EVALUATION OF THE SMALL RESERVOIR PROGRAM FOR RURAL WATER SUPPLY: INTERIM REPORT

BY

SUSAN M. MURRAY

PREPARED FOR
THE DEPARTMENT OF REGIONAL ECONOMIC EXPANSION

September 30, 1974

ABSTRACT

This is the interim report of a study concerned with the evaluation of certain reservoir and rural water supply projects in the Province of Ontario assisted under the Agricultural and Rural Development Act. (ARDA).

In this report a framework and format for the collecting and compiling of operational performance monitoring data on water resource projects are set out. With reference to such a framework and format, performance monitoring is carried out for the Orangeville Dam and Deer Creek Reservoir projects. Problems concerning insufficiency of project or planning data are highlighted.

Where possible, comparisons of pre-project data are made with post project data and inconsistencies examined. Serious inconsistencies are generally found to be lacking although in the case of the Orangeville Dam, the federal share of eligible costs is recorded in the records of the Ontario Conservation Authority as being significantly less than the allowable 37.5%. Suggestions are also made for the adoption of standardized project appraisal and operational performance monitoring frameworks which are compatible for analysis purposes.

TABLE OF CONTENTS

LIST OF TABLES

1. Introduction

This is the interim report of a study concerned with the evaluation of certain reservoir and rural water supply projects assisted under the Agricultural and Rural Development Act (ARDA) in the Province of Ontario. The aims of this study as set out in the terms of reference of the contract are as follows:

a) to compile data relating to the Orangeville Dam and Deer Creek Reservoir projects assisted under ARDA;

b) to devise an appropriate framework and format for the presentation of operational performance monitoring data on water resource projects and, with reference to the foregoing, discuss data applicable to the Orangeville Dam and Deer Creek Reservoir;

c) to calculate measures of efficiency of the Orangeville Dam and Deer Creek Reservoir in achieving their objectives;

d) to estimate the impacts of the Orangeville Dam and Deer Creek Reservoir on their respective areas.

This interim report will set out and discuss the findings of study components (a) and (b). Specifically, it will present and discuss the operational performance monitoring data applicable to the Orangeville Dam and Deer Creek Reservoir with reference to the framework and format devised for the presentation of such data on water resource projects. As well, general program data and project specific data compiled from the records of the Ontario Conservation Authorities Branch will be presented for the Orangeville Dam and Deer Creek Reservoir.

The Small Reservoir Program for Rural Water Supply was initiated in 1964 by the Ontario provincial government to encourage conservation authorities and rural municipalities to improve their rural water supply. Under this program, the province financed 75% of the cost of acquiring land and constructing dams and reservoirs for purposes of increasing water supply for irrigation, stock watering, fire protection and recreation. In 1966 the program was incorporated into the Second Federal-Provincial Agricultural and Rural Development Agreement and in this context was seen primarily as a means of improving and developing rural water resources in selected areas in both Southern and Northern Ontario in order to stimulate rural economic development. Under this new arrangement, the federal and provincial governments each agreed to contribute $37\frac{1}{2}$ % of the cost of acquiring land and constructing dams and reservoirs. The conservation authority or municipality contributed the remaining 25% and was also responsible for the maintenance and operation of the water supply installations.

The ARDA II agreement dealing with the Small Reservoir Program was signed on October 13, 1966. In this agreement it is stated that "in all cases the benefits are totally for rural people"[1]. However, as this report will indicate, it would seem that, in practice, not all ARDA funded water resource projects benefit only rural people. It should also be remembered that in this respect the objectives of the Conservation Authorities Branch are not identical with those of the Ontario ARDA

---

[1]ARDA Agreement: Small Reservoir Program dated October 13, 1966.

administration. The latter is primarily interested in assisting rural people whereas the Ontario Conservation Authority, in this instance, is primarily concerned with increasing the supply of water.

Between 1966 and May, 1972, ARDA expenditures in connection with the Small Reservoir Program amounted to $8,971,942 and involved 144 water supply schemes. Of these projects, 57 were constructed in Southwestern Ontario at a cost of $5,650,291. That is, 39.6% of the total number of projects funded under ARDA during this period were located in Southwestern Ontario and 62.97% of the pertinent ARDA expenditures were in relation to developments in this region. Because of the relatively high degree of urbanization of this area, it is improbable that no urban people benefited from ARDA funded dam and reservoir projects. Thus, it would seem that the objective of confining the benefits to the rural population is not likely to have been met in practice.

2. Project Data: Orangeville Dam

The construction of the Orangeville Dam and Reservoir was first recommended in the Credit Valley Conservation Report, 1956 to prevent flooding and supplement water flows in the dry summer months. In 1957, the authority received a 50% provincial grant under the Cónservation Authorities Act to acquire land for the project. This scheme involved the acquisition of 515 acres of land at a cost of $30,000 from 19 different land owners. Engineering studies were undertaken in 1965 and 1966 to determine design criteria for the project. Construction began in 1967 and was completed in 1970. The construction contract was awarded to Capital Paving Limited, Guelph, for $693,924.

