TRADITIONAL USES OF INPUT-OUTPUT MODELS IN WATERSHED PROGRAMS PLANNED UNDER PRINCIPLES AND GUIDELINES

by

Keith Sheets
Agricultural Economist - Technology Staff
USDA Natural Resources Conservation Service - State Office
Lincoln, Nebraska

Written for presentation at the 1998 Annual Meeting
Organized Symposium
THE AMERICAN AGRICULTURAL ECONOMICS ASSOCIATION

Salt Lake City, Utah
August 2-5, 1998

SUMMARY:

This paper outlines the traditional uses of input-output (I/O) modeling in watershed programs planned under federal "Principles and Guidelines." Generally, the national economic development costs and benefits are analyzed, and the I/O model is used to track on regional economic development impacts. These regional impact estimates have little impact in project selection, but provide a selling tool to develop local support for project funding and implementation.

Key Words: IMPLAN, Input-Output, watershed analysis, water quality, NRCS, conservation, regional analysis

TRADITIONAL USES OF INPUT-OUTPUT MODELS IN WATERSHED PROGRAMS PLANNED UNDER PRINCIPLES AND GUIDELINES (P&G)

Introduction

This paper discusses effects on regional economies that will be caused by the planned Turkey Creek Watershed project. Two of the effects that are usually assessed in water resource projects planned under Principles and Guidelines are Regional Economic Development (RED) and National Economic Development (NED). Regional Economic Development benefits are reported for only the significantly affected region. Effects outside the significantly affected region are recorded in the "rest of the United States" category. The region is defined for the RED account, so that all or almost all of the NED benefits for the project will accrue to the region.

The positive effects of the project on the region's income are equal to the sum of NED benefits that accrue to the region, plus transfer of income from outside the region. Income transfers to the region as a result of the project include income from implementation outlays, transfers of basic economic activity, and indirect and induced effects. In each case, income transfers refer to new income within the region rather than to increases in total expenditures.

The Turkey Creek Watershed Plan

The 175,700 acre Turkey Creek Watershed is located in Johnson and Pawnee Counties, Nebraska, and Marshall and Nemaha Counties in Kansas. The sponsoring local organization is the Nemaha Natural Resources District in Nebraska. Based on local support, the sponsor requested that the project be analyzed using the "small dam concept" that originated in Missouri (see references). Fewer larger dams make the project more environmentally friendly and reflect the desires of more local people. The recommended plan consists of 75 floodwater retarding dams (70 smaller, averaging 6 surface water acres each; and 5 larger, averaging 50 surface water acres each) to be installed to provide incidental recreation and flood prevention (see Figure 1). The project will also reduce sedimentation, enhance wildlife habitat, enhance water quality, improve riparian health, and improve economic conditions by increasing incomes. Riparian and biological assessments were part of the planning process. Table 1 shows a comparison of NED annual benefits and costs of the project.

The planning was completed under "program neutral" planning where the Natural Resources Conservation Service (NRCS) provides assistance for the planning of the project, but other funds may be used for construction. Funds for construction will be applied for through the Nebraska Natural Resources Commission's Resource Development Fund program and other eligible sources. Nebraska Resource Development Fund projects are evaluated economically by calculating an internal rate of return. No discount rate is used. Benefits and costs are entered the year they occur in a cash flow stream over the life of a project, and the internal rate of return on

the investment is then calculated. Projects need only to have a rate of return of 3% to be economically feasible. Whereas, if a PL 566 federal project has a rate of return of less than 7-1/8% (or a benefit cost ratio of less than one using 7-1/8% discount rate), it is considered economically infeasible. Since the Turkey Creek project probably will be funded by the Nebraska Resource Development Fund (local funding), it is important to show all of the local (regional) benefits. The IMPLAN computer model was used to project these local benefits.

TABLE 1

COMPARISON OF NED ANNUAL BENEFITS AND COSTS

Turkey Creek Watershed

(Dollars) [1]

Average Annual Benefits					
Evaluation Unit	Dmg. Reduction	Incidental Recreation	Total	Average Annual Cost	Rate of Return
5 larger Floodwater Retarding Structures	317,460	2,200	319,660	67,050	12.3%
70 Smaller Floodwater Retarding Structures	211,640	22,200	233,840	105,150	4.7%
Total	529,100	24,400	553,500	172,200	7.8%

Use of IMPLAN for Estimating Regional Impacts for Turkey Creek Watershed

IMPLAN is the computer simulation model used to measure the regional impacts for the Turkey Creek Watershed plan. The model produces regional multipliers based on the project expenditures in the study area. The size of a multiplier depends upon at least three things: (1) the economic activity involved; (2) the time period under consideration; and (3) the size of the area being considered. Since the proposed project would be funded primarily from state and district funds outside the watershed, Pawnee County, Nebraska, and Nemaha County, Kansas, were used as the IMPLAN area. [2]

The regional effects for the project were developed from the project construction and the NED analysis.

[1] Price Base: 1997

[2] In some projects, the Federal Government pays much of the cost. In this project, most of the funds will be local in nature, so the study area was designed to separate the benefited area (local watershed) from the outside cost bearing area. In most PL-566 studies, the local region can be the state. Using state instead of county IMPLAN regions would provide larger multipliers, since there would be less leakage outside a larger region.

