/bu.	$170.10	$194.40	$230.85	$243.00
Variable Cost Pre Harvest	91.36	91.36	91.36	91.36
Harvest (custom @ 25¢/bu.)	17.50	20.00	23.75	25.00
Total Variable Cost	108.86	111.36	115.11	116.36
Returns	61.24	83.04	115.74	126.64

* Developed from "Selected Crop Enterprise Cost Budgets for Idaho" -- Economic Research Service, 1975.

WEIGHTED PER ACRE RETURNS OVER THE VARIABLE COST OF PRODUCTION

SOIL INDEX RATING OF 130

Crops	Per Acre Return	Percent or Area	Weighted Per Acre Return
Alfalfa Hay	$123.15	20	$24.630
Corn Silage	160.84	5	8.042
Potatoes	891.26	10	89.126
Mixed Grain	120.86	20	24.172
Sugar Beets	624.02	15	93.603
Pasture 1/	123.15	5	6.158
Corn Grain	126.64	15	18.996
Alfalfa Seed 1/	891.26	10	89.126
		100	353.853
	Weighted Returns = $353.85 Per Acre		

SOIL INDEX RATING OF 111

Crops	Per Acre Return	Percent of Area	Weighted Per Acre Return
Alfalfa Hay	$ 98.21	20	$19.642
Corn Silage	141.44	10	14.144
Potatoes	660.26	10	66.026
Mixed Grain	102.96	20	20.592
Sugar Beets	452.00	15	67.800
Pasture 1/	98.21	5	4.910
Corn Grain	115.74	15	17.361
Alfalfa Seed 1/	660.26	5	33.013
		100	243.488
	Weighted Returns = $243.49 Per Acre		

1/ The crop budget data used in this analysis did not contain pasture or alfalfa seed crops. The following was assumed for evaluation purposes: The returns over the variable cost of production for potatoes would most nearly reflect the expected returns for alfalfa seed and alfalfa hay for pasture.

ANNUAL COST OF THE SPRINKLER SYSTEM
BASED UPON A 300 ACRE FARM

Items	Cost	Life	Amortization Factor @ 8%	Annual Fixed Cost
Well	$30,000	50 Yr.	0.082	$2,460
Pump and Motor	50,000	20 Yr.	.102	5,100
Mainline	31,000	40 Yr.	.084	2,604
Laterals	27,000	10 Yr.	.149	4,023
	$138,000			$14,187

Maintenance Estimated at 1% of cost: $138,000 X 1% = $1,380

Power Cost @ $25/H.P. per season : 400 H.P. motor X $25/H.P. = $10,000

Estimated Annual Cost of the Sprinkler System:

Annual Fixed Cost	$14,187
Maintenance	1,380
Power	10,000
TOTAL	$25,567

Per Acre: $25,567 ÷ 300 Acres = $85.22

WEIGHTED PER ACRE RETURNS OVER THE VARIABLE COSTS

OF PRODUCTION LESS THE DEVELOPMENT COSTS

Soil Index Rating	Per Acre			Column 2 less 3 and 4	Rounded 2/
	Returns over variable cost of production	Less Development Costs			
		Sprinkler System	Stone Removal		
130	$353.85	$85.22		$268.63	$269
111	243.49	85.22		158.27	158
111 (Stony)	243.49	85.22	$40.80 1/	117.47	118
95	141.63	85.22		56.41	56
95 (Stony)	141.63	85.22	$40.80 1/	15.61	16
75	55.02	85.22		-30.20	- 30
0	0	85.22		-85.22	- 85

1/ Estimated cost of $400 per acre paid off in 20 years @ 8% interest. Annual cost of removing stones per acre: $500 x 0.12 = $40.80.

2/ Total acres of each soil productivity index in a farm unit to be multiplied by weighted per acre return to determine total estimated returns of the unit to be compared with the $34,280 required.

FIXED ITEMS

Estimated Capital Cost of	
Machinery	$100,000
Amortized @ 8% interest for 20 years	10,200
Repairs @ 4% of cost	4,000
Annual Fixed Machinery Cost	$ 14,200
Estimated Capital Cost of	
Farmstead	$ 40,000
Amortized @ 8% interest for 50 years	3,280
Repairs @ 2% of Cost	800
Annual Fixed Farmstead Cost	$ 4,080
Family Living	$ 10,000
General Overhead	2,000
Taxes, Risk and Management	4,000
Total Fixed Allowances	$ 34,280