The Orangeville Dam is located in the Township of Mono, County

of Dufferin, just north of the town limits of Orangeville. It is the second largest water supply project funded under ARDA II. The reservoir is situated in a basin used mainly for grazing with some cultivation of the higher areas and waste cedar swamplands in the lower sections. The reservoir site itself was mostly swampland with a 15 acre lake in the northeast portion. No existing buildings in the area were flooded in the creation of the reservoir. For more detailed information concerning this project refer to Table 1.

TABLE 1: CHARACTERISTICS OF THE ORANGEVILLE DAM

Location	Township of Mono, County of Dufferin
Objective	Flood Control
Sub-objective	Supplementation of low summer flows
Other Benefits Accruing	Recreation Pollution abatement Improved wildlife habitat
Main Benefiting Municipality	Town of Orangeville
Total Cost	$1,113,910
Construction Commenced	July, 1967
Construction Completed	North Dam: September, 1968 Main Dam: November, 1968 Reservoir: 1969
Project Appraisal Benefit-Cost Ratio	Not indicated by consulting engineers

The Orangeville Dam and Reservoir project involved the construction of the Main Dam, the North Dam, a reservoir and a control structure. The

North Dam is located 5,000 feet north of the Main Dam and is required in order to prevent water in the reservoir from flowing northward into the Nottawasaga River Valley. The reservoir is designed to store winter runoff in excess of approximately three cubic feet per second (c.f.s.) during the months from December to May, thus enabling a steady release of ten c.f.s. during the six months from June to November. As well, the design is such that all floods up to the 1 in 25 year flood should be controlled. The physical specifications for the facilities constructed are given in Table 2.

TABLE 2: PHYSICAL SPECIFICATIONS: ORANGEVILLE DAM

RESERVOIR	Total length: 2 miles Average Width: 1,500 feet Water Storage Volume: 2,300 acre/feet Surface Area: 430 acres
MAIN DAM	Total Length: 1,700 feet Maximum Bottom Width: 1,100 feet Maximum Height: 20 feet
NORTH DAM	Total Length: 1,800 feet Maximum Bottm Width: 1,200 feet Maximum Height: 17 feet
CONTROL STRUCTURE	Crest Length: 90 feet Maximum Probable Flood Discharge: 4,400 c.f.s.

It is understood that the Ontario Conservation Authority Branch has a cost-benefit analysis undertaken by consulting engineers when uncertainty exists as to the benefits of a proposed project. However, in the consulting engineers' report on the Orangeville Dam project no attempt was made to put any dollar value on the three benefits thought to accrue - viz - increased summer flow, dilution of municipal sewage and flood control.

Subsequently, as some rough working papers indicate, the Conservation Authorities Branch attempted to assign dollar values to the benefits accruing from the project. These were assumed to be flood control, recreation, pollution abatement, increased flow and wildlife enhancement. The life of the project was assumed to be 100 years and the interest rate 5%. Other assumptions were not specified. The benefits were computed to be $1,170,000. However, calculations of benefits do not appear to have followed standard present value methods. It was noted that even if the extreme estimated cost of the dam and reservoir ($1,200,000) was used, the cost-benefit ratio would still be close to 1:1. It should be noticed that this extreme estimate was, in fact, very close to the total final cost. The problems involved in the analysis of the benefits accruing to the Orangeville Dam will be considered and discussed in more detail in conjunction with the analysis of the efficiency of the project in achieving its objectives which will be presented in the final report.

While searching the files of the Ontario Conservation Authorities Branch, it was noticed that after the construction of the Orangeville Dam, there was a problem of flooding at the sewage treatment plant located downstream of the dam project. A drainage study of the Credit River basin was commissioned in 1971 to investigate flooding, drainage and erosion problems along the Credit River in the Town of Orangeville. It would appear that the problem of flooding has now been dealt with satisfactorily.

3. Project Data: Deer Creek Reservoir

The Deer Creek Reservoir is located in the Township of North Walsingham, Norfolk County, approximately 2 3/4 miles south of the

Village of Langton and 15 miles west of Simcoe. It is in the middle cost range of water supply projects funded under ARDA II and offers a different range of benefits than the Orangeville Dam. The primary purpose of the Deer Creek Reservoir is the supply of irrigational water requirements to the agricultural crops in the region. Engineering studies were undertaken in 1967 and 1968 to determine the feasibility and design criteria of the project. Construction began in 1968 and was completed in 1969. The construction contract was awarded to O.J. Gaffney Limited, Stratford. For supplementary information regarding the Deer Creek Reservoir, refer to Table 3.