Figure 1

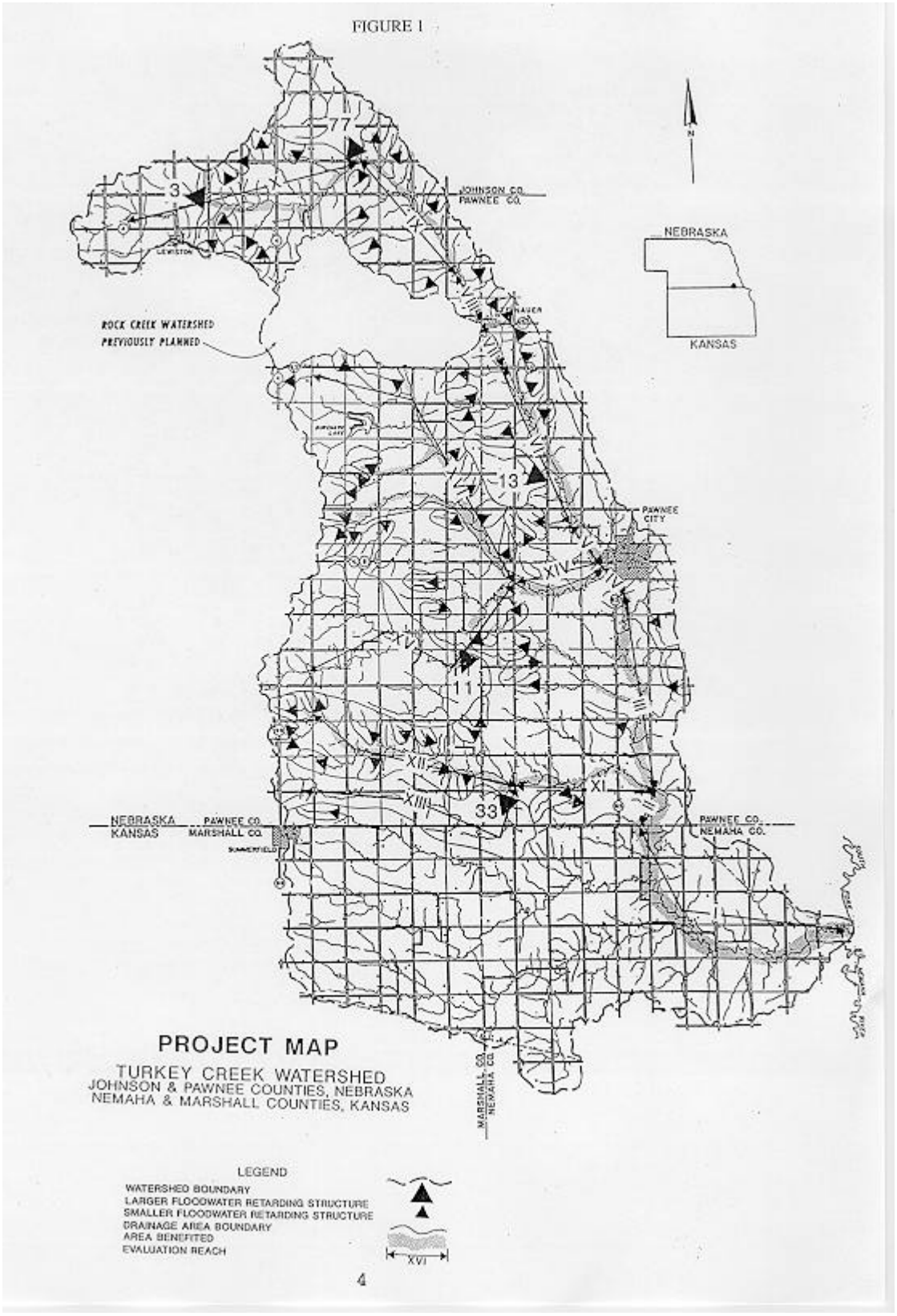
FIGURE I
77
3
JOHNSON CO.
PAWNEE CO.
NEBRASKA
KANSAS
ROCK CREEK WATERSHED
PREVIOUSLY PLANNED
13
PAWNEE CITY
11
33
NEBRASKA
KANSAS
PAWNEE CO.
MARSHALL CO.
PAWNEE CO.
NEMAHA CO.
MARSHALL CO.
NEMAHA CO.
PROJECT MAP
TURKEY CREEK WATERSHED
JOHNSON & PAWNEE COUNTIES, NEBRASKA
NEMAHA & MARSHALL COUNTIES, KANSAS
LEGEND
WATERSHED BOUNDARY
LARGER FLOODWATER RETARDING STRUCTURE
SMALLER FLOODWATER RETARDING STRUCTURE
DRAINAGE AREA BOUNDARY
AREA BENEFITED
EVALUATION REACH
XVI
4

The project expenditures of $5.6 million for the five large and 70 small dams would create 73 person-years of construction employment directly, and another 40 person-years of employment as the funds circulate through the two-county region. The $5.6 million in construction would leave $3.7 million dollars ($102,000 annualized) of value-added within the watershed. Value-added is payments made by industry to workers, interest, profits, and indirect business taxes. These can all be considered as net benefits to a local area. Total expenditures or sales also include payments for imports and other fund flows outside the region.