TABLE 3: CHARACTERISTICS OF THE DEER CREEK RESERVOIR

Location	Township of North Walsingham, County of Norfolk
Objective	Irrigation
Sub-objective	Supplementation of low summer flows
Other Benefits Accruing	Water supply for Langton Stock watering Recreation
Main Benefiting Municipality	Township of North Walshingham
Total Cost	$328,851
Construction Commenced	July, 1968
Construction Completed	July, 1969
Project Appraisal Benefit-Cost Ratio	2.2:1

The Deer Creek Reservoir is located in the middle of an intensive tobacco growing area; the other main crops in the region include grain and corn. The land directly affected by the proposed flooding is all strictly bottomland, wasteland, steep slopes and wooded areas. All these lands are part of tobacco farms except in one instance where a mixed tobacco-pasture operation is involved. No existing buildings in the area were flooded to create the reservoir. For more detailed information concerning land use in the drainage basin refer to Table 4.

TABLE 4: LAND USE IN BASIN: DEER CREEK RESERVOIR

Land Use (1966)	Area	
	Number of Acres	Percentage Distribution
Grain:		
Winter Wheat	781	17.2
Buckwheat	3	0.1
Winter Rye	171	3.8
Oats	26	0.6
Barley	5	0.1
Tobacco	1115	24.6
Corn	399	8.8
Summer Fallow	70	1.6
Hay	52	1.2
Pasture: Improved	128	2.8
Unimproved	25	0.6
Wooded Lands and Forests	1192	26.3
Urban Area: Roads and Buildings	298	6.6
Idle Wasteland	177	3.9
Water (Ponds and Reservoir)	85	1.8
Total	4,527	100.0

The Deer Creek Reservoir project, funded under ARDA, involved the construction of a dam and reservoir. The physical specifications for these facilities are given in Table 5. At the time of construction of the Deer Creek project, a road and bridge were also constructed by

O.J. Gaffney Limited across the lands and structures of the conservation works. This new county development road is part of a main traffic artery going west to Aylmer. The cost of constructing the road and bridge was shared between the Ontario Department of Highways and the County of Norfolk. The total cost of the road and bridge was approximately $366,000.

TABLE 5: PHYSICAL SPECIFICATIONS: DEER CREEK RESERVOIR

Surface Area of Reservoir:	76 acres
Permanent Reservoir Level:	657.5 G.S.C.
Water Storage Volume:	1,485 acre-feet
Greatest Water Depth:	45 feet
Average Water Depth:	30 feet
Flood Storage Level:	667.85 G.S.C.

In the case of the Deer Creek Reservoir, a cost-benefit analysis was done as part of a preliminary engineering study carried out by a firm of consulting engineers. The economic life of the project was assumed to be 50 years and an interest rate of 4% was used for discounting. The benefit-cost ratio was computed with only one benefit quantified-irrigation. Additional benefits such as recreation, stock watering and water conservation were not assigned a dollar value. However, it was pointed out that if one were to consider these additional benefits it could only increase the benefit-cost ratio. Irrigation benefits were computed on the basis of the following crops-tobacco, corn, hay, pasture, vegetables and strawberries. With no irrigation project, only tobacco, corn, hay and pasture were considered in the computations. The reasoning for assuming different land use in the area with the irrigation project was not explained. On this basis, the benefit-cost ratio was computed to be 2.2:1. This benefit-cost analysis will be discussed

further as part of the calculation of measures of efficiency which will be done in conjunction with the impact evaluation phase.

During the search of the Ontario Conservation Authority files, reported complaints were noted. On one instance, a farmer complained of flooding in his cornfield. Since this was mentioned only once in the correspondence, it would appear that the problem was promptly dealt with and a solution was found that was satisfactory to both parties. Also, with the filling of the reservoir, a future road allowance in the area was flooded. The Conservation Authority subsequently purchased this land from the Township of North Walsingham.

4. A Framework for Operational Performance Monitoring

Operational performance monitoring is concerned with program inputs and direct outputs. Thus, for example, capital expenditures (and, where appropriate, other factor inputs) may be related to pertinent physical output measures, while the number of dollars spent may be categorized under various headings. Operational performance monitoring also provides a means whereby regular comparisons may be drawn between estimates of key variables or values made in the project planning stage and the corresponding figures achieved in practice. For physical development projects, such comparisons will normally encompass costs of construction, volume of output and timing of development.

In the case of the Orangeville Dam and Deer Creek Reservoir the operational performance monitoring is being carried out after the completion of the projects rather than throughout the construction of the projects. However, the approach developed for these two projects will serve to define an appropriate framework for the operational performance

monitoring of other water resource projects not yet undertaken. Also, any monitoring data which are found not to have been collected for the Orangeville Dam and Deer Creek Reservoir could, if possible, be recorded for future water resource projects.

The following variables are considered as candidates for inclusion in the operational performance monitoring phase of the evaluation. Under ideal conditions, it would be desirable to collect data on all the following variables.[2]

I PROGRAM LEVEL DATA

1. Annual program expenditures by primary purpose (flood control; irrigation; water supply; recreation; other).
2. Annual program expenditures by type of expenditure (land acquisition; construction; engineering; surveys and miscellaneous; administration).
3. Number of projects by primary purpose.
4. Number of projects approved, underway, completed.
5. Number of man-years employment, technical and professional, by occupational classification.
6. Total Cost; Shareable Cost; Federal Share; Provincial Share; Authority Share.

---

[2]Total availability of data for a variable is denoted by *; partial availability by + .

II PROJECT LEVEL DATA

+1. Actual and approved annual expenditures on: land; construction (by type of facility); engineering; surveys and miscellaneous; administration; maintenance.

*2. Total Cost; Shareable Cost; Federal Share; Provincial Share; Authority Share.

*3. Number and amount of payment claims.

+4. Actual and expected facilities complete/incomplete/not started by year.

+5. Number of acres of farmland removed from production.

+6. Number of man-years employment (local; other) in construction/ maintenance.

+7. Number of "benefiting acres"[3]

+8. Cost per "benefiting acre".

*9. Cost per acre-foot of conservation storage.

+10. Total and federal cost per man-year employment.

11. Revenues paid for domestic/agricultural water supply.

12. Revenues generated through recreational facilities of the project.

---

[3] "Benefiting acres" is not a well defined concept in the general context of a water resource project. However, in relation to a specific project with specific purposes, variuos proxy measures can be defined. For example, in the case of a project whose major purpose is flood control, "benefiting acres" could be defined as the number of acres newly protected. "Protected" could then be rigourously defined in order to operationalize the measure.

13. Seasonal peak flow of water.

14. Number of urban water supply connections on the system.

15. Number and amount of farmers' insurance claims.

It would be desirable to collect data on the above set of variables in relation to any water resource project. However, this may not always be possible. Of the measures presented above, those listed under Part I relate to the overall program. It would be desirable to have such measures reported on an annual basis to provide a program summary. However, such summary information is not available from the Conservation Authorities Branch and it is not the purpose of this study to compile these data. The measures listed in Part II above relate to specific projects. The data relating to these measures have been collected, wherever possible, on an annual basis for the Deer Creek Reservoir and the Orangeville Dam and are presented in the following sections of this report.

5. Operational Performance Monitoring: Orangeville Dam

In this section, the operational performance monitoring data are presented and discussed for the Orangeville Dam. These data were computed and tabulated from the files of the Ontario Conservation Authorities Branch.

The actual annual costs by type of expenditures for the Orangeville Dam were computed from the payment claim forms made available by the Accounts Section, Ontario Department of Energy, Mines and Resources. These costs were not available for all the types of expenditure indicated in Section 4. However, on these forms the actual costs were subdivided according to preliminary engineering, land acquisition, development, construction and other. There were no figures or estimates available for the costs of administration or of maintenance. The actual costs by year for the

Orangeville Dam are given in Table 6. There are also no data on the approved annual costs. However, approved total cost figures are available.

As was previously mentioned, the Orangeville Dam was essentially completed by 1970 (1970-71 fiscal year). However, it is not surprising that there were some expenditures after this date. The expenditures for land acquisition may be settlement payments made to parties who initiated protest action when the initial purchase offer was made. The construction costs in 1971-72 could possibly be back payments owed to the contractor. The expenditure for construction in 1973-74 was for fencing at the reservoir site. It would appear that the expenditure for "development" in 1968-69 is an error on the audit form. From the description of the work completed on this form, it seems likely that this cost should have been included in the construction total for 1968-69. Other than the above mentioned, there are no other unusual expenditures for the Orangeville Dam.

For the Orangeville Dam, there appear to be no data available for approved annual costs. However, there are two estimates of approved total costs by type of expenditure - in 1967 and in 1970. In 1970, a revised estimate of the total costs was made. An additional grant of $39,375 was approved at this time for additional costs incurred to complete the dam and reservoir. These additional costs were due to increases in land costs and survey, legal and appraisal fees. For the actual and approved total costs by type of expenditure for the Orangeville Dam and Reservoir, refer to Table 7.