The NED annual flood damage reduction benefits of $529,100 (Table 1) were modeled as increased income for medium income households. The modeling was done this way because the reduced flood and sedimentation damages to agriculture result in little change in normal agricultural expenditures. If a cornfield is flooded out, most land, labor, and input costs have already occurred. The gain is primarily in increased farm income. Likewise, reductions in road and bridge damage should ultimately be reflected in lower tax rates; thus, higher personal income. This approach allows the IMPLAN value-added figures to be added to the NED benefits for RED benefits.

The $529,100 of annual flood damage reduction benefits would create another $260,000 of spending, 5.3 additional permanent jobs, and $153,500 of additional annual value-added in the local counties. The NED recreational benefit of $24,400 was calculated from the P&G tables at $4.52 each for 5,400 visitor days. This impact was calculated using $20 per day expenditures divided between $10 for retail purchases and $10 for eating and drinking. This $108,000 annual expenditure creates 4 jobs and $75,000 in local value-added annually.

The following tables contain more specific data on these items. Table 2 summarizes the average annual (AA) effects of the NED account. Table 3 summarizes the average annual effects of the IMPLAN area's Regional Economic Development account. Table 4 summarizes the average annual effects of the rest of the United States Regional Economic Development account. It should be noted that the net effects in Table 2 plus the net effects in Table 4 equal the net effects of Table 3 (381,300 + 495,500 = 876,800).

TABLE 2

THE NATIONAL ECONOMIC DEVELOPMENT ACCOUNT AVERAGE ANNUAL EFFECTS

Beneficial Effects	Dollars	Adverse Effects	Dollars
Reduced Flood Damage	529,100	AA Installation Costs	125,200
NED Recreation	24,400	OM&R Costs	47,000
Totals	553,500		172,200
Net NED	381,300		

TABLE 3

THE REGIONAL ECONOMIC DEVELOPMENT ACCOUNT

AVERAGE ANNUAL EFFECTS

Beneficial Effects	Dollars	Adverse Effects	Dollars
NED Reduced Flood Damage	529,100		
Local value-added from NED Reduced Flood Damage	153,500	AA Landrights Costs	7,200
NED Recreation	24,400		
Local value-added from recreation expenditures	75,000		
Annualized local value-added from construction expenditures	102,000		
Totals	884,000		7,200
Net Local RED	876,800		

TABLE 4

REST OF THE UNITED STATES REGIONAL ECONOMIC DEVELOPMENT ACCOUNT
AVERAGE ANNUAL EFFECTS

Beneficial Effects	Dollars	Adverse Effects	Dollar
		AA Other Installation Costs	118,000
		OM&R Costs	47,000
Total	0		165,000
		P&G Adjustment Factor	330,500
Net Rest of US RED			495,500

In summary, the relationship between the affected regional economy and the national economy should be restated. Multiplier effects are shown only in the RED account. Since the NED account registers all effects on the national economy, any differences between regional and national economic effects of the plan take the form of transfers from or to the rest of the nation. Multiplier effects are <u>not</u> shown in the NED account because they represent inter-regional transfers of regional economic activity, not increases in the national economy. The assumption is, if this investment had been spent in a different location, then that other region would have obtained similar Regional Economic Impacts. This is why the RED accounts are useful to local decisionmakers within the region, but less so to national decisionmakers outside the region. In other NRCS projects, RED accounts have been used to increase local and state support because of the high local benefits to costs.

REFERENCES

Buland, David, USDA NRCS, 1997, Use of IMPLAN Data and Model for Estimating Regional Impacts for the Turkey Creek Watershed, NE-KS, Summary, Blackland Research Center, Temple Texas. http://waterhome.tamu.edu/NRCSdata/implan/

Miller, Constance, USDA NRCS, 1998, Personal Communication, Northern Plains Regional Office, Lincoln, Nebraska.

Minnesota IMPLAN Group, 1997, IMPLAN Professional, Users Guide, Analysis Guide, Data Guide, Minnesota IMPLAN Group Inc., Stillwater, Minnesota. http://www.implan.com/

Nemaha Natural Resources District; US Department of Agriculture's Natural Resources Conservation Service and Forest Service, 1998, Watershed Plan-Environmental Impact Statement for Turkey Creek Watershed, USDA NRCS, State Office, Technology Section, Lincoln, Nebraska.

US Water Resource Council, 1983, Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, US Government Printing Office, Washington, DC, http://www.wrc-ndc.nsace.army.mil/iwm/p&g1.htm

US Department of Agriculture, Natural Resources Conservation Service, 1992, Missouri Approach to Project Formulation With Small Dams, State Office, Columbia, Missouri.

US Department of Agriculture, Soil Conservation Service (Now NRCS), 1987, Economic Handbook, Part II, for Water Resources, US Government Printing Office, Washington, DC.