TABLE 6: ACTUAL ANNUAL COSTS BY TYPE OF EXPENDITURE: ORANGEVILLE DAM

Type of Expenditure	Fiscal Year								
	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75 (to Aug. 74)
	$	$	$	$	$	$	$	$	$
Preliminary Engineering	43,365								
Land Acquisition			43,428				423		1,000
Development			27,451						
Construction		277,199	613,201	85,036	20,882	1,610		315	
Other									
Total	43,365	277,199	684,080	85,036	20,882	1,610	423	315	1,000

TABLE 7: ACTUAL AND ESTIMATED COSTS BY TYPE OF EXPENDITURE: ORANGEVILLE DAM

Type of Expenditure	Original Estimate (1967)	Revised Estimate (1970)	Actual	
			Amount	Percentage Distribution
	$	$	$	
Prelininary Engineering	50,180	50,180	43,365	3.89
Land Acquisition	66,000 (160 acres)	200,000 (179 acres)	44,851	4.03
Development	-	-	27,451	2.46
Construction	950,000	893,000	998,243	89.62
Other	30,500	6,000	-	-
Total	1,096,680	1,149,180	1,113,910	100.0

The land acquistion estimates found in Table 7 include survey, legal and appraisal fees. The construction estimates include engineering and contingency costs. The revised estimate of the total cost of the Orangeville Dam is closer to the actual costs incurred than is the original estimate. However, the component estimates differ substantially from those of the actual. There would seem to be no apparent reason for budgeting $200,000 for land acquisition when the actual expenditures for acquiring land were only approximately $45,000. It may be that the survey, legal and appraisal fees did not increase as much as expected or perhaps the actual construction costs include some of these fees. This could not be determined from the claim forms. In any case, the original estimate is a much better indication of the actual costs of land acquisition.

It also appears that the costs of construction had decreased by 1970. However, after completion of the project, it is evident that this was not the case. The final construction costs are higher than both estimates. The fact that there were no planned expenditures for "development"

would seem to support the hypothesis that those actual expenditures so classified should be considered construction costs. If this hypothesis is true, then 92.08% of the total costs are construction expenditures. The expenditures listed under "other" in both estimates in Table 7 comprise bank interest. The extent to which such a charge entered, if at all, into actual costs could not be determined from the payment claim forms.

For the actual total, shareable, federal, provincial and authority costs by year, refer to Table 8. Table 9 contains these actual and estimated total costs. Shareable cost is defined to be the sum of the federal and provincial shares for those claims in which the federal government contributed.

TABLE 8: ACTUAL COSTS BY YEAR: ORANGEVILLE DAM

Costs	FISCAL YEAR								
	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75 (to Aug. 1974)
	$	$	$	$	$	$	$	$	$
Total	43,365	277,199	684,080	85,036	20,882	1,610	423	315	1,000
Shareable	-	-	512,848	63,777	-	-	98	236	750
Federal	-	-	255,811	31,889	-	-	49	118	375
Provincial	32,524	207,899	257,037	31,888	15,662	1,207	268	118	375
Authority	10,841	69,300	171,232	21,259	5,220	403	106	79	250

TABLE 9: ACTUAL AND ESTIMATED COSTS: ORANGEVILLE DAM

Costs	Original Estimate (1967)	Revised Estimate (1970)	Actual	
			Amount	Percentage Distribution
	$	$	$	
Total	1,096,680	1,149,180	1,113,910	100.0
Shareable	784,876	824,250	577,610	51.9
Federal	392,438	412,125	288,242	25.9
Provincial	392,438	412,125	546,978	49.1
Authority	311,804	324,930	278,690	25.0

As can be seen in Table 8, according to the Ontario Conservation Authorities payment claims, the federal government did not contribute to the cost of the Orangeville Dam in the years 1966-67, 1967-68, 1970-71, or 1971-72. During these years, the provincial government is shown as contributing 75% of the total expenditures and the authority 25%. There are several possible explanations for this. It would appear that not until 1968-69 did the provincial government begin to use, for the Orangeville Dam, the federal funds allocated under ARDA to the Small Reservoir program. Consultations with the Ontario Conservation Authority indicate that a probable explanation for this is that the Orangeville Dam was not an ARDA project until 1968-69. It was also indicated in this consultation that perhaps certain land purchases included in the total cost were not eligible under ARDA. Since funds allocated under ARDA II for the Small Reservoir Program were not project specific, it would appear there was no necessity for the federal share for a given project to be 37.5%. Thus, funds may have been shifted from this project to another project under the program. The above reasoning would also explain the percentage distribution of the actual costs found in Table 9.

The number and amount of payment claims each year for the Orangeville project are given in Table 10. The amount of payment claims is defined to be 75% of the total cost on each claim since the local

authority contributes 25%. As would be expected, the majority of the claims are during the actual construction of the project.

TABLE 10: NUMBER AND AMOUNT OF PAYMENT CLAIMS: ORANGEVILLE DAM

Payment Claims	Fiscal Year								
	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75 (To Aug./74)
Number	7	15	24	7	2	2	2	2	1
Amount ($)	32,524	207,899	512,848	63,777	15,662	1,207	317	236	750

The number of acres removed from production in order to construct the Orangeville Dam was obtained from the land acquisition files of the Ontario Conservation Authorities. As part of the land acquisition process, an appraiser files a report giving the type of land involved and a fair price for the purchase. From these sources, data on the number of acres removed from production, by type of use, were obtained and are presented in Table 11. However, the acreage does not include 515 acres of land purchased by the conservation authority in the late 1950's. There was no information available on the classification of this land. Hence, Table 11 refers to only that land purchased between 1966 and August, 1974. The land was classified as homesite, pastureland, slash or other. Of the total area removed, 52 acres,or 29.1%,was farmland.

TABLE 11: NUMBER OF ACRES REMOVED FROM PRODUCTION BY TYPE OF USE: ORANGEVILLE DAM

Type of land	Area	
	Number of acres	Percentage Distribution
Homesite	20	11.1
Pastureland	52	29.1
Slash	54.1	30.4
Other	52.6	29.4
Total	178.7	100.0

During the construction phase of the Orangeville Dam, progress reports were filed by the supervising engineer which contained information on the number of men working constructing the dam. Using these data, it is possible to compute the number of man-years employment in construction. The progress reports for the Orangeville Dam were filed on a monthly basis. To compute the number of man-years employment created, the total number of man-months was converted to man-weeks. Then, assuming that 48 man-weeks is equal to 1 man-year, the number of man-years was determined. For the number of jobs created in construction for the Orangeville Dam, refer to Table 12.

TABLE 12: EMPLOYMENT IN CONSTRUCTION: ORANGEVILLE DAM

Employment	Fiscal Year	
	1967-68	1968-69
Man-weeks	832	674
Man-years	17.3	14

As previously stated, the construction of the Orangeville Dam was essentially completed by 1968-69. However, there was some work done on the reservoir subsequently, although the Conservation Authority files do not contain progress reports on these latter phases of construction. During 1967-68, the contractor worked from July, 1967 to March 31, 1968, a 39 week period. During this period, 832 man-weeks, or 17.3 man-years, employment were created. Hence, there was an average of 21.3 full-time construction workers per week during the period July 1, 1967 to March 31 1968. In the 1968-69 fiscal year, 674 man-weeks, or 14 man-years, employment were created in the 35 week period between April 1, 1968 and November 30, 1968. Therefore, there was an average of 19.3 full-time workers per week from April 1, 1968 to November 30, 1968. For purposes of estimating employment and income effects, it would be desirable to know how much of this employment and resulting wages went to local persons. This is not known but since the contracting firm was Capital Paving Limited, Guelph, it is likely that most of the man-years employment created benefited employees of this firm from outside the locality.

No annual data are apparently available on the number of man-years employment in maintenance of the project. The Credit Valley Conservation Authority, however, was able to provide some information. There is one full-time dam operator at the dam site at all times and a four or five man work crew working on maintaining and developing the area. If operational performance monitoring were to be undertaken in future years, the required information could be provided. However, no data on past years are currently available.

Three cost effectiveness ratios are calculated relating to water storage and employment. The total cost per acre-foot of conservation storage is calculated to be $484. The total cost per

man-year employment is computed to be $35,588 and the federal cost per man-year employment is $9,209. Note that man-year employment figures refer only to the construction phase as data are not available for the other phases.

The files of the Ontario Conservation Authority contained no information on the number of "benefiting acres" and hence, the cost per "benefiting acre" could not be calculated. Neither were any detailed data available on the actual and expected facilities complete/incomplete/not started by year. In this regard, the only data provided were the completion dates of the facilities involved. There have been no revenues generated through recreational useage of the Orangeville project. There were apparently no data on revenues paid for domestic/agricultural water supply, seasonal peak flow of water, the number of urban water supply connections or the numbers and amount of farmers' insurance claims.

6. Operational Performance Monitoring: Deer Creek Reservoir

In this section, the operational performance monitoring data will be presented and discussed for the Deer Creek Reservoir. These data were also computed and tabulated from the files of the Ontario Conservation Authorities Branch.

For the Deer Creek Reservoir, the payment claim forms provided by the Accounts Section, Ontario Department of Energy, Mines and Resources were used to tabulate the actual annual costs by type of expenditure. These costs were subdivided in the same manner as those of the Orangeville Dam. Again, there were no figures or estimates available for the cost of administration or maintenance. The actual annual costs for the Deer Creek Reservoir are given in Table 13. As in the case of the Orangeville Dam, there are apparently no data on the approved annual expenditures. However, approved total cost figures are available.

TABLE 13: Actual Annual Costs by Type of Expenditure: Deer Creek Reservoir

Type of Expenditure	Fiscal Year					
	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73
	$	$	$	$	$	$
Preliminary Engineering	8,000					
Land Acquisition		3,054	10,221			433
Construction		233,599	63,716	3,965		
Other		5,863				
Total	8,000	242,516	73,937	3,965		433

As previously mentioned, the Deer Creek Reservoir was essentially completed in the 1969-70 fiscal year. The two small expenditures incurred after this date are not unusual. The construction cost in 1970-71 could possibly have been back bills owed to the contractor or payments for miscellaneous work required to complete the project. The land acquisition expenditure in 1972-73 includes the cost of the land purchased from the Township of North Walsingham because of the flooding of the future road allowance. The expenditure classified as "other" in 1968-69 is for the clearing of the reservoir site. Hence, there would seem to be no inconsistencies in the actual annual costs for the Deer Creek Reservoir.

There are no data available on approved annual costs for the Deer Creek Reservoir. However, there are two estimated, made in 1968 and 1969 respectively, of approved total costs by type of expenditure. Also, in 1969, an additional grant of $22,500 was approved for additional costs incurred to complete the project. For the actual and approved total costs by type of expenditure for the Deer Creek Reservoir, refer to Table 14.

Table 14: Actual and Estimated Costs by Type of Expenditure: Deer Creek Reservoir

Type of Expenditure	Original Estimate (1968)	Revised Estimate (1969)	Actual	
			Amount	Percentage Distribution
	$	$	$	
Preliminary Engineering	9,000	9,000	8,000	2.43
Land Acquisition	27,000	29,400	13,708	4.17
Construction	263,000	281,800	301,280	91.62
Other	12,000	12,000	5,863	1.78
Total	311,000	341,000	328,851	100.00

The revised estimate of the total cost of the Deer Creek Reservoir is somewhat closer to the actual total cost incurred than is the original estimate. However, the component estimates, in some cases, differ substantially from the costs actually incurred. In both estimates, the amount budgeted for land acquisition is much greater than the actual cost of acquiring land. The actual construction cost is also greater than either of the estimates. Perhaps some of the charges on the claims forms for construction should actually be listed under land acquisition. The expenditures listed under "other" in both estimates are for the clearing of the reservoir site. It should be noted that the percentage distribution of the actual costs for the Deer Creek Reservoir is very similar to that of the Orangeville Dam.

For the actual total, shareable, federal, provincial and authority costs by year, refer to Table 15. The actual and estimated total costs are given in Table 16.

Table 15: Actual Costs by year: Deer Creek Reservoir

Costs	Fiscal Year					
	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73
Total	$ 8,000	$ 242,516	$ 73,937	$ 3,965	$	$ 433
Shareable		181,886	55,453			
Federal		90,143	27,114			
Provincial	6,000	91,743	28,339	2,974		325
Authority	2,000	60,630	18,484	991		108

As can be seen in Table 15, the federal government apparently did not contribute to the cost of the Deer Creek Reservoir in the years 1967-68, 1970-71 or 1973-74. This is the same pattern noticed for the Orangeville Dam. Similar reasons as those hypothesized for the Orangeville project

might explain the apparent deficiencies in federal funding. It should be noted that, in this case, the percentage of federal funding is much closer to the maximum allowable, 37.5%, than in that of the Orangeville Dam.

Table 16: Actual and Estimated Costs: Deer Creek Reservoir

Costs	Original Estimate (1968)	Revised Estimate (1969)	Actual	
			Amount	Percentage Distribution
	$	$	$	
Total	311,000	341,000	328,851	100.00
Shareable	226,500	249,000	237,339	72.17
Federal	113,250	124,500	117,257	35.66
Provincial	113,250	124,500	129,381	39.34
Authority	84,500	92,000	82,213	25.00

The number and amount of payment claims each year for the Deer Creek Reservoir are given in Table 17. As would be expected, the majority of the claims are during the construction phase of the Deer Creek Reservoir.

Table 17: Number and Amount of Payment Claims: Deer Creek Reservoir

Payment Claims	Fiscal Year					
	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73
Number	1	9	5	2	0	1
Amount ($)	6,000	181,886	55,453	2,974	-	325

The land acquisition files of the Ontario Conservation Authorities and the appraisal report for the Deer Creek Reservoir were used to determine the number of acres removed from production, by type of use, in order that this project could be undertaken. For the Deer Creek Reservoir, the land acquired is classified as bottomland, woodland, tobacco land or pastureland. The number of acres removed from production for the Deer Creek Reservoir is given in Table 18.

Table 18: Number of Acres Removed from Production by Type of Use: Deer Creek Reservoir

Type of Land	Area	
	Number of Acres	Percentage Distribution
Bottomland	59.2	20.0
Woodland	123.6	41.7
Pastureland	8.0	2.7
Tobacco Land	3.9	1.3
Type Unknown	101.4	34.3
Total	296.1	100.0

However, for 101.4 acres, or 34.3%, of the land acquired, the land use was not available. From Table 18, it is evident that at least 11.9 acres, or 4%, of the total acreage was farmland. From the land acquisition files, it was clear that none of the 101.4 acres was tobacco land. If the assumption is made that the acreage whose type is unknown has the same proportion of bottomland, woodland and pastureland as that of the 194.7 acres for which the land use is known, then 16.8 acres of the total would be pastureland, and 20.7 acres, or 6.9%, of the total acreage removed would be farmland.

During the construciton of the Deer Creek Reservoir, progress reports were filed on a weekly basis by the supervising engineer. These reported the number of construction workers and were used to compute the number of man-years employment in the construction of the Deer Creek Reservoir. The number of man-weeks employment was computed from these reports and converted to man-years employment using the assumption that 48 man-weeks is equal to 1 man-year. The number of jobs created in the construction of the Deer Creek Reservoir is given in Table 19.

Table 19: Employment in Construction: Deer Creek Reservoir

Employment	Fiscal Year	
	1968-69	1969-70
Man-weeks	199	297.5
Man-years	4.1	6.2

Construction of the Deer Creek Reservoir began on July 21, 1968 and continued until October 5, 1968. The following year construction commenced again on April 6 and was completed by July 26. There were no progress reports for any construction after this date. During 1968-69, from July 21 to October 5, an 11 week period, 199 man-weeks, or 4.1 man-years, employment were created. Hence, there was an average of 18.1 full time construction workers per week during this time period. In the 1969-70 fiscal year, 297.5 man-weeks, or 6.2 man-years, were created in the 15 week period from April 6 to July 26. Therefore, during this time period, an average of 19.8 full time workers per week were employed in the construction of the Deer Creek Reservoir. The contracting firm for the Deer Creek project was O.J.Gaffney Limited, Stratford. Hence, it is likely that a majority of the men employed during the construction were imported from the Stratford area and therefore benefited from the project in the form of wages received.

There are no annual data available on the number of man-years employment in maintenance. However, the Long Point Conservation Authority provided the following information. There is one full time dam operator at the dam site at all times and a two or three man work crew working on the maintenance of the project. Again, if the operational performance monitoring were being done on a yearly basis, more data could be provided.

For the Deer Creek Reservoir project, the number of "benefiting acres" is available from the Ontario Conservation Authority files. In an Ontario Conservation Authority Report, it is stated that the Deer Creek Reservoir would directly benefit 1,900 acres in the basin through the supply of irrigational water requirements. These acres are those above the dam site and immediately adjacent to the reservoir. However, the term "benefiting acres" was not defined in this report and should not be confused with the concept of "benefiting acres" introduced earlier.[4] For this reason, the number of "benefiting acres" in the current context should be considered only as an estimate of the true number of "benefiting acres".

Four cost effectiveness ratios are calculated relating to water storage, employment and benefiting acres. The total cost per benefiting acre for the Deer Creek Reservoir is $173. This ratio is computed using the estimate of "benefiting acres" given previously. The total cost per acre-foot of conservation storage is calculated to be $222. The total cost per man-year employment is computed to be $31,927 and the federal cost per man-year employment is $11,384. Again, the man-year employment figures refer only to the construction phase as data are not available for the other phases.

For the Deer Creek project, there appears to be no detailed data on the actual and expected facilities complete/ incomplete/ not started by year. Only the completion dates are given. The amount of revenue generated through recreational facilities is not applicable to the Deer Creek Reservoir since no admission fee is charged for the use of such facilities. Data are also not available on revenues paid for domestic/ agricultural water supply, seasonal peak flow of water, the number of urban water supply connections or the number

---

[4] See Page 12

and amount of farmers' insurance claims. We have already noted that these data are not available for the Orangeville Dam and this could also be the case for any other ARDA assisted water resource project in Ontario.

7. Comments

As is apparent throughout this report, several desirable data are not available for the Orangeville Dam and Deer Creek Reservoir. Because of this, certain facets of an ideal performance monitoring evaluation could not be pursued. It would appear that the reason these items are unavailable is the lack of a standard project proposal and data reporting format. One of the purposes of this study has been to define such a reporting format. However, on the basis of the experiences gained in compiling the data for Section 4, there would appear to be a need to develop a format for project planning and updating which is compatible with the performance monitoring framework. Part of performance monitoring involves the comparison of actual with planned achievements. However, if information from the planning or pre-project phase is not available on a compatible basis with the actual or current project data, such comparisons cannot be made. This point is particularly relevant if current project performance monitoring is to be adopted.

As was mentioned previously, it may be doubted whether the benefits from the Orangeville Dam and Deer Creek Reservoir projects have accrued solely to rural people. In fact, as has been pointed out, a significant proportion of the jobs created in the construction phases of both projects were likely filled by individuals from urban areas in Southwestern Ontario. Although it is possible that long term benefits will accrue to persons from

rural areas, it would seem especially likely, in the case of the Orangeville Dam, that such benefits will also accrue to the urban population of Orangeville itself. As was also pointed out previously, the objective of confining benefits to persons in rural areas would appear to be impractical in the context of the Small Reservoir Program.

Susan M. Murray
September 30, 1